

# An Illustrated Guide to Basic Water Purification Operations

User Manual  
Release 1.0

BTW Consulting (Pty) Ltd



WRC Report No. TT 247/05





# An Illustrated Guide to Basic Water Purification Operations

User Manual  
Release 1.0

Report to the Water Research Commission  
By  
BTW Consulting (Pty)Ltd



**WRC Report No TT 247/05**  
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#### **DISCLAIMER**

This report has been reviewed by the Water Research Commission (WRC) and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the WRC, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

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# PREFACE

Pure and safe drinking water is an essential component of life, which is why the provision of potable water by water service providers to the South African people is a crucial function. The people responsible for operating the water treatment plants throughout South Africa play an important and determining role in ensuring that the quality of our daily water supply conforms to the required standards. In this regard the skills development and training of the water treatment plant operators is seen as a vital component of a consistent and effective service - especially in small water treatment facilities based in rural areas where support services are often not readily available.

This guide is aimed mainly at entry-level water treatment plant operators and in particular those who operate small and geographically isolated plants. The guide clearly emphasizes the important role that these operators play in ensuring that safe drinking water is supplied to our communities in these areas. Particular attention has been given to the needs of these operators who have limited literacy skills, with the basic concepts of water treatment and the correct operational procedures explained in simple terms in a humorous manner using cartoon illustrations. The guide is intended to be used as both a reference manual by professionals and managers. An electronic slide presentation on CD is also provided for training purposes.

The Water Research Commission sincerely thanks all who have contributed their knowledge, wisdom and ingenuity to the creation of a unique and truly South African product of which we can all feel proud. We are certain that the guide will make a significant and long lasting impact on the quality and sustainability of water supplies to our communities.












Dr Rivka Kfir  
Chief Executive Officer  
Water Research Commission  
Date: 24 June 2005

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## **GLOSSARIES**

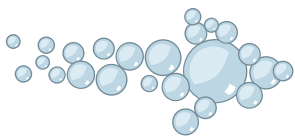
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# INTRODUCTION

The purpose of this guide is to provide persons involved in conducting routine maintenance tasks and checks on water purification works with a better understanding of basic water purification activities.

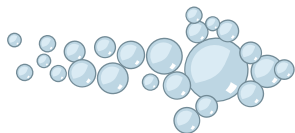
The guide has been developed in an illustrated colour format to aid a wide spectrum of users in the understanding of the underlying fundamental concepts to basic water purification works.

The guide is intended for use by:



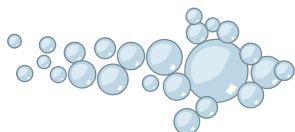
Water care operators and attendants

To apply the basic operating activities related to a water purification works effectively and to develop an understanding why these tasks are important in the overall functioning of the works.



Water care managers

To provide guidance in basic water purification operations to staff.



Educators

To develop an understanding of routine operation and maintenance activities of a water purification works.

# Overview of a typical water purification plant



ABSTRACTION



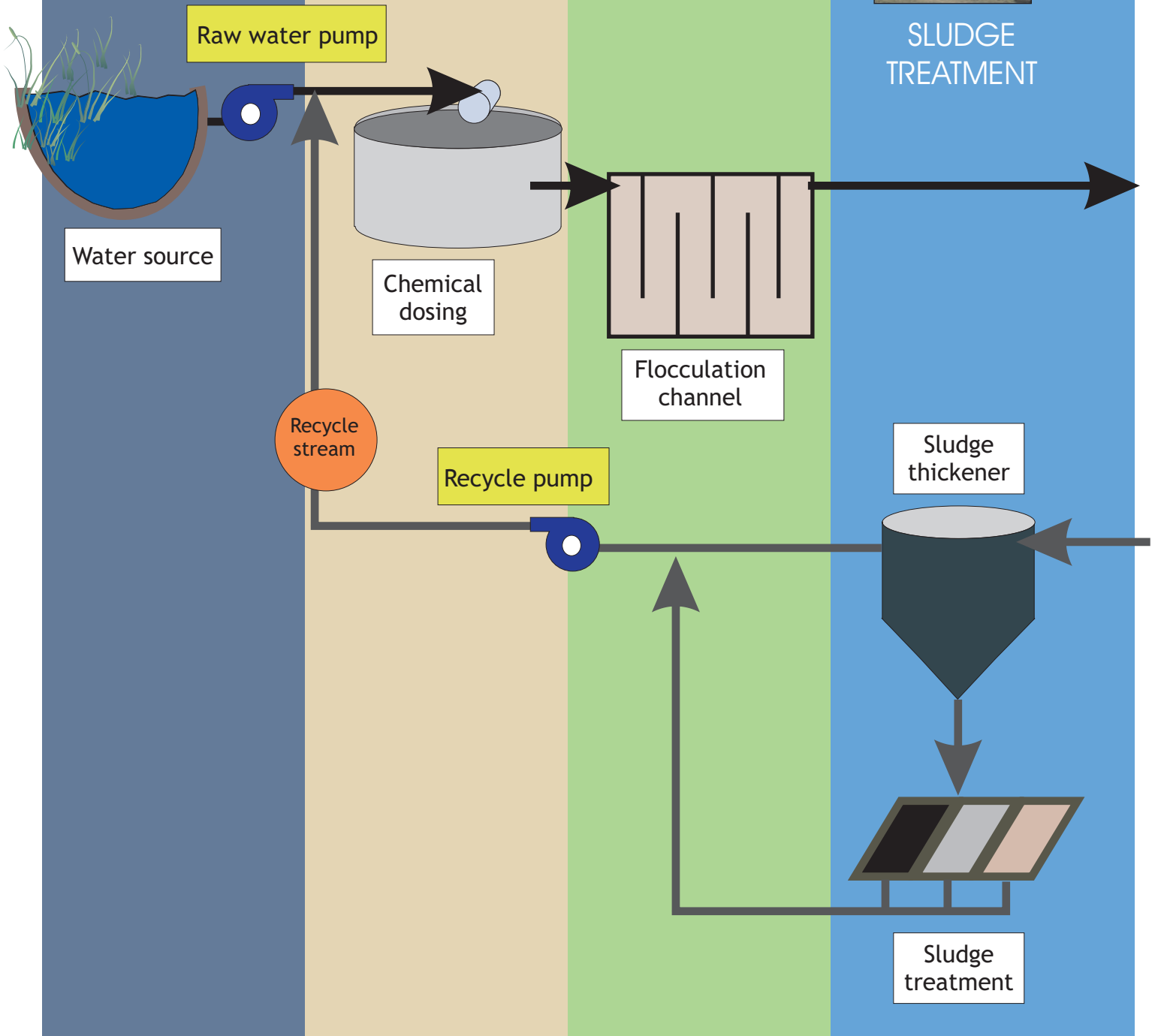
CHEMICAL DOSING

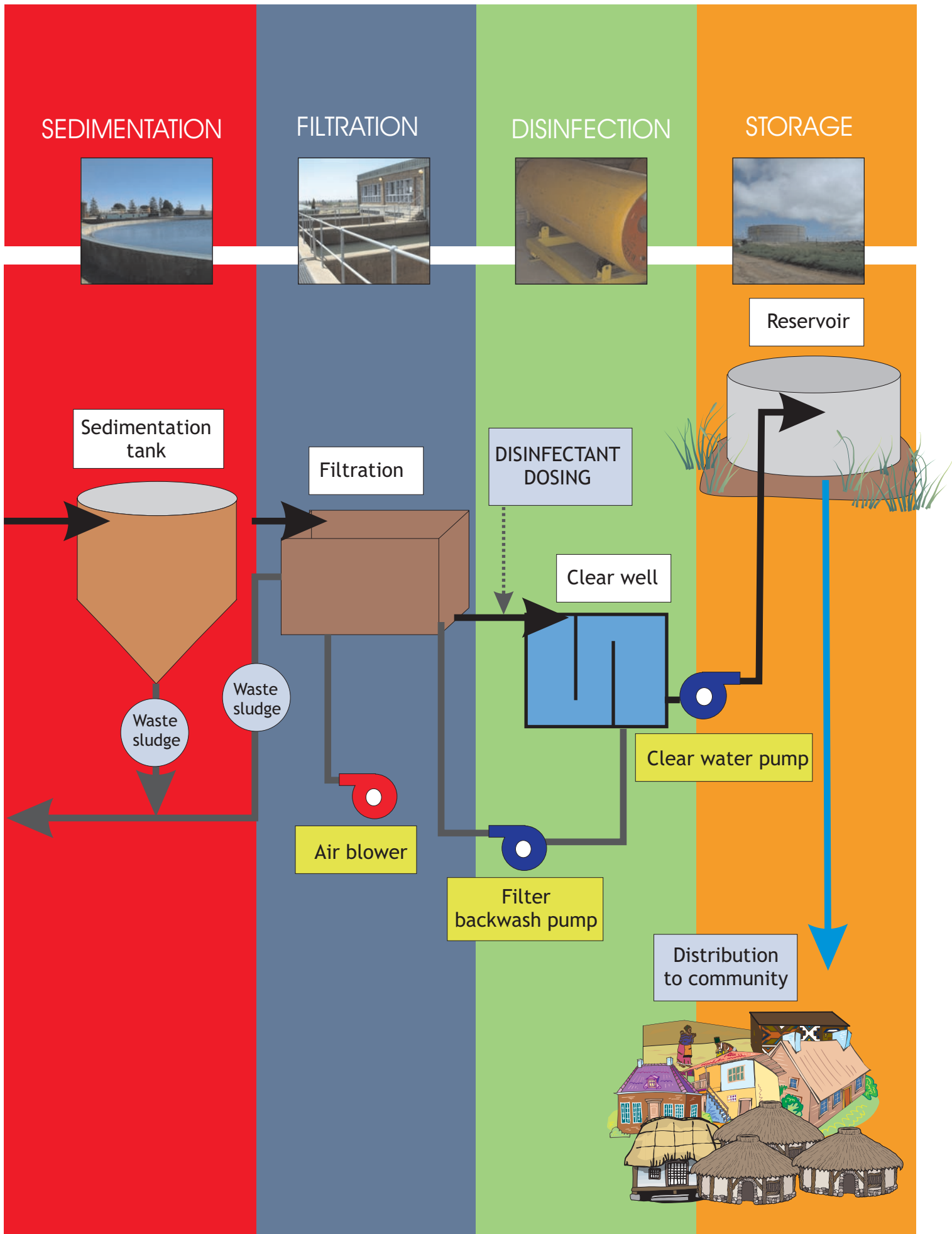


FLOCCULATION



SLUDGE TREATMENT







## SYMBOLS USED IN THE MANUAL



Correct action



Incorrect action



Problem OR Trouble



Safety tip for a dangerous situation

## ABSTRACTION 1

# ABSTRACTION 1



ABSTRACTION CAN BE DONE  
IN TWO WAYS:

1. Pump station from water source
2. Canals out of dams and rivers

# ABSTRACTION 1

## TRANSLATIONS

English	Abstraction
Isizulu	Ukundonsa
Isixhosa	Ukususa
Siswati	Kudvoswa kwemanti etindzaweni temvelo
Sesotho	Tlhotlo
Setswana	Tshunyetso ya metsi go tswa mo metsweding ya one ya tlhago
Sepedi	Go ntšha/gogo meetse metsweding/methopong ya tlhago
Ixitsonga	Kuka mati yahuma exihlobyeni
Venda	U bvisa madi kha tsha mupo
Afrikaans	Onttrekking

## THE PURPOSE OF ABSTRACTION

Raw water for water purification plants is generally abstracted from surface water sources such as dams and rivers. In cases where the purification plant is lower than the source, water can be diverted directly into a canal or pipeline to the plant, without the need for pumps. Where the plant is above the source, pumps are needed.

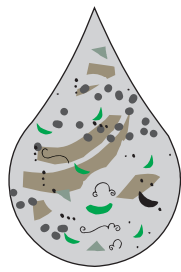
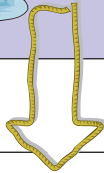
The quality of raw water taken from dams is fairly constant throughout the year, whereas the quality of raw water from rivers can vary considerably through the year due to rain and varying flow in rivers. These variations will then require regular adjustments to the chemical dosing rate and the type of flocculant that can provide effective flocculation.

# ABSTRACTION 1

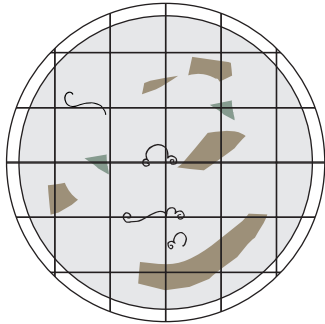
## THIS IS THE EFFECT OF ABSTRACTION ON THE WATER



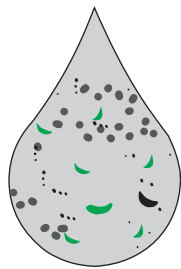
Abstraction from water source



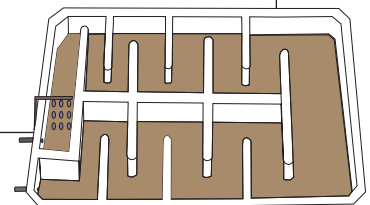
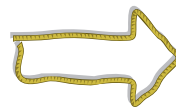
Water contains large object, solids, fine suspended solids and disease causing bacteria



Through screens at the abstraction process the large objects are removed from the water



The water without the large objects are pumped to the purification plant



Large objects



Large solids



Fine solids



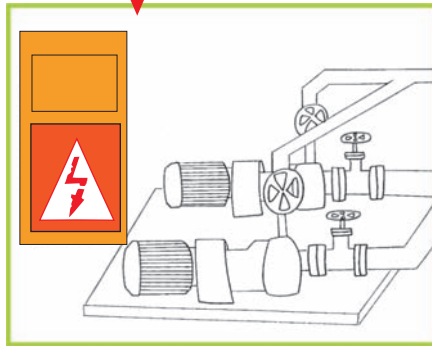
Disease causing bacteria

# ABSTRACTION 1

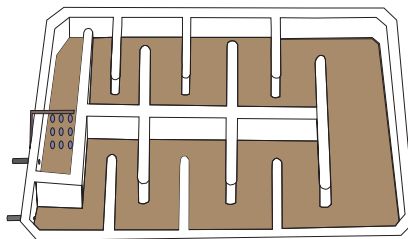
## ABSTRACTION FROM DAMS AND RIVERS



PIPE LINE FROM DAM OR RIVER

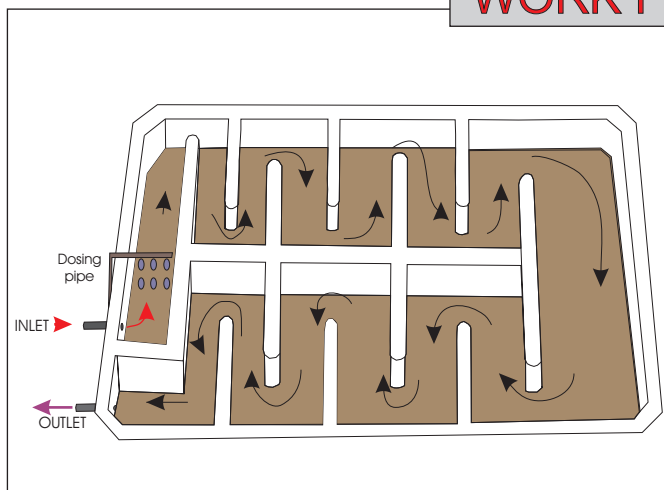



PUMP STATION



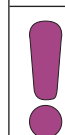
FLOCCULATION CHANNEL

### WORK PROCEDURE



 The operator knows that the abstraction process is running smoothly when the inflow into the flocculation channel is normal



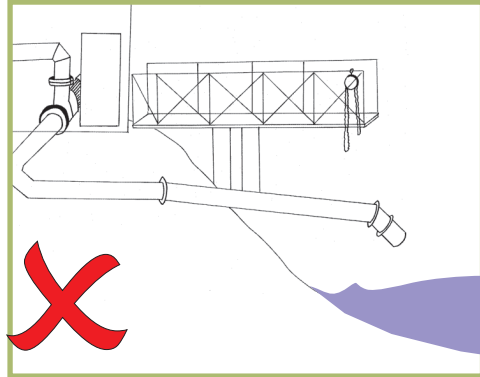
 The operator calls the supervisor if the inflow into the flocculation channel is very slow or has stopped - there is a problem with the abstraction of raw water from the source

# ABSTRACTION 1

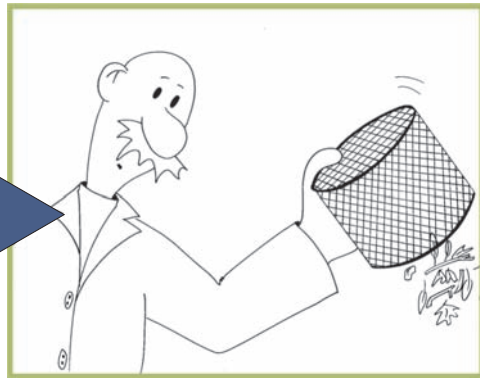
**NO INFLOW**

**WHERE IS THE PROBLEM ??**

- 1 The mouth of the suction pipe must be underneath the water at all times



- 2 There could be a blockage or trapped air in the suction pipe. Clean the screen!



- 3 Make sure that all the pumps are operational



# ABSTRACTION 1

- 4 Make sure that the power supply to the pumps are on



- 5 There might be a leak in the pipe that goes to the water purification plant



Notes.....

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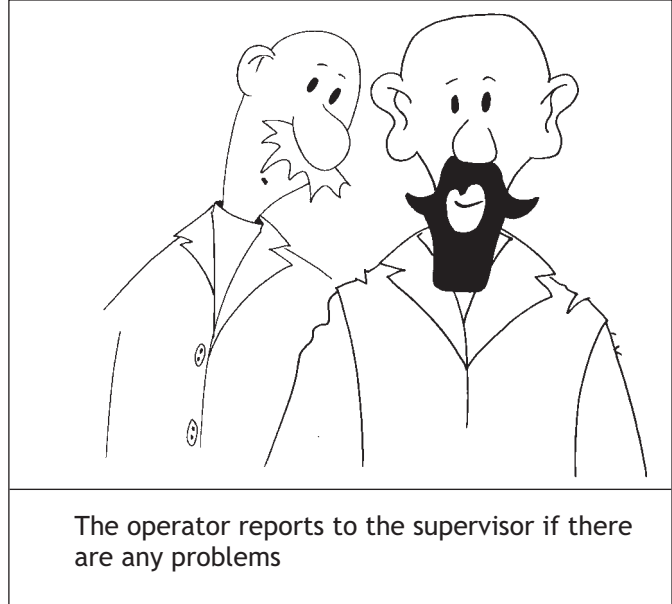
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## ABSTRACTION 1



  
**Always wear your safety jacket!!**

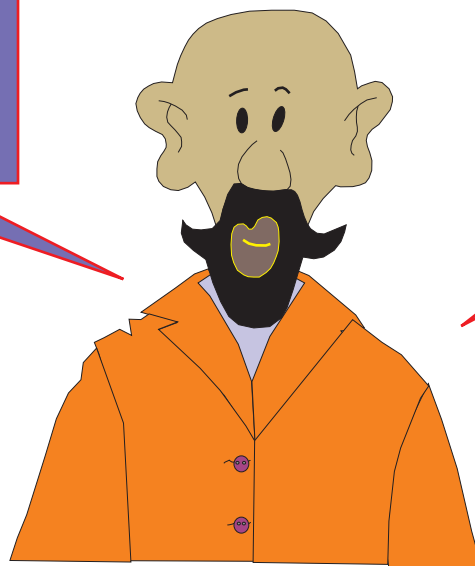
## SUMMARY

The operator keeps the mouth of the inlet pipe free from obstructions and under the water

The operator informs the supervisor if there is no flow into the water purification plant

The operator makes sure that pumps in the pump station are in a working order

The operator reports all problems to the supervisor

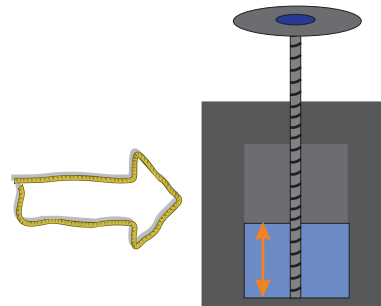




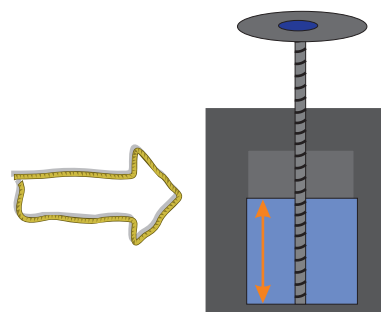
# ABSTRACTION 1

## HOW TO MANAGE THE INFLOW

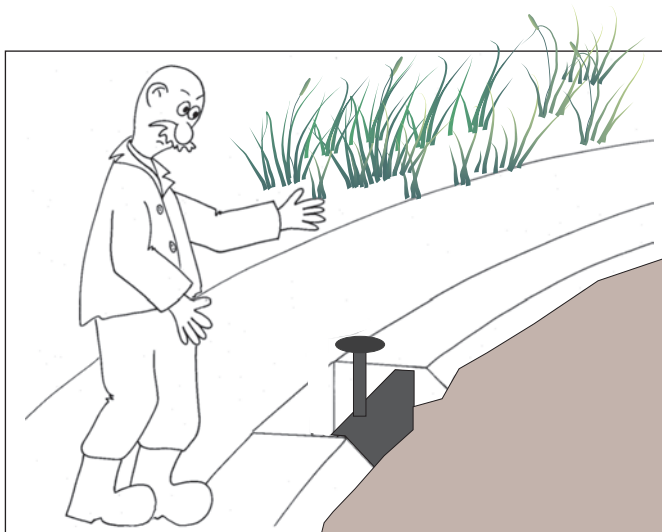
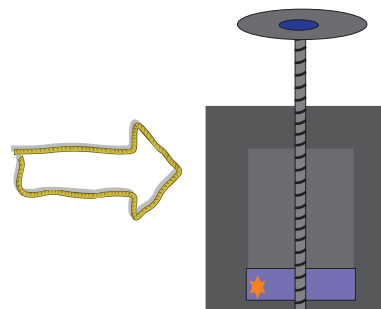
When the water level in the channel is **normal** the weir is open to allow normal flow



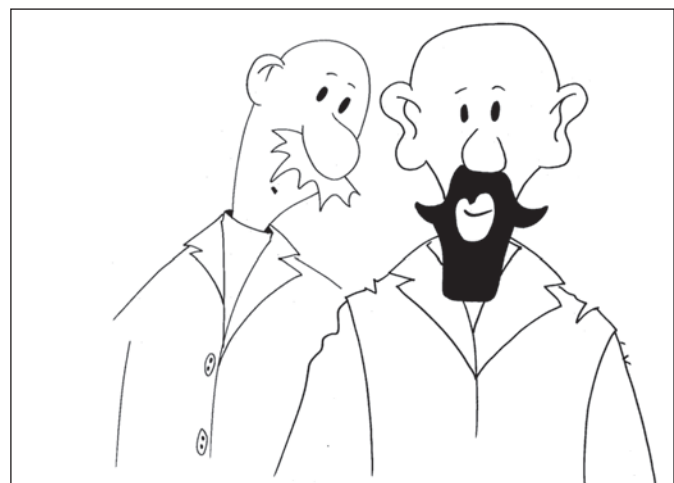
When the water level in the channel is very **low** the weir is opened more to allow more flow into the plant



When the water level in the channel is **high** the weir is slightly closed to allow less flow



The operator makes sure that the weir is open at all times. If closed no inflow can take place



The operator reports any problems to the supervisor



# CHEMICAL DOSING 2



THE FOLLOWING ASPECTS ARE IMPORTANT  
IN CHEMICAL DOSING:

1. Lime dosing

2. Flocculant dosing

## CHEMICAL DOSING 2

### TRANSLATIONS

English	Chemical dosing
Isizulu	Ithamo elilinganisiweyo lesithako
Isixhosa	Ukuhoya iikhemikhals ekususeni izinto eziphilayo nasekucoceni
Siswati	Kutsatsa umutsi wentele kususa ema organisms ne Disinfection
Sesotho	Litlhare tse tsheloang
Setswana	Go dirisa dikhemikhale go tlosa di-organisms le go bolaya dikokwanatlhoko
Sepedi	Go šomiša dikhemikhale, go tloša diphidi le go thibela gore di se sa bowa
Ixitsonga	Matirhiselo ta ti khemikhali, ku susa switsotswana na ku sirhelela ma vabyi
Venda	U langa dzi chemicals, u itela u bvisa dzi organisms
Afrikaans	Chemiese dosering

### THE PURPOSE OF CHEMICAL DOSING

There are particles in the incoming water that have to be removed. These particles can:

1. Make the water look dirty
2. Give the water a bad taste, and,
3. Cause illness in people.

Some of these particles will remain in the water for a long period of time. To speed up the process of particles falling to the bottom so that they can be removed, chemicals can be added. Chemical dosing is done for two main reasons. The first is to dose a \*coagulant. Coagulants are usually either aluminium or iron salts which are sometimes combined with \*polymers. Coagulants are dosed in order to chemically \*destabilise the charge of \*colloidal particles which in turn results in \*colloids to form larger \*flocs in the downstream \*flocculation process. Sometimes bentonite clay is dosed with the coagulants to give the forming flocs more weight for easier removal.

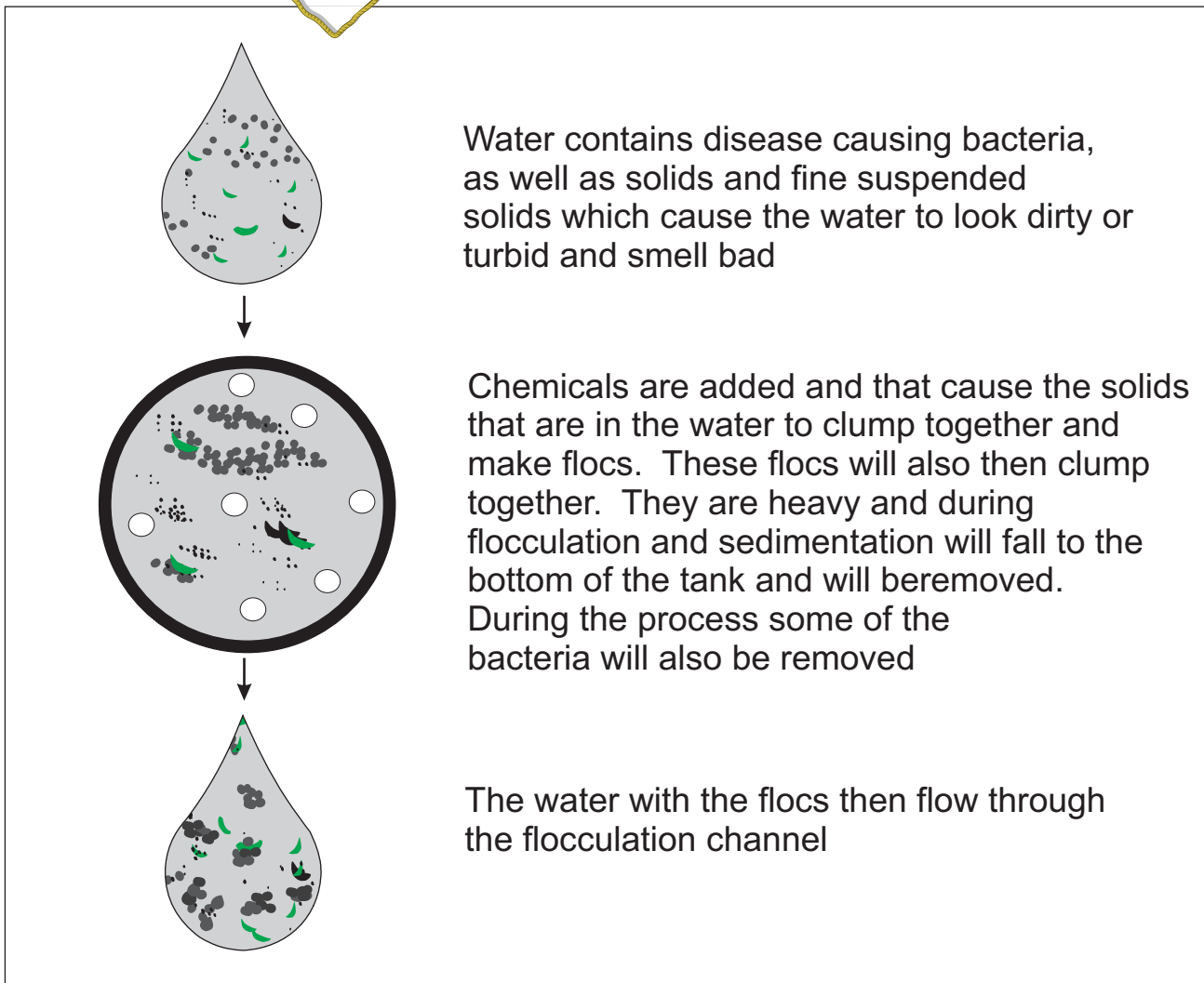
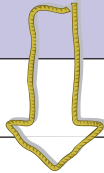
The other reason for chemical dosing is for water stabilisation. \*Corrosive water (low pH) will result in corrosion of steel piping systems and some \*alkalinity must then be added to the water to increase the pH. Usually lime or soda-ash is used to achieve this. When the natural \*pH is very high this again can result in scale forming in the pipes and an acid must be added to reduce the pH.






\* See Glossary

## CHEMICAL DOSING 2

### THIS IS THE EFFECT OF CHEMICAL DOSING ON THE WATER

Dosing takes place in the flocculation channel

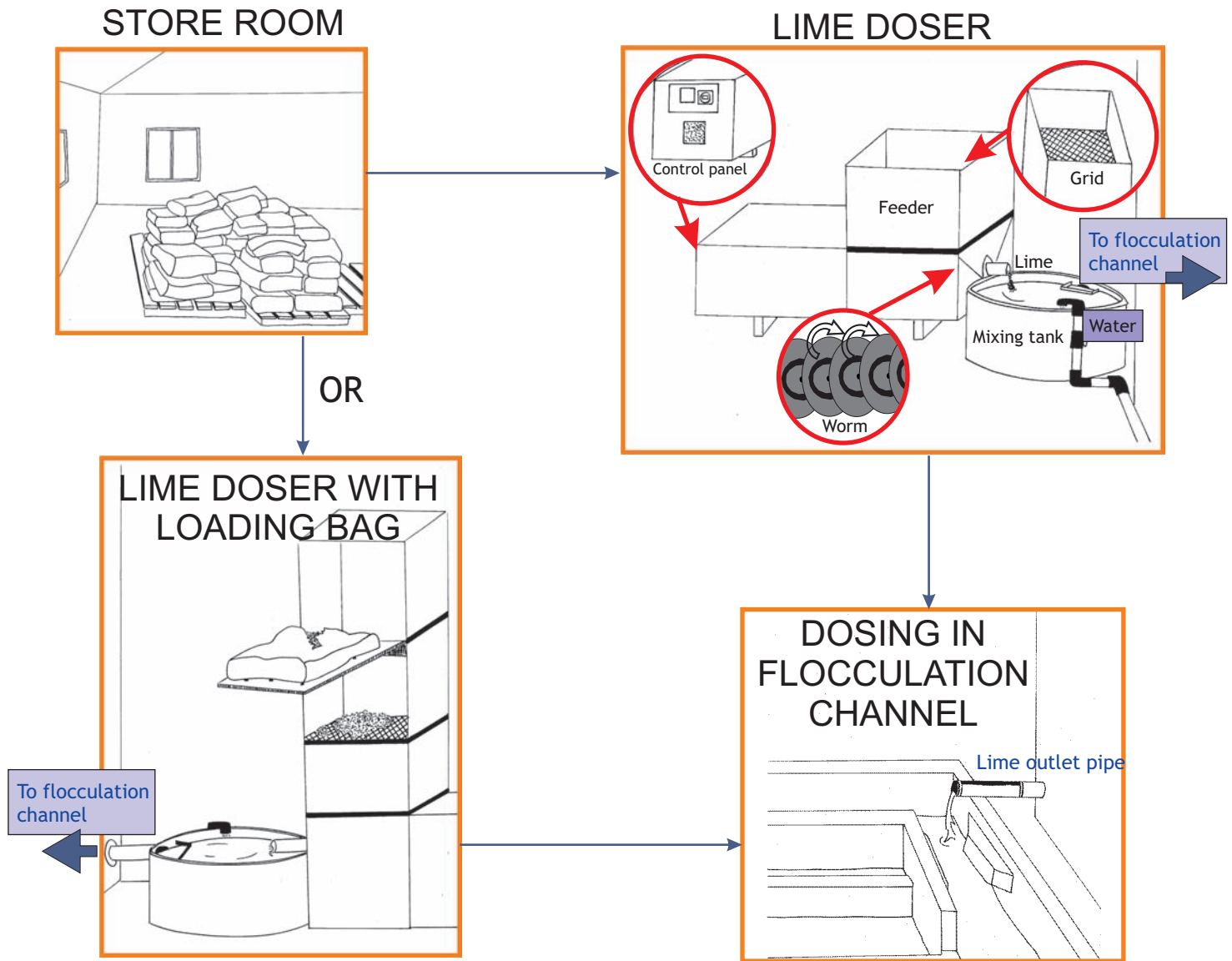


-  Chemicals
-  Large objects
-  Large solids
-  Fine solids
-  Disease causing bacteria



# CHEMICAL DOSING 2

## THE LIME DOSING UNITS



### THE OPERATOR

Uniform-BUTTON UP!

Gloves

Boots

The operator is dressed in the correct work clothes

Wear mask when working with lime

The operator wears a dust mask when adding lime

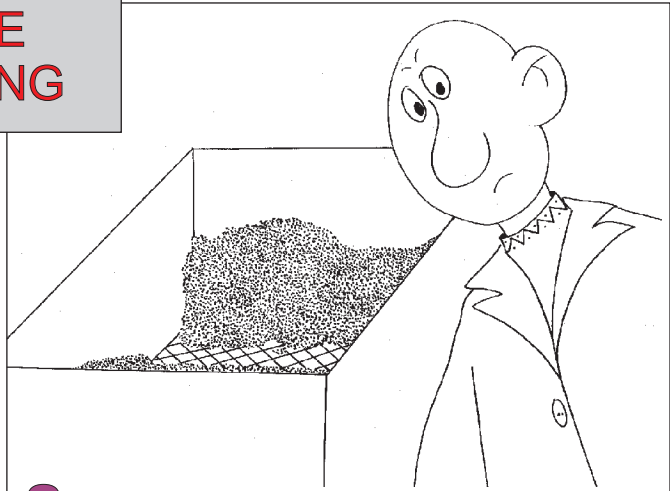
The operator should not wear loose clothing around the dosing units

# CHEMICAL DOSING 2

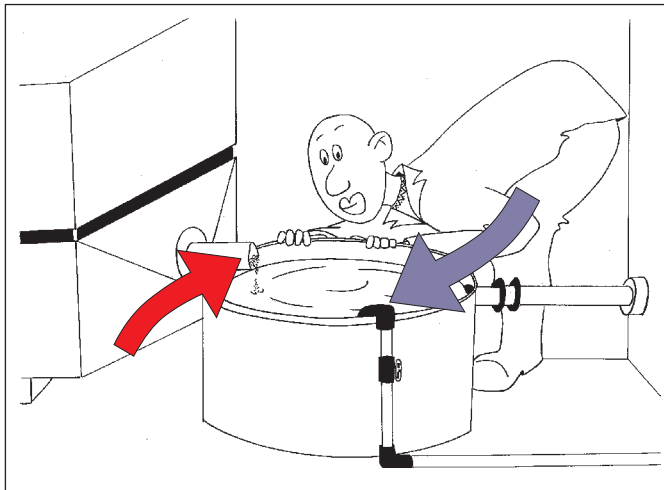
## LIME DOSING



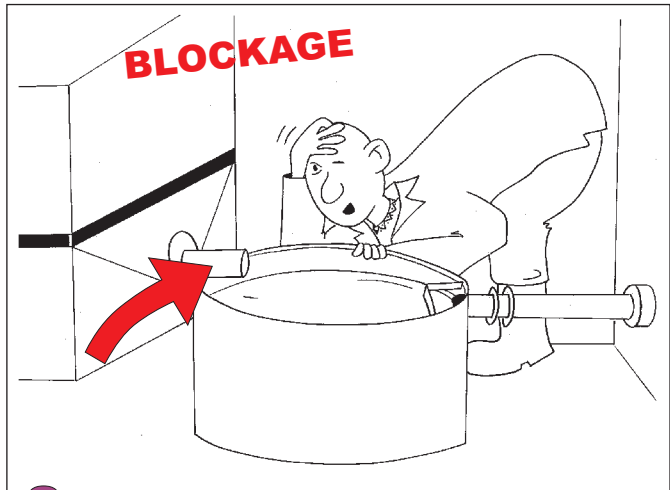
✓ The operator makes sure that there is enough lime in the unit and that the lime feeder is working



! The operator makes sure that the lime does not pack onto the sides of the unit



✓ The operator sees to it that the lime and water is mixing in the mixing tank

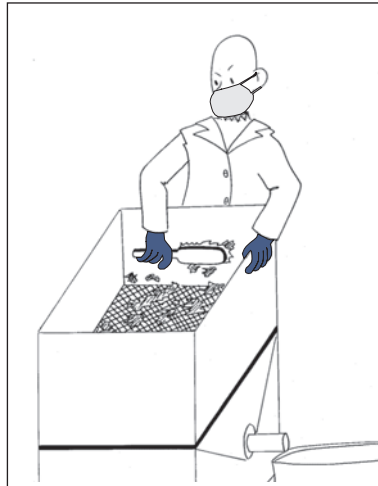


! The operator sees that no lime is coming out. This means that there is a blockage



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## CHEMICAL DOSING 2

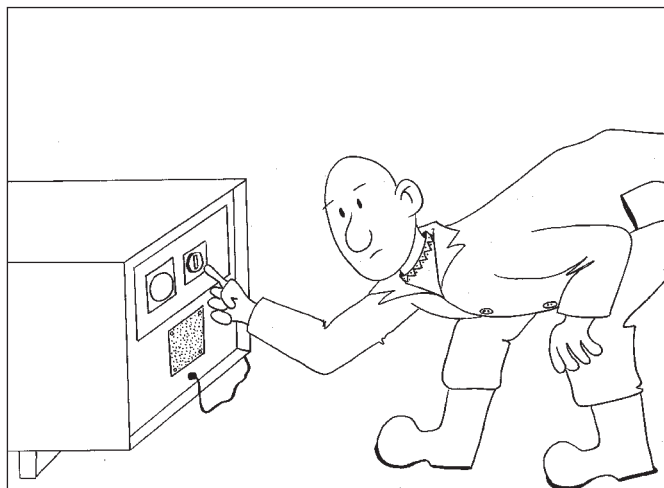


### HOW TO FIND THE BLOCKAGE

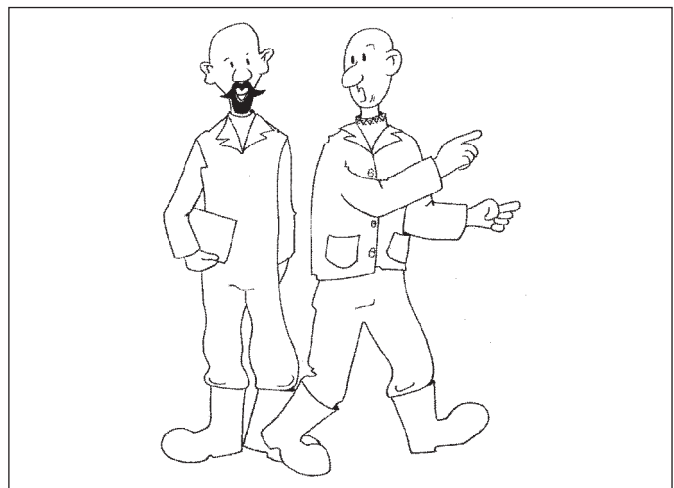


✓ The operator cleans the grid to make sure that the lime has not blocked the grid and is still falling through

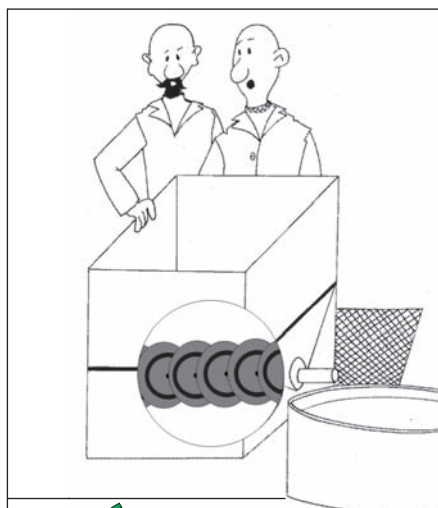
! If the lime is still not feeding into the mixing tank, the worm in the tank might not be working



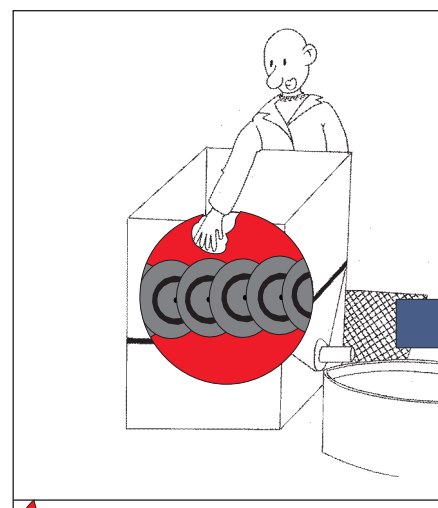
The operator switches the motor off at the control panel



The operator calls the supervisor



✓ The operator and the supervisor look to see if the worm is working



✗ The operator must never put his hands near the worm

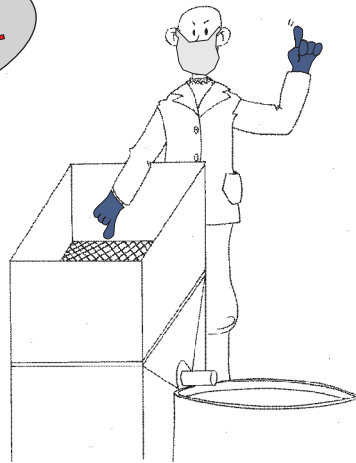



🎯 If the operators' hand gets caught in the worm, it can lead to injury

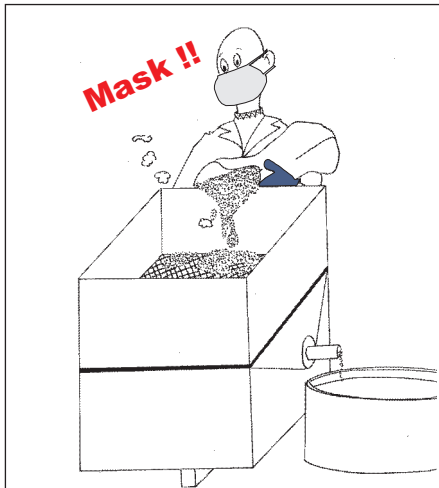
# CHEMICAL DOSING 2


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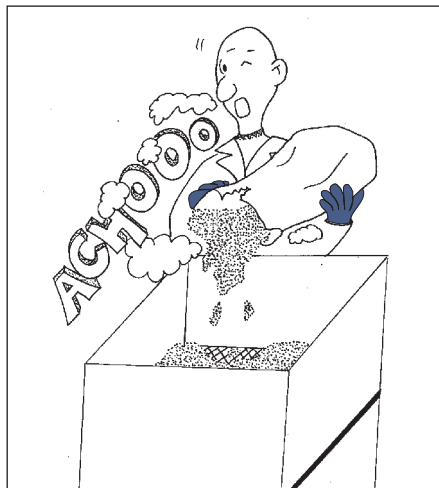
**ADDING LIME**

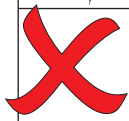


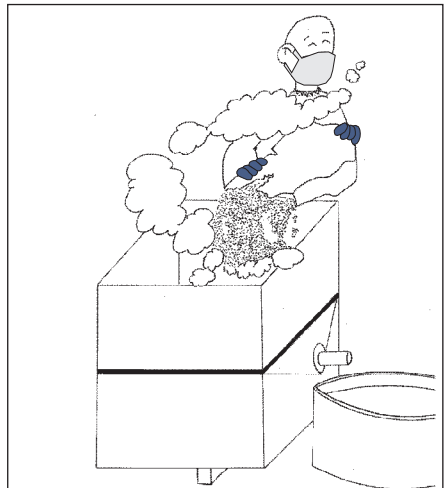
 Before adding lime the operator makes sure that the grid is in place

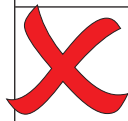


 The operator wears a dust mask when adding the lime

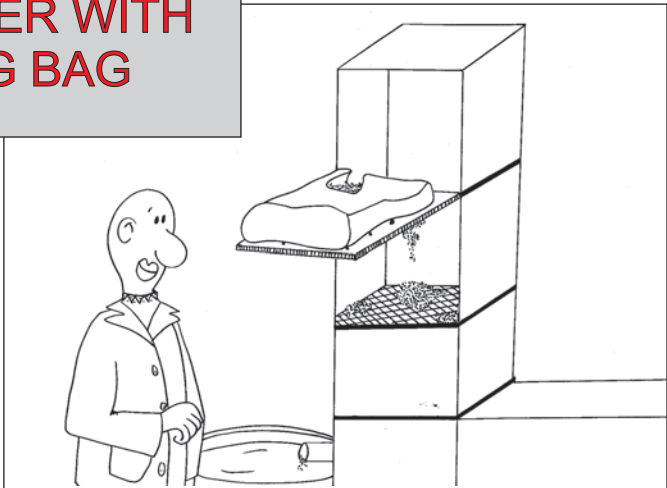



 The operator is not wearing a dust mask



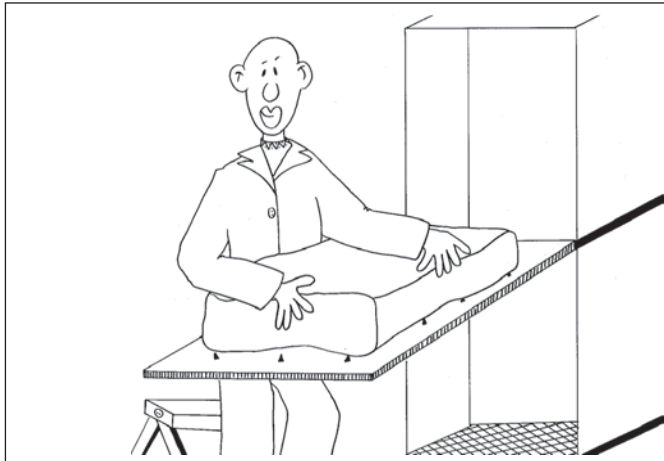
 Adding the lime too quickly leads to excessive dust in the air

**LIME FEEDER WITH LOADING BAG**



 The operator makes sure that there is always enough lime

# CHEMICAL DOSING 2

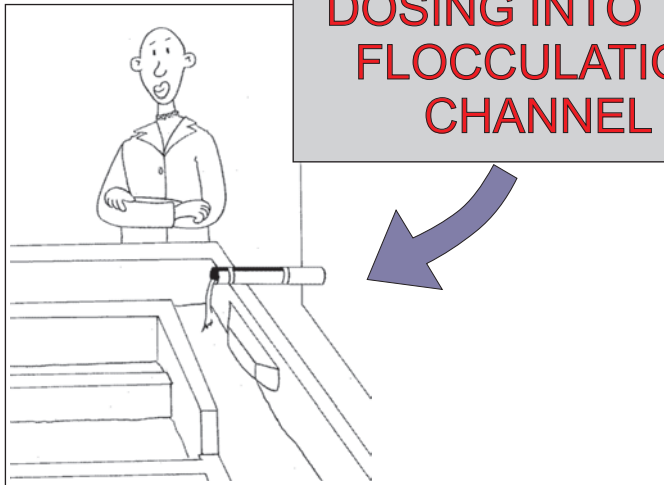


✓ The operator makes sure that the bag is pinned securely onto the bag feeder when adding a new bag and before closing the feeder door

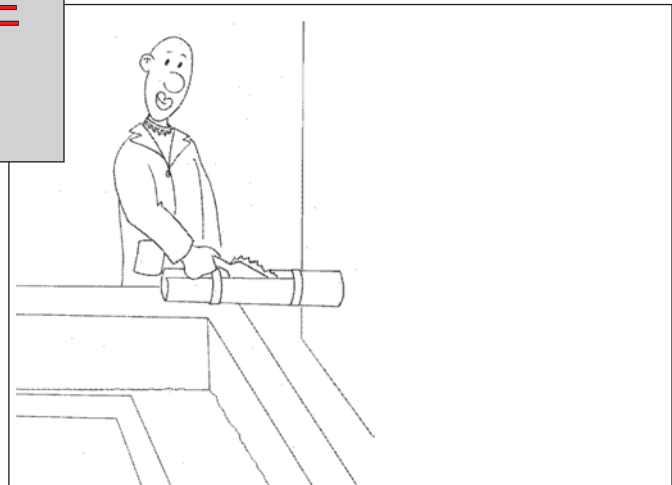


✗ After the bag has been emptied it should be removed from the feeder. A bag that has fallen onto the grid will cause blockages and disrupt the lime dosing

## DOSING INTO THE FLOCCULATION CHANNEL



The operator makes sure that dosing takes place at the lime outlet pipe



The operator cleans and brushes the lime outlet pipe regularly to prevent a build-up of lime and possible blockages



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# CHEMICAL DOSING 2



Notes.....

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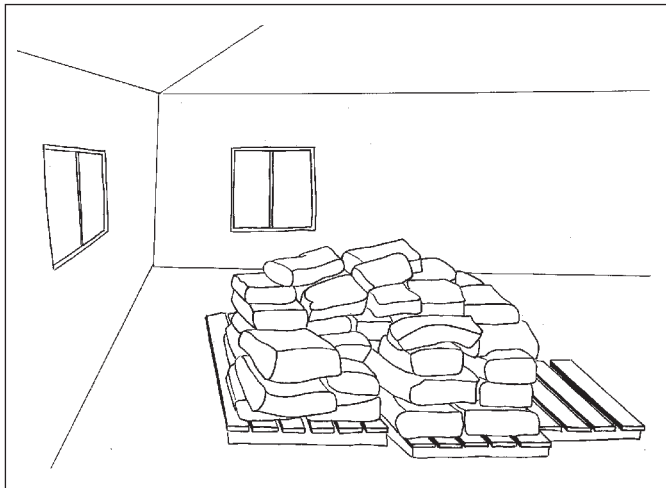
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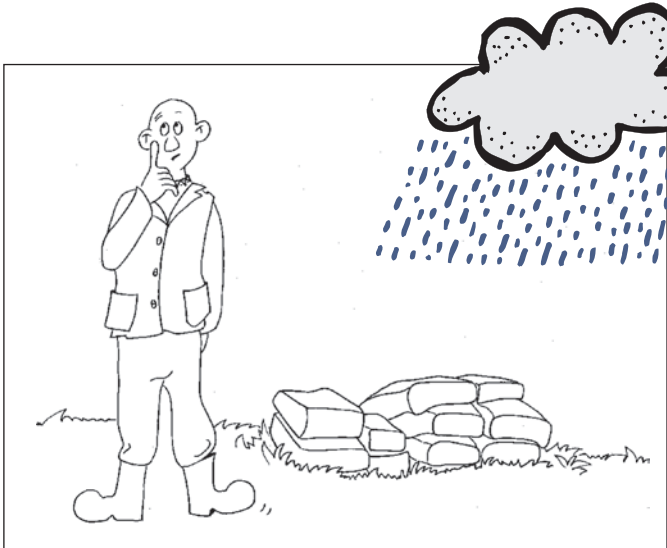
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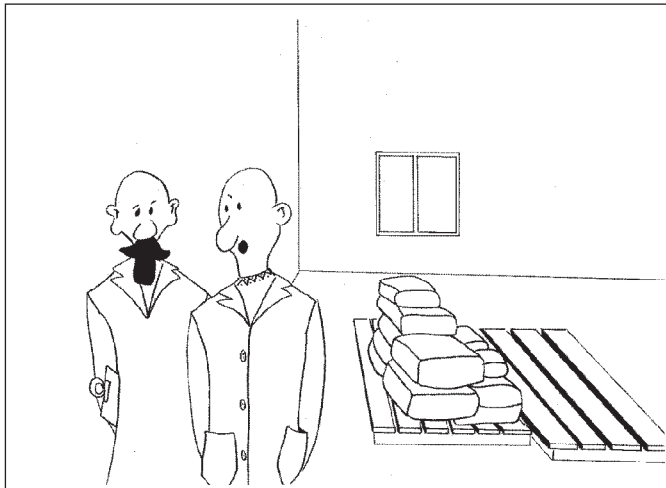
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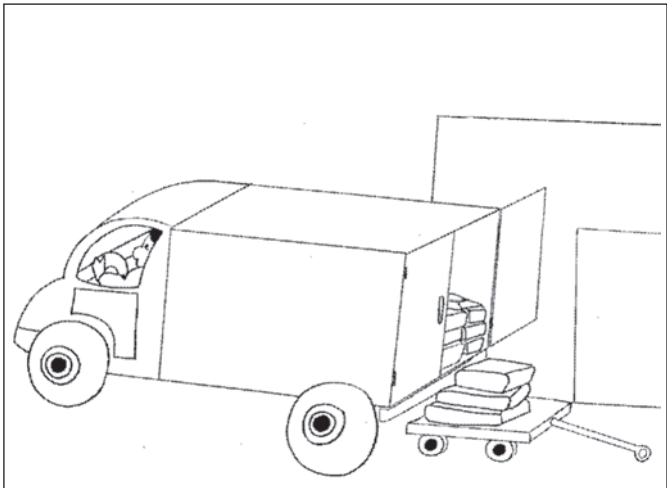
✓ The operator keeps the store rooms neat and tidy



✗ The operator should never leave the lime outside where it can get wet



The operator informs the supervisor if the lime stock is low



The supervisor is responsible for ordering more lime

## CHEMICAL DOSING 2



✓ The operator makes sure that the new bags are packed separately from the bags that are still in the store room



The operator uses the old bags first and then the new bags

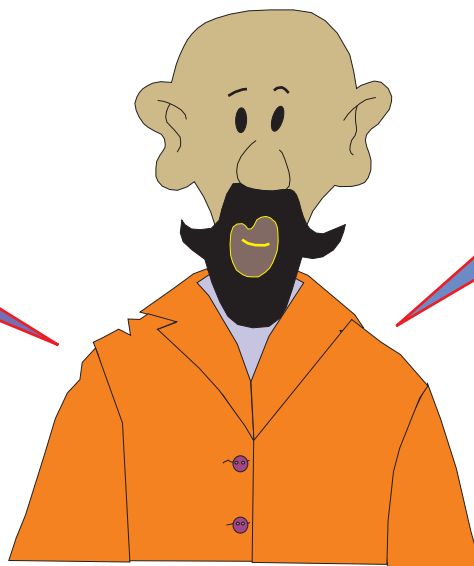
## SUMMARY

The operator informs the supervisor if the chemicals are low in stock

The operator makes sure that dosing takes place

The operator keeps the units and pipes clean and makes sure that there are no blockages

The operator reports all problems to the supervisor

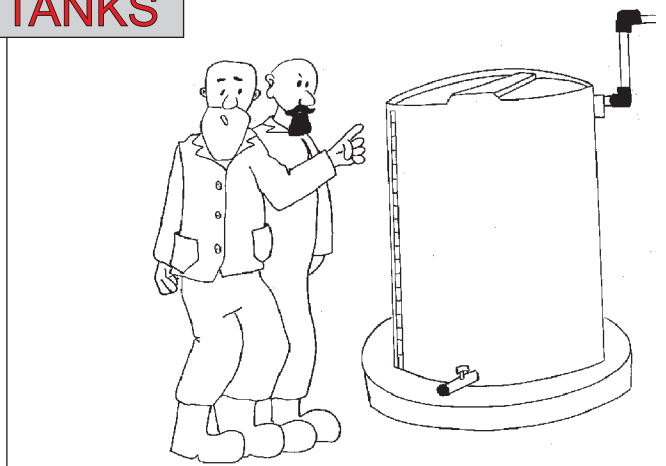






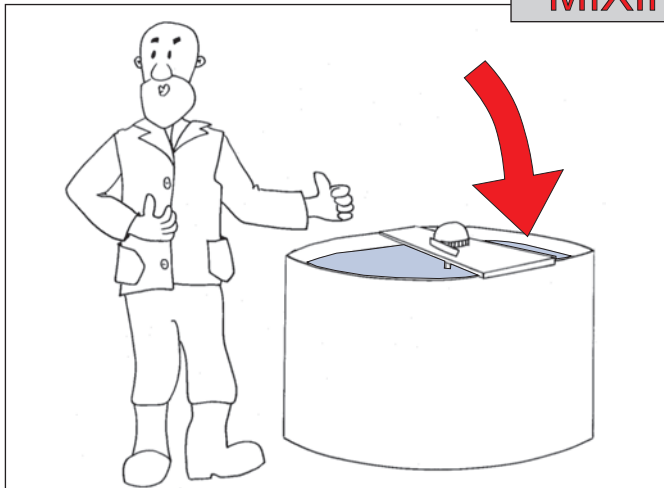
# CHEMICAL DOSING 2

## STORAGE TANKS

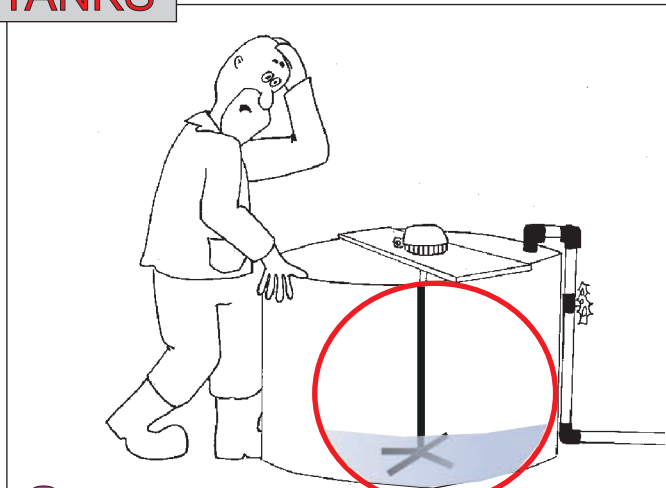


✓ The operator checks the level of the flocculant in the storage tanks. If low or empty he informs the supervisor

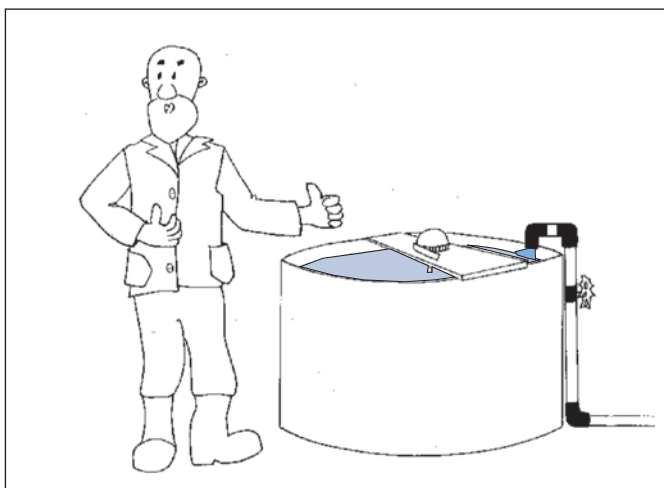
## MIXING TANKS



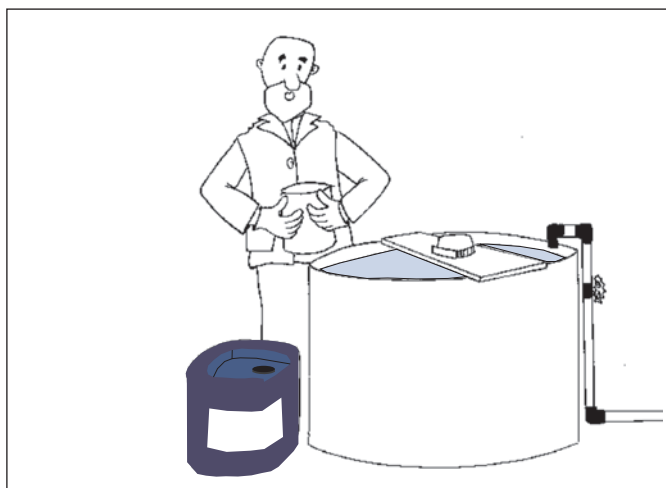
✓ The operator makes sure that the mixing tank is full



! The operator sees that the mixing tank is low or empty

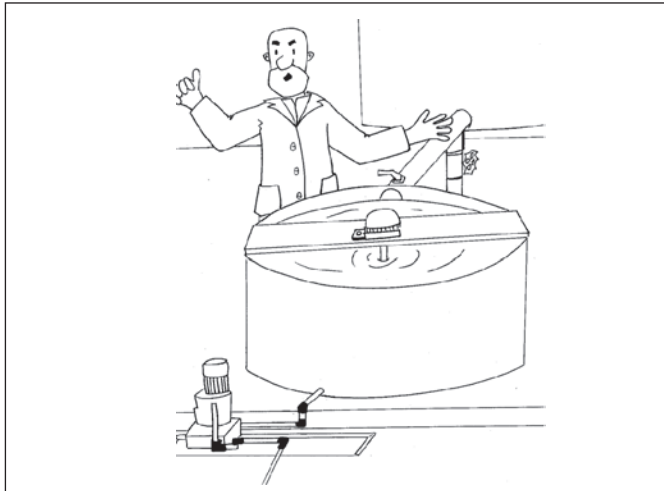


The operator fills the tank with water



The operator mixes and adds the flocculant in the correct concentrations as instructed by the supervisor

# CHEMICAL DOSING 2



✓ The operator makes sure that mixing takes place

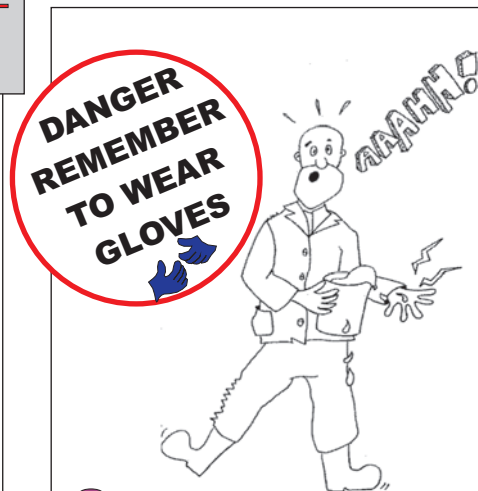


! The operator calls the supervisor if there is no mixing

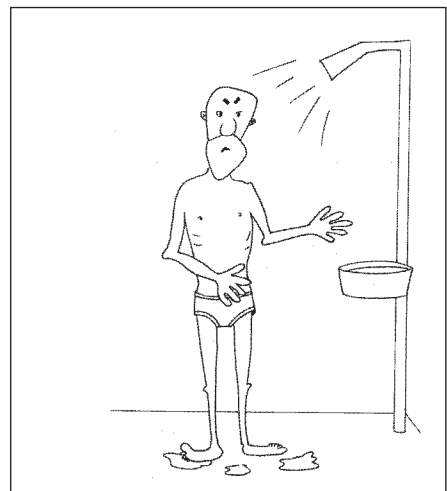
## MIXING OF THE FLOCCULANT



✓ The operator sometimes has to mix the flocculant in a beaker first



! The operator takes great care not to spill any flocculant



🎯 In case of an accident - take a shower **IMMEDIATELY!**



Notes.....

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## CHEMICAL DOSING 2

### DETERMINE THE CORRECT FLOCCULANT DOSAGE WITH THE BEAKER TEST

**This test measures the turbidity of the water**

1

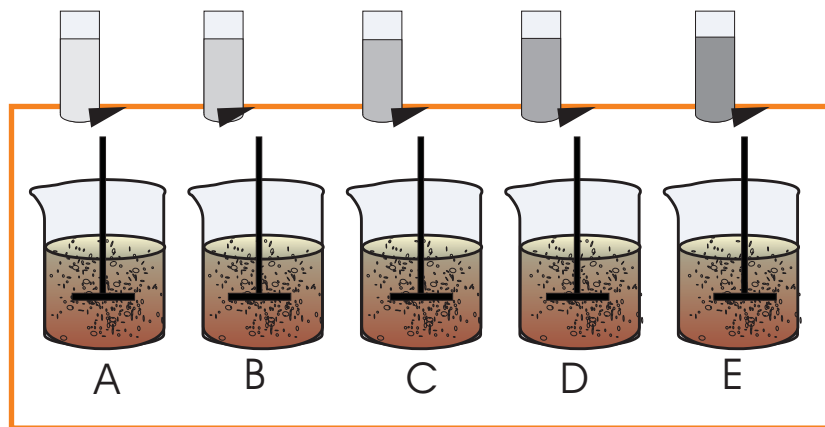


The supervisor will do this test to determine the correct amount of flocculant to be added to the raw water in the flocculation channel



2

5 different concentrations of flocculant (A,B,C,D,E) are added to 5 different beakers with raw water and stirred



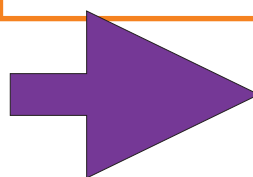
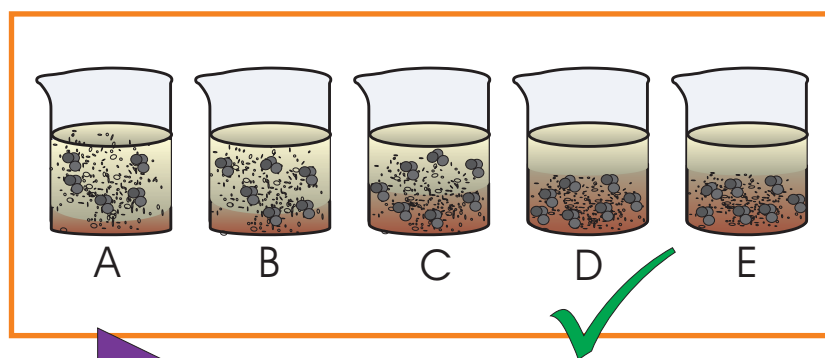
3

Stop stirring and wait **20 minutes**

4

After this time the flocs will sink to the bottom. The turbidity of the \*supernatant is then tested.


The lowest concentration of flocculant (in this example it would be D) that results in the supernatant with the lowest turbidity is the correct concentration to be used.



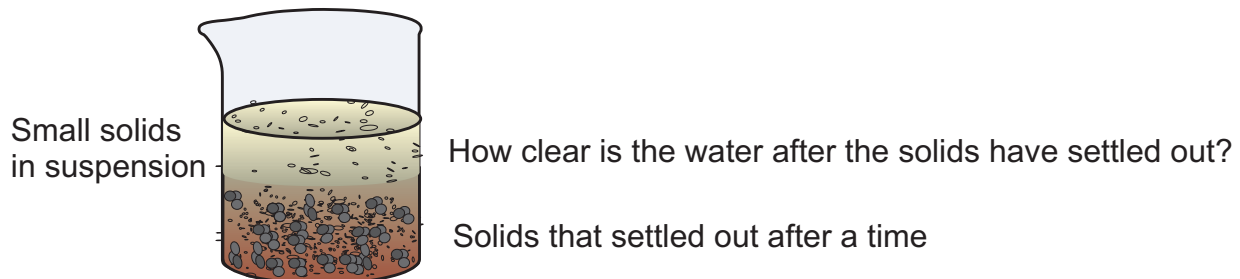
## CHEMICAL DOSING 2

### WHY IS TURBIDITY VERY IMPORTANT??

#### WHAT IS TURBIDITY

 Turbidity is an indication of the amount of suspended solids (soil, bacteria and algae) in the water.

 Turbidity relates to how clear the water is



 The turbidity of water can be less than 1 (NTU) for clear water to more than 1 000 for muddy water

#### IMPORTANCE OF REDUCING THE TURBIDITY

Turbidity affects the colour of water

Turbidity affects the odour of water

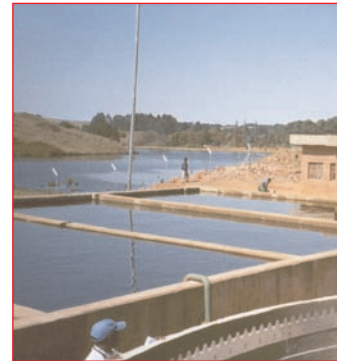
Turbidity affects the taste of water

Micro-organisms like bacteria is often associated with turbidity

## TURBIDITY AND THE CORRECT CHEMICAL DOSING



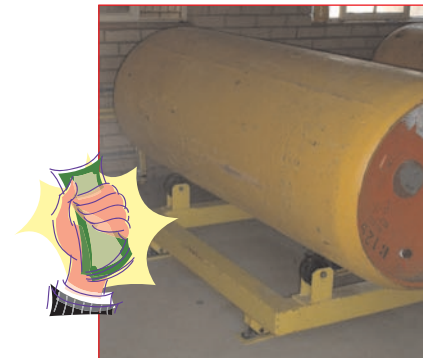
If not enough chemicals are used to reduce the turbidity of the raw water the **sedimentation and filtration processes** are ineffective as the solids do not settle in the settling tanks but are carried through to the filters



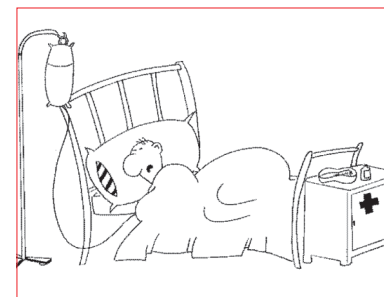
If too much chemicals are used, **money** is wasted



If not enough chemicals are used to reduce the turbidity of the raw water it costs more **money** to disinfect the water during the **disinfection stage** as more chlorine is needed



The disinfection process might be ineffective and this might lead to **illness** of the people in the community using the waters



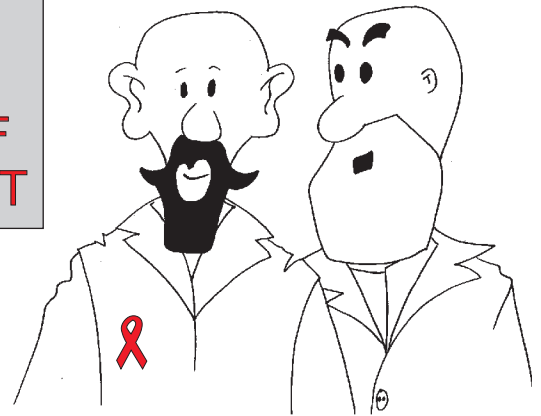


# CHEMICAL DOSING 2

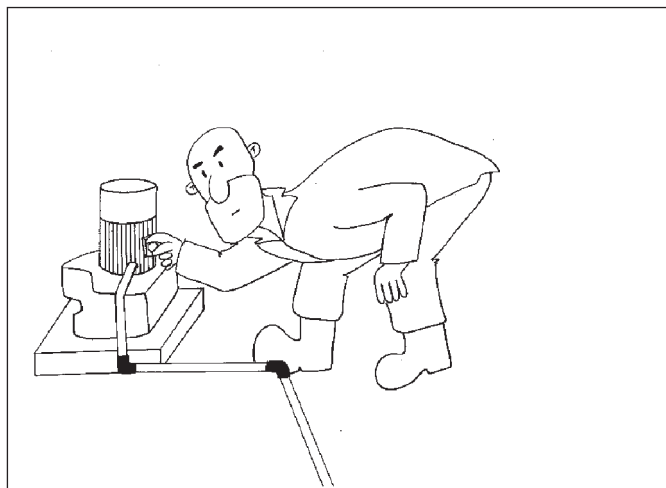


The operator takes a sample from the dosing point in the flocculation channel on a weekly basis. He takes the sample over a set period of 2 minutes

## MAINTAINING THE CORRECT DOSAGE OF FLOCCULANT



The supervisor takes the beaker to the operator. The operator will determine if dosing is taking place at the correct dosage and will tell the supervisor if any adjustments need to be made



If needed the operator makes the necessary adjustments on the dosing pump

Notes.....

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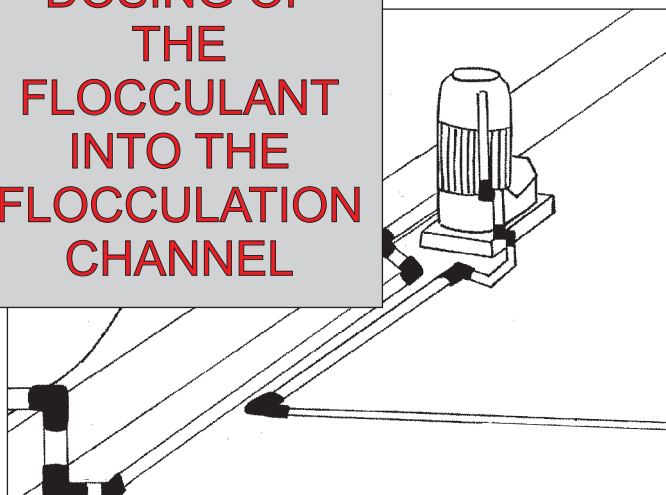
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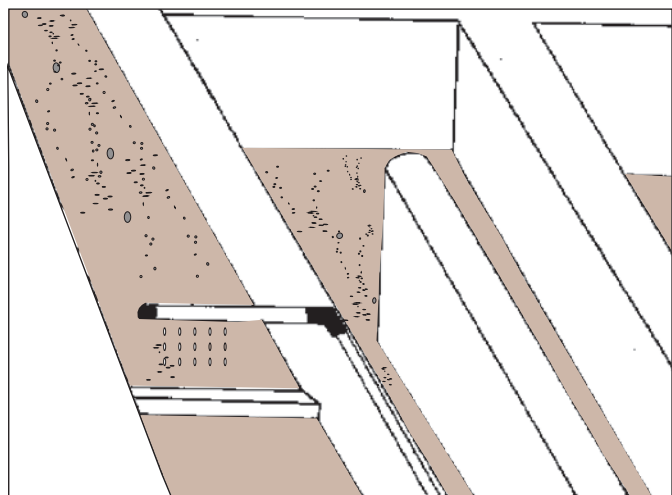
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## DOSING OF THE FLOCCULANT INTO THE FLOCCULATION CHANNEL

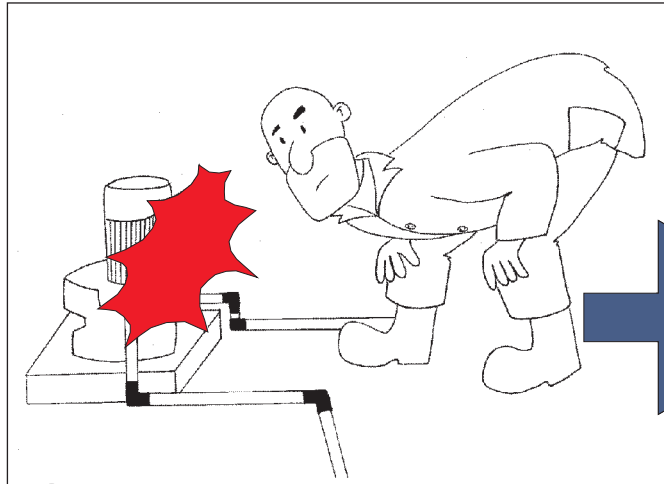


The operator sees that the dosing pump is working

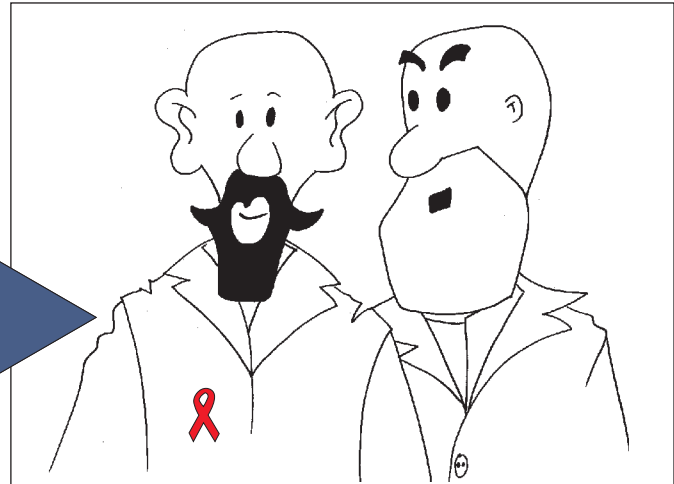


✓ Dosing is taking place in the flocculation channel

## CHEMICAL DOSING 2



The operator sees that the dosing pump is not working



The operator calls the supervisor if there is no flocculant dosing due to a faulty pump

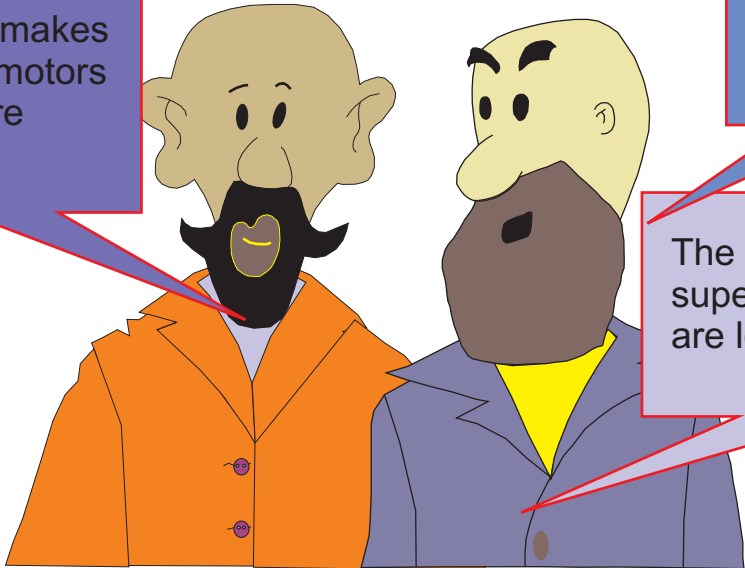
## SUMMARY

The operator makes sure that dosing takes place

The operator adds flocculant and water to the mixing tank when the mixing tank level is low

The operator makes sure that the motors and pumps are working

The operator reports all problems to the supervisor



The operator informs the supervisor if the chemicals are low in stock



# FLOCCULATION 3



TWO METHODS OF FLOCCULATION:

1. Hydraulic flocculation

2. Mechanical flocculation

## FLOCCULATION 3

# TRANSLATIONS

English	Flocculation
Isizulu	Ukubumbana kwezingxenyana ezincane emanzini ngemva Kokuthi kufakwe isithako esishuqungayo dokhu kuhlanguana kwakha amaflokisis
Isixhosa	Ukubotshwa kunye kwezinto ezincinci emanxini ngokuzixuba ngobunono emva kokudibana kweCoagulant ezenza ingqokelela yoboya enkulu
Siswati	Kunamatselana kwema particles emantini ngekutsi kuhlanguaniswe emva kwekufakwa kwema coagulant chemicals kutsi kwakhe ema floccs
Sesotho	Khomamarellano - ho khomamareletsa mafoforetsane mmoho ka metsing ka ho kopanya ka mokhoa o motle kamora ho tshela lithhare tse ipopang e le ho etsa tse Kholoanyane
Setswana	Go kgotlhaganngwa ga dikarolwana mo metsing ka go di kopanya ka tlhokomelo morago ga gore dikhemikhale tsa coagulant di tshelwe mo teng gore dibope di-flock tse di kgolwane
Sepedi	Go bofaganya diripana tša nyenyane tša leraga ka meetseng ka go di tswaka ka motswako wa khemikale woo o thatafatšago leraga gore le ipope dithokolo tše kgolwanyana
Ixitsonga	ku hlanganisa ntshuri, hikiva ku mikisiwa hivukheta endzaku kaku engeteriwa kamimirhi kuendlela ku tenga loku kulu
Venda	U tanganyisa kana u vhumba tshithu tshihulwane nga u tanganyisa dzi chemicals nga ngomu madini
Afrikaans	Flokkulasie

## THE PURPOSE OF FLOCCULATION

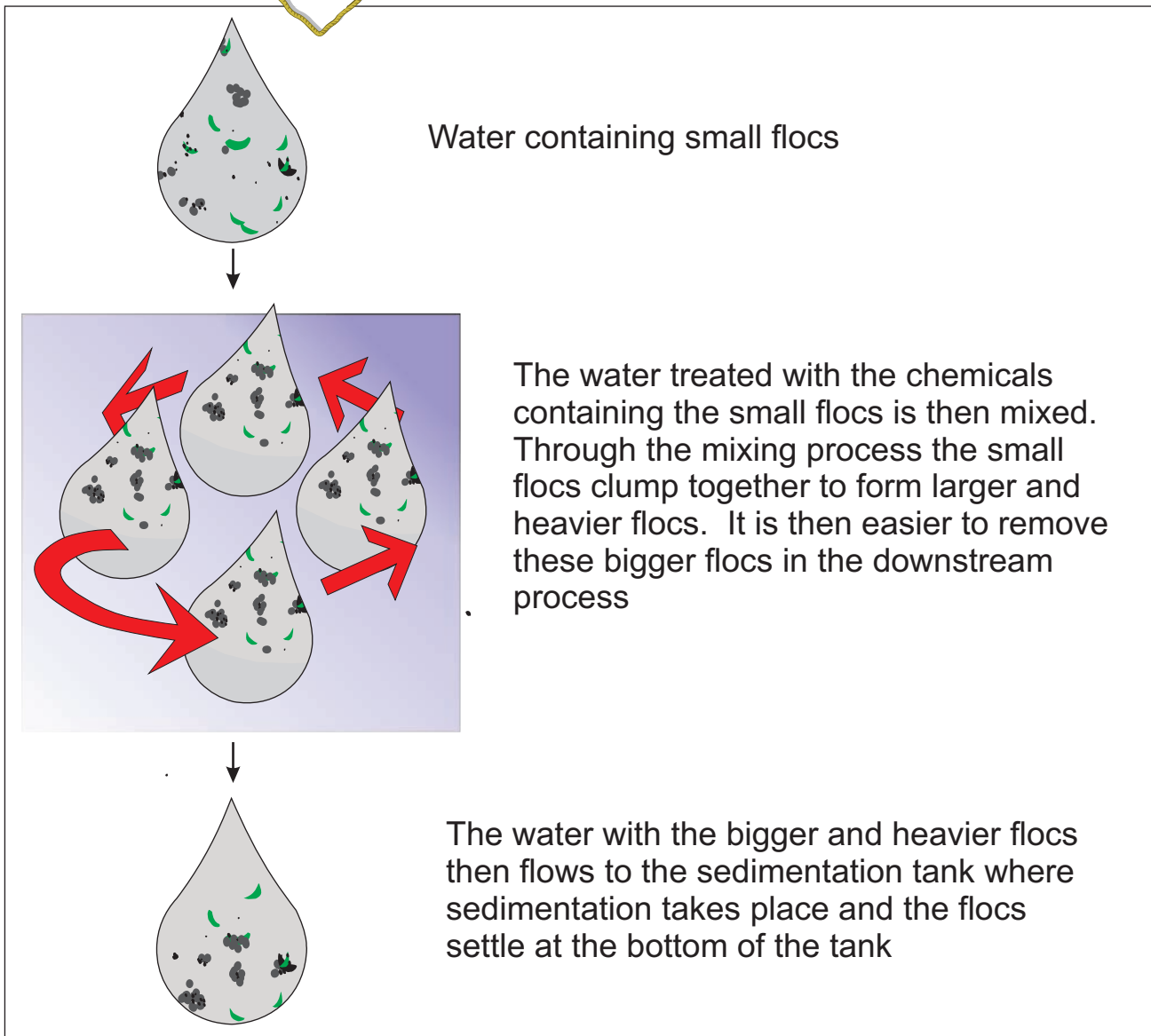
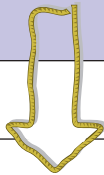
Small particles do not settle well but large particles do. \*Flocculation is required to make the small particles bigger. Flocculation takes place when the chemicals and suspended particles are mixed. The mixing allows the particles to \*collide and group together to form floccs. These floccs group together to form larger and heavier floccs. Mixing, or flocculation can be done \*hydraulically by means of passing the flow through a baffled channel, or \*mechanically by means of \*propeller mixers.

\* See Glossary.

# FLOCCULATION 3

## THIS IS THE EFFECT OF FLOCCULATION ON THE WATER

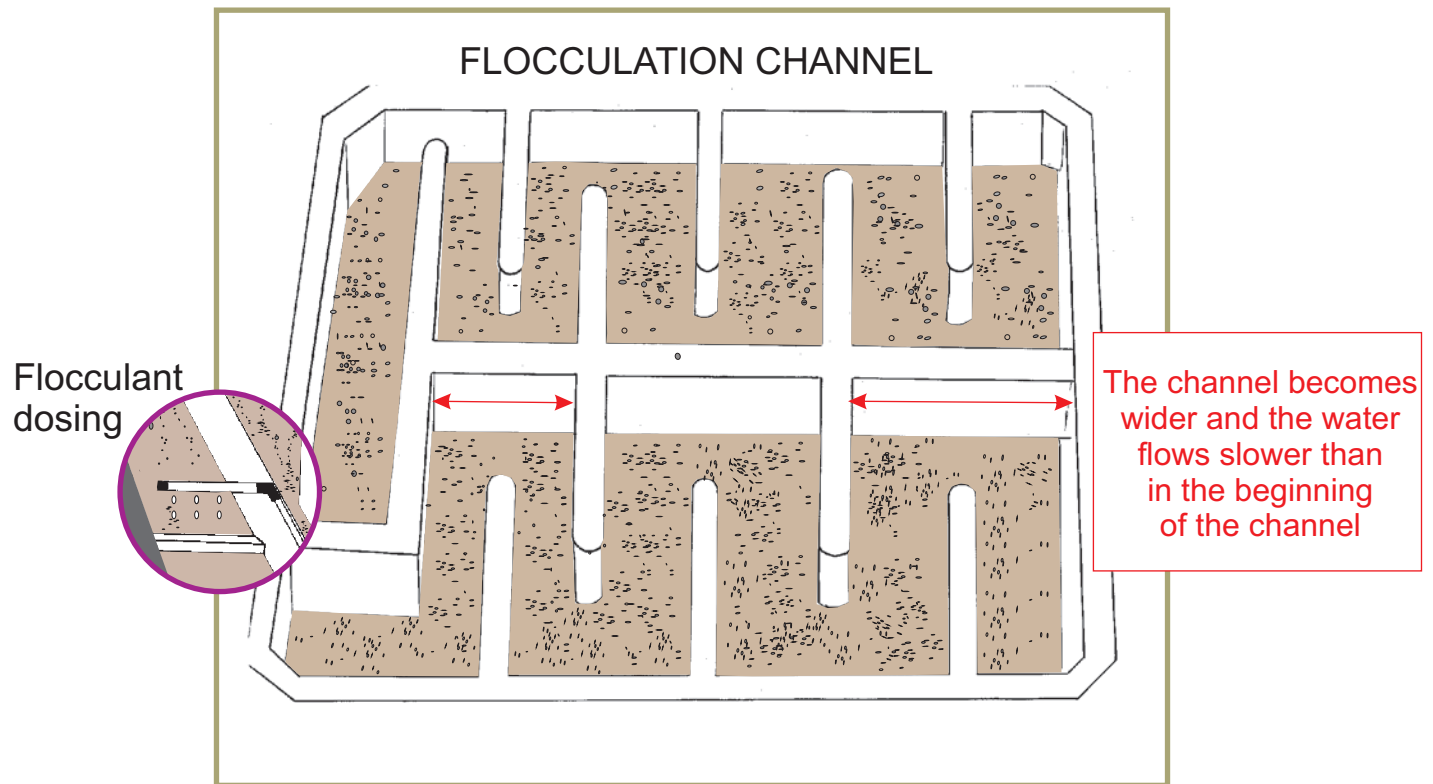
Mixing takes place in a hydraulic flocculation unit or channel or mechanically



	Large solids
	Fine solids
	Disease causing bacteria

# FLOCCULATION 3

## THE HYDRAULIC FLOCCULATION UNIT

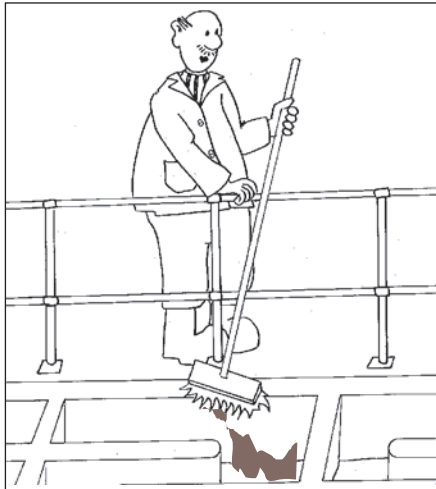


### FLOCCULATION

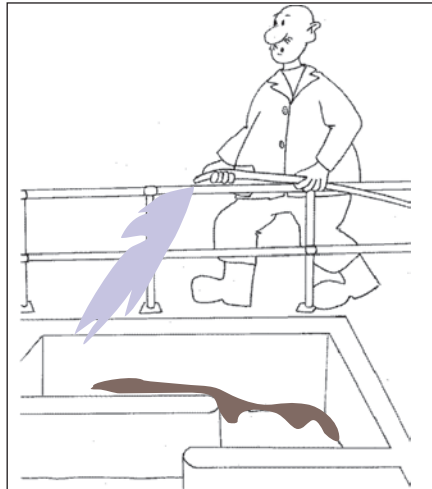
The first panel shows an operator in a white coat looking at the flocculation channel. The water is cloudy with many small particles. A green checkmark is next to the text: 'The operator makes sure that flocculation takes place'. The second panel shows the same operator looking at the channel, but the water is clear and the particles have settled. A purple exclamation mark is next to the text: 'The operator calls the supervisor if there is no flocculation'.



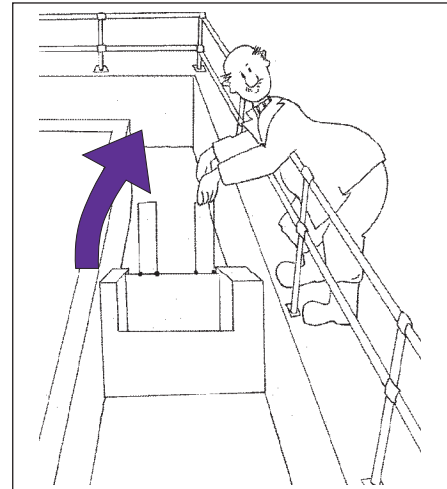
## FLOCCULATION 3



The operator sweeps the empty flocculation channel clean



The operator washes the sludge out of the empty flocculation channel



When finished the operator opens the channel and puts it back into operation



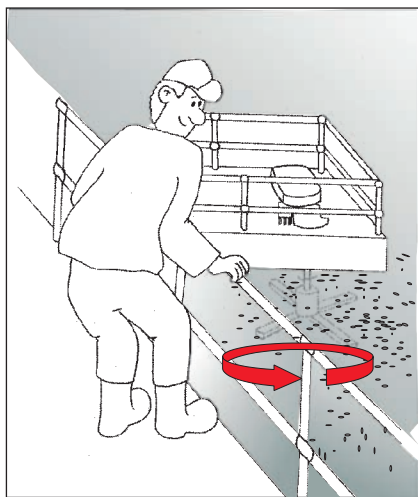
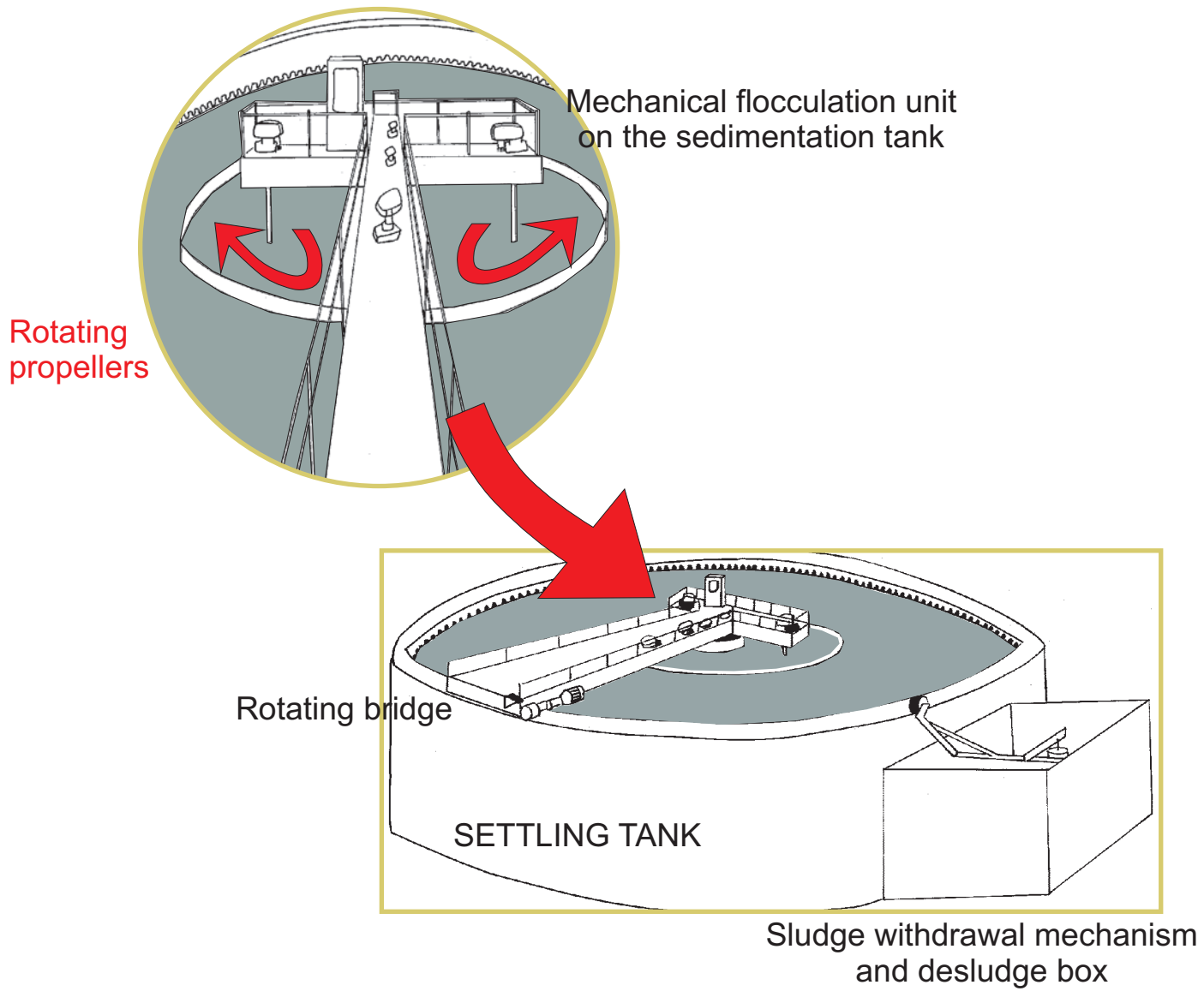
## SUMMARY

A cartoon illustration of a man in a blue jacket and red shirt, pointing towards the right. Four callout boxes are connected to him by red lines, each containing a summary point.

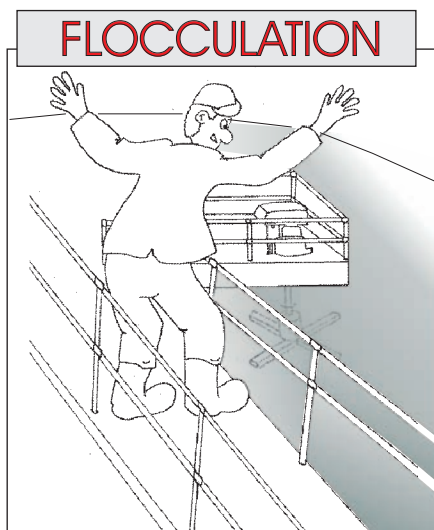
- The operator makes sure that flocculation takes place**
- The operator reports all problems to the supervisor**
- The operator informs the supervisor when he needs to desludge the channel**
- The operator keeps the units clean**

# FLOCCULATION 3

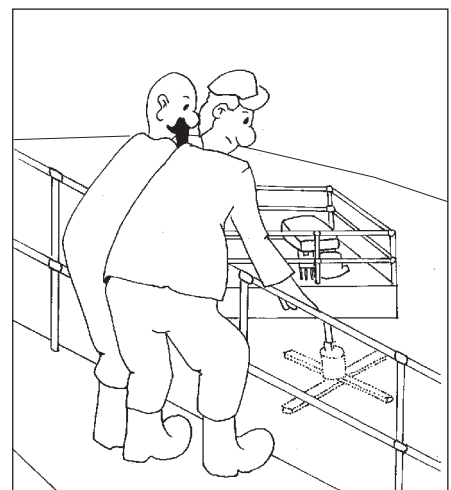
## THE MECHANICAL FLOCCULATION UNIT



The operator makes sure that the propeller works and that flocculation takes place



! The operator notes that the propeller is not working



The operator calls the supervisor



# FLOCCULATION 3



Notes.....

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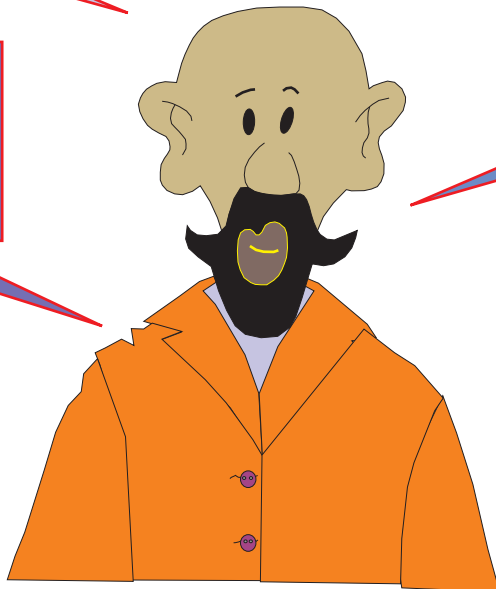
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# SUMMARY

The operator makes sure that flocculation takes place

The operator makes sure that the propeller is working

The operator reports all problems to the supervisor





# SEDIMENTATION 4



1. Round sedimentation tank

2. Rectangular sedimentation tank

## SEDIMENTATION 4

# TRANSLATIONS

English	Sedimentation
Isizulu	Ukuzikisa - yinquba lapho izinxenye eziqinileyo zizinza noma zicwile emanzini elashwayong kwa tlase (sakang) ga metsi a go dirwang mo go one
Isixhosa	Indlela apho uhlalutya luthi luphume okanye lutshone emanzini alungisiweyo
Siswati	Indlela lesetjentiswako lapho ema solid particles ashona phansi emantini lahlobiswako
Sesotho	Kineho -mokhoa oo mafoforetsane a tsoang kapa a qoelang ka metsing a hlahlojoang ka teng
Setswana	Tiragalo e dikarolwana di ya
Sepedi	Tsela yeo diripana tša dithata di itshekago goba di Nwelelago ka meetseng ao a hlwekišwago
Isitsonga	Ndlela leyi swilavi dzikaka ha ha yona swi lulamisiwa
Venda	Maitele ane zwithu zwo omaho, zwo dzhenaho madini zwa Bviswa ngao
Afrikaans	Sedimentasie

## THE PURPOSE OF SEDIMENTATION

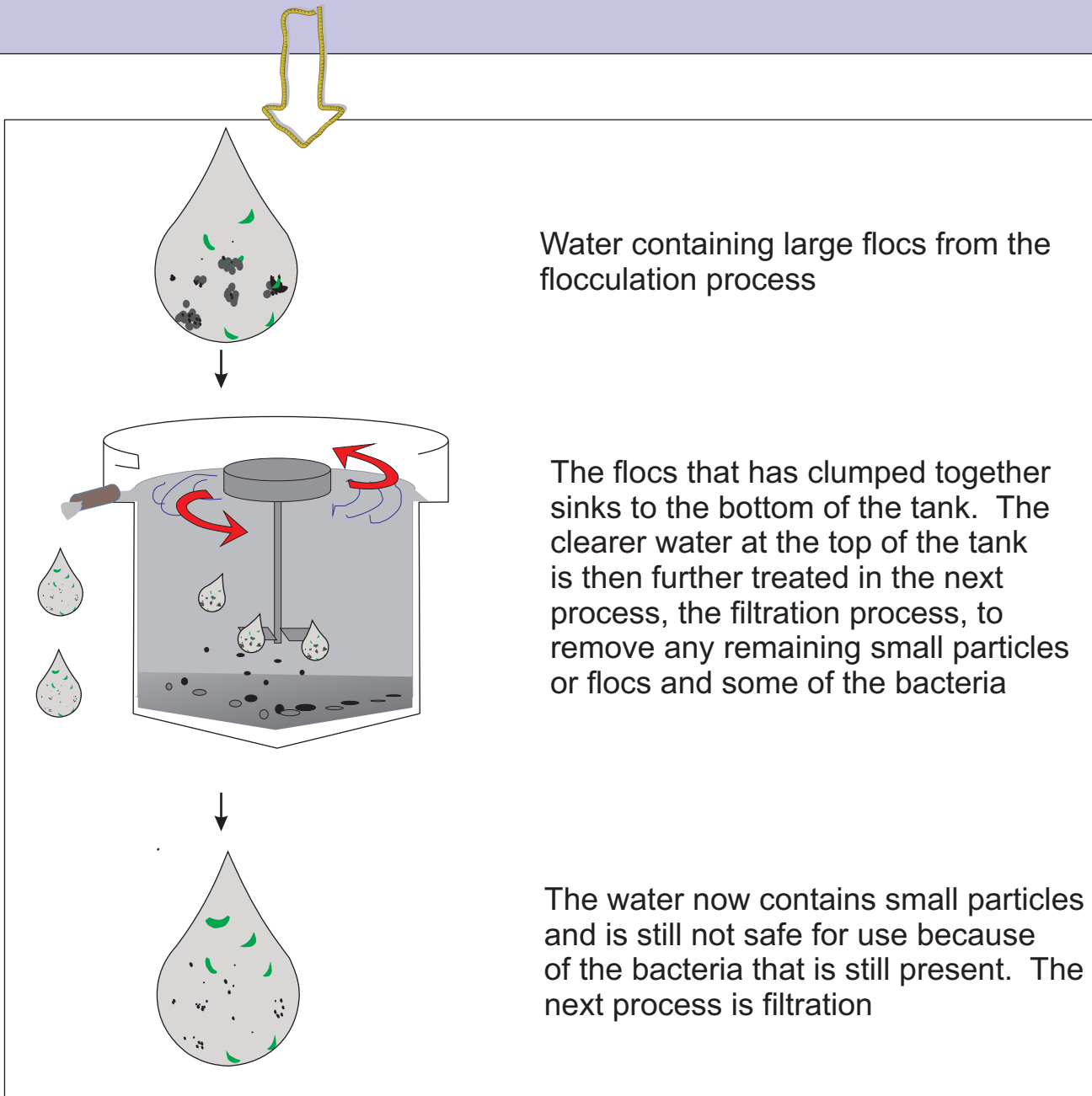
\*Sedimentation takes place when the suspended particles or flocs, from the flocculation process settles out. The water with the particles moves slowly through a basin or \*sedimentation tank. Most of the larger flocs that have formed in the coagulation and flocculation process \*sink to the bottom of the settling tank, resulting in clearer top water. This clearer water is discharged from the top of the settling tank and flows to the filter process. The flocs or particles at the bottom forms a \*sludge which is removed from the bottom of the settling tank from time to time. This sludge is usually treated or dried for disposal.

\* See Glossary

# SEDIMENTATION 4

## THIS IS THE EFFECT OF SEDIMENTATION ON THE WATER

The large and heavy flocs settle out to the bottom of the tank



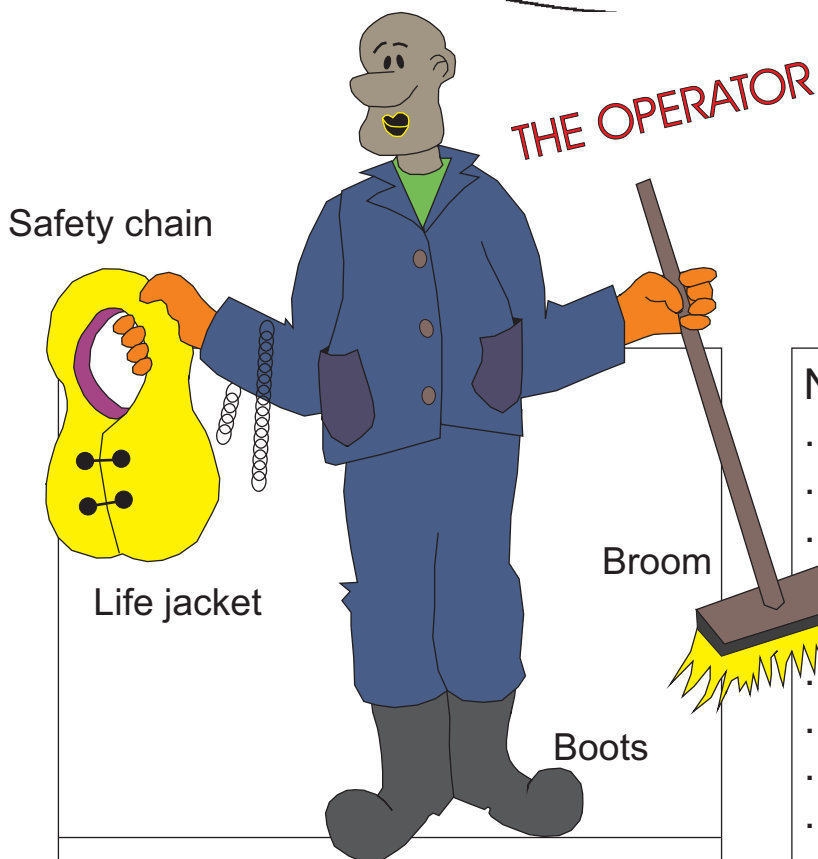
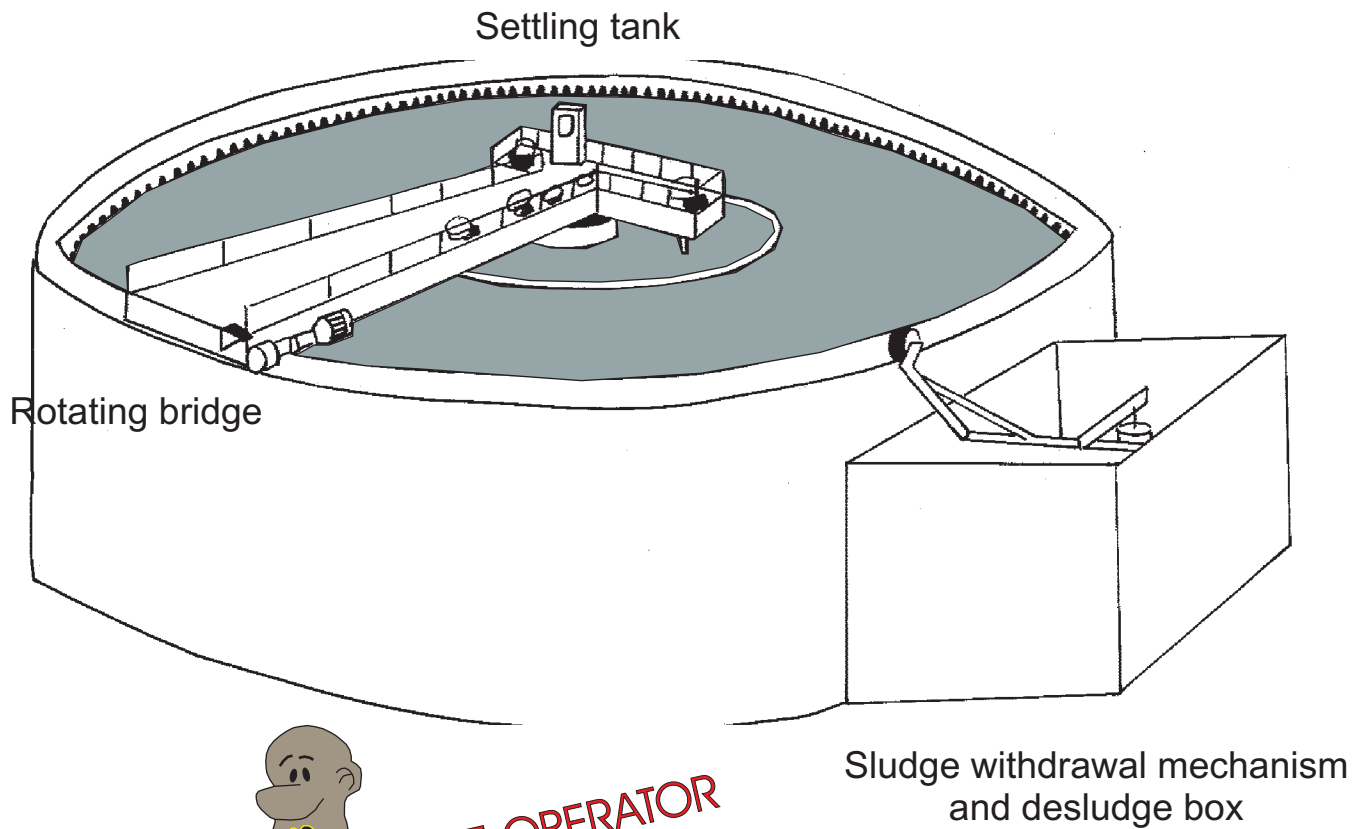
Disease causing bacteria



Fine solids

# SEDIMENTATION 4

## THE ROUND SEDIMENTATION UNIT



The operator is equipped with a life jacket and safety chain for safety when he cleans the tank

Notes.....

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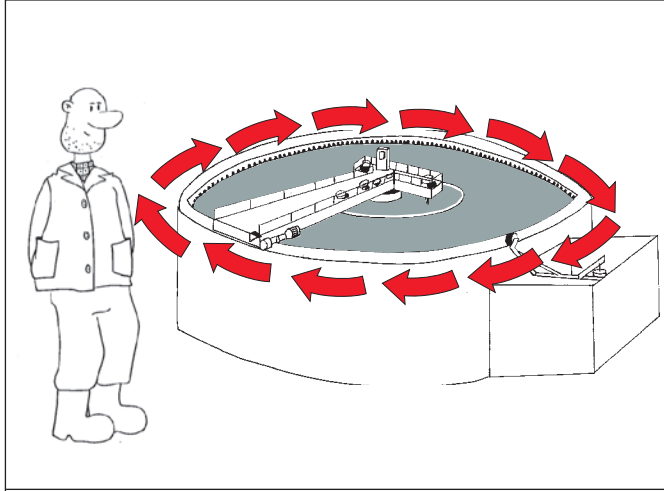
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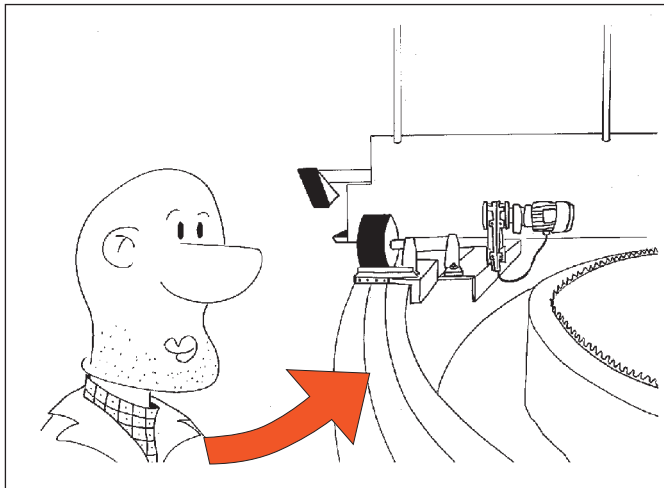
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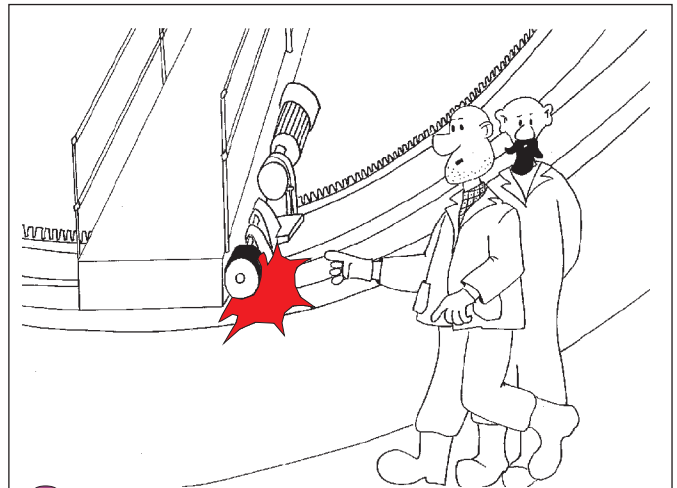
# SEDIMENTATION 4



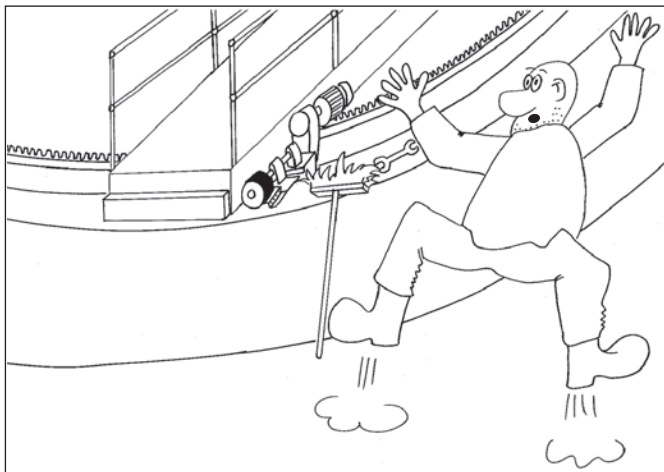
The operator makes sure that the bridge unit is rotating



The operator makes sure that the wheel alignment is in the centre of the running surface



! The operator calls the supervisor if the bridge unit fails to rotate



**X** The operator must never leave anything on the side of the tank. It can fall in and cause damage to the sludge scrapers

Notes.....

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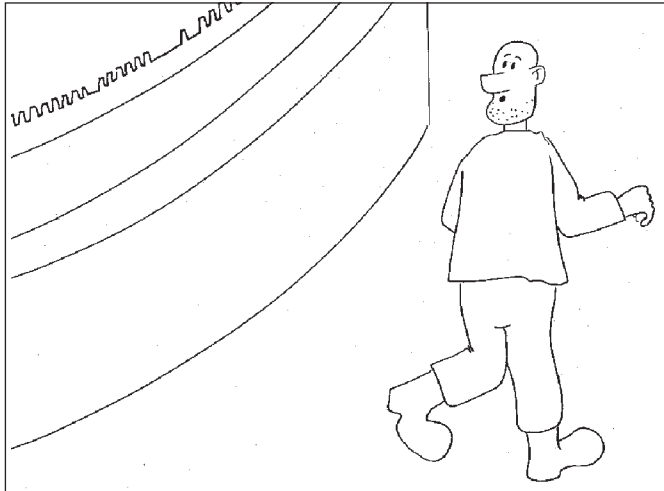
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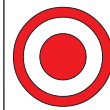
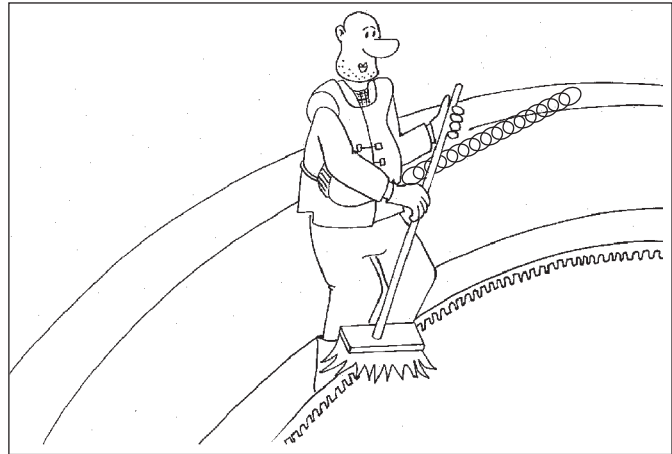
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# SEDIMENTATION 4

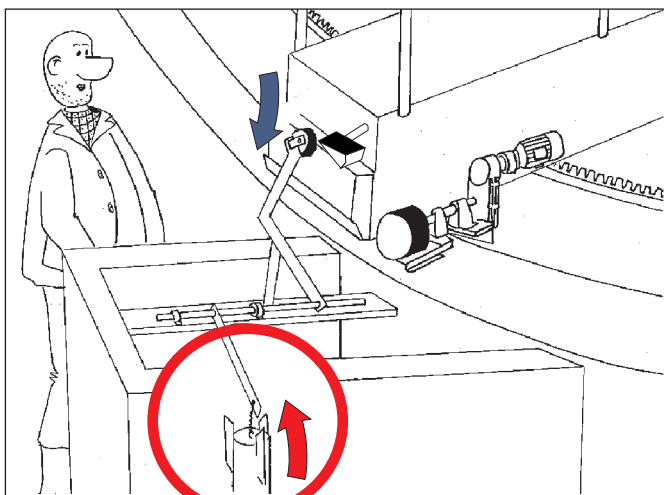


The operator checks regularly that there are no loose plates in the tank

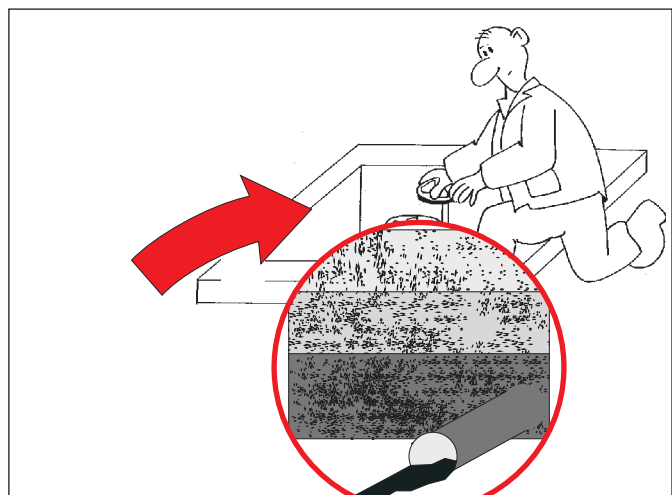


The operator brushes the overflow weir plates regularly to remove any sludge or scum accumulation. Note that he is wearing a life jacket

## DESLUDGING



The operator makes sure that the desludge mechanism works



Alternatively the operator can open the desludging valve to withdraw sludge

# SEDIMENTATION 4

Notes.....

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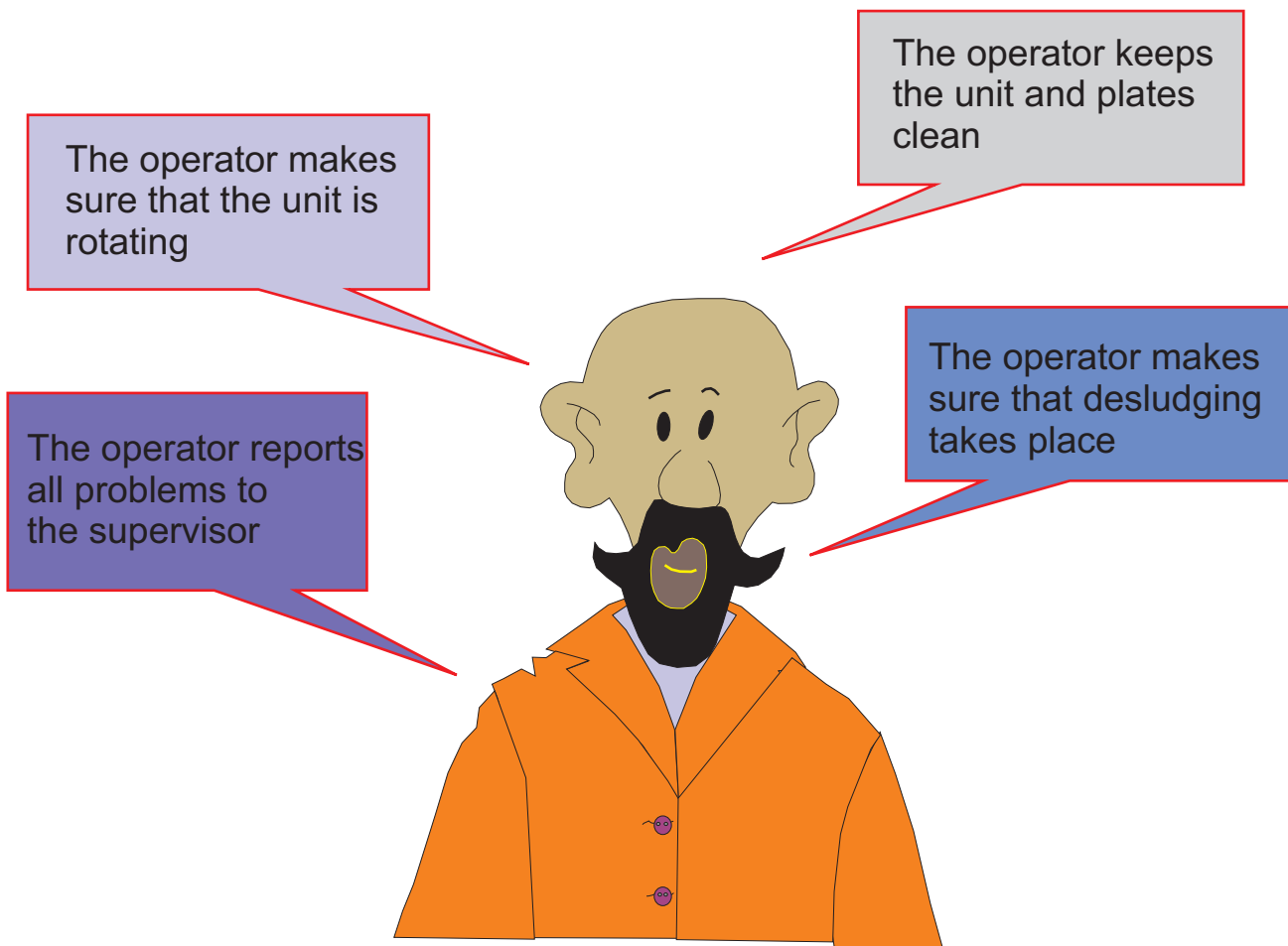
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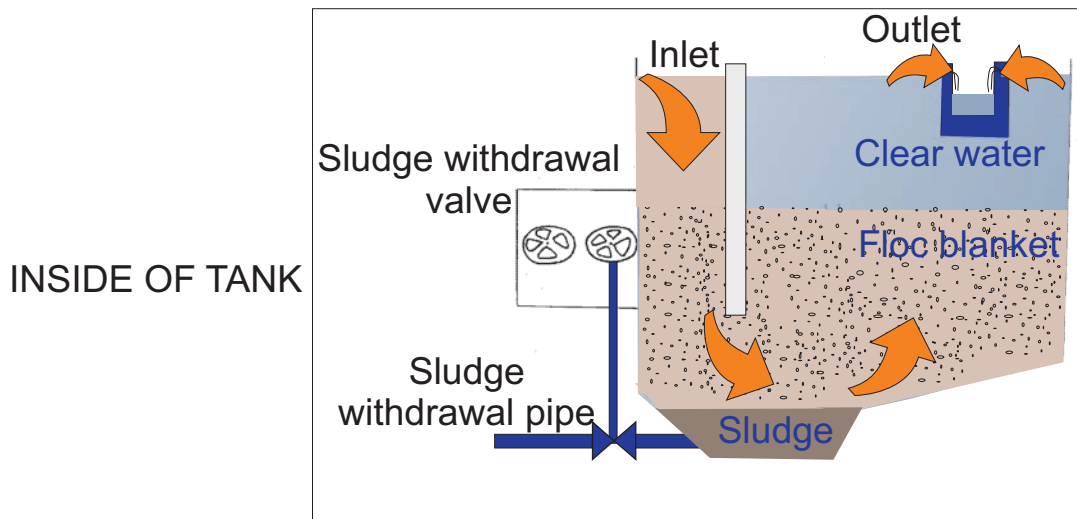
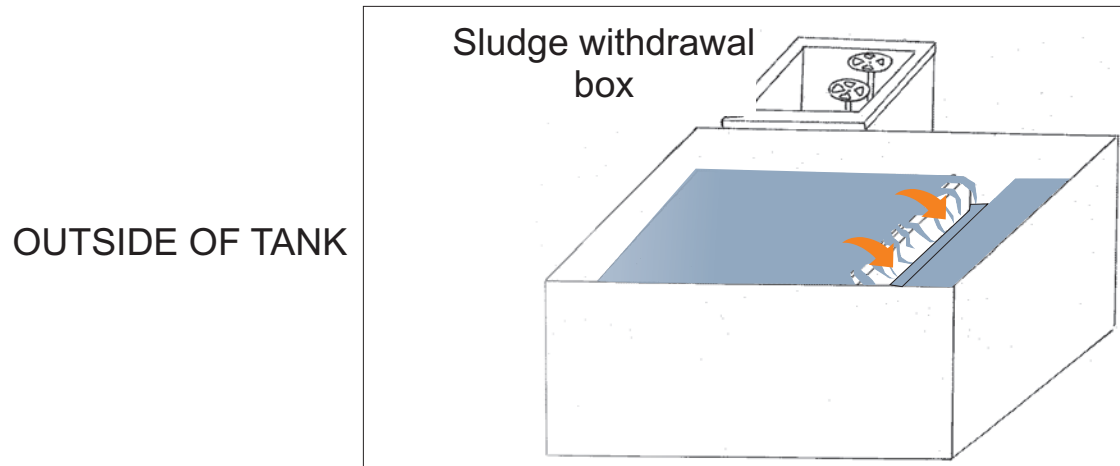
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## SUMMARY

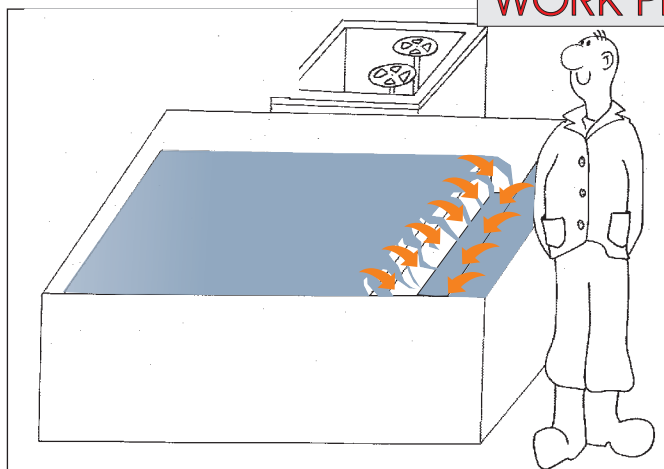


# SEDIMENTATION 4

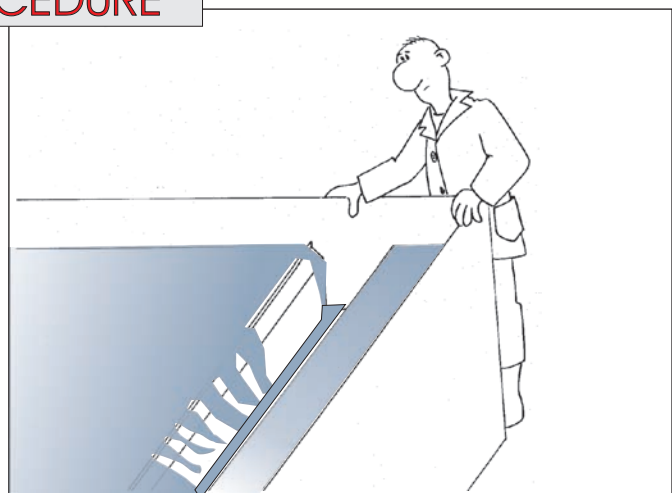
## THE RECTANGULAR SEDIMENTATION UNIT



### WORK PROCEDURE



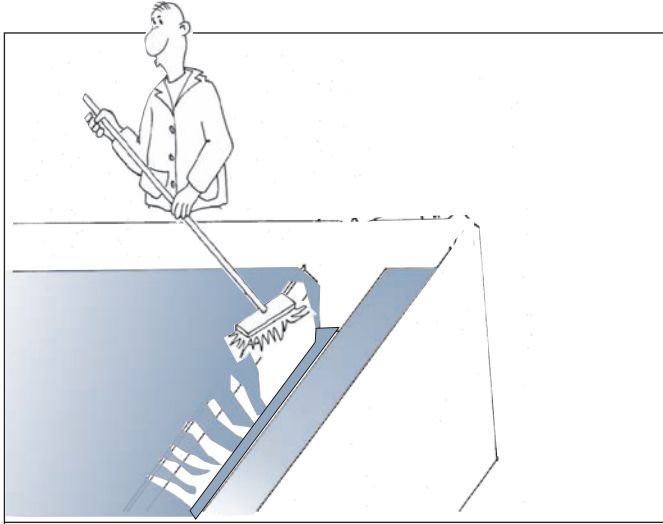
The operator makes sure that the water flows evenly and that there is no blockages over the outlet weir



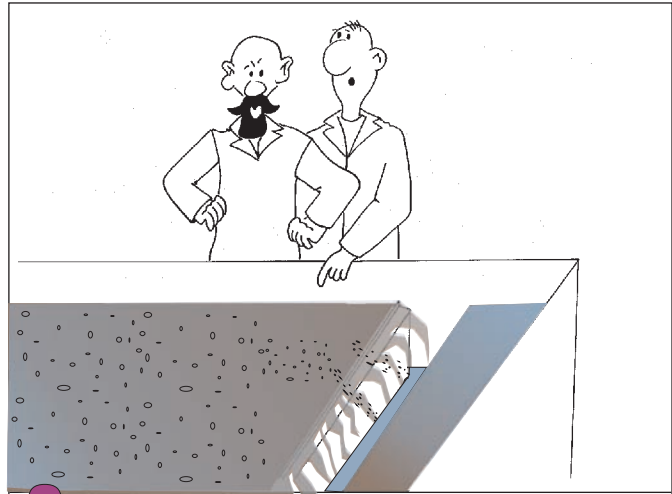
The operator notes that the flow over the overflow weir is uneven



# SEDIMENTATION 4



The operator brushes the overflow weir and the sides of the tank regularly to remove any sludge accumulation



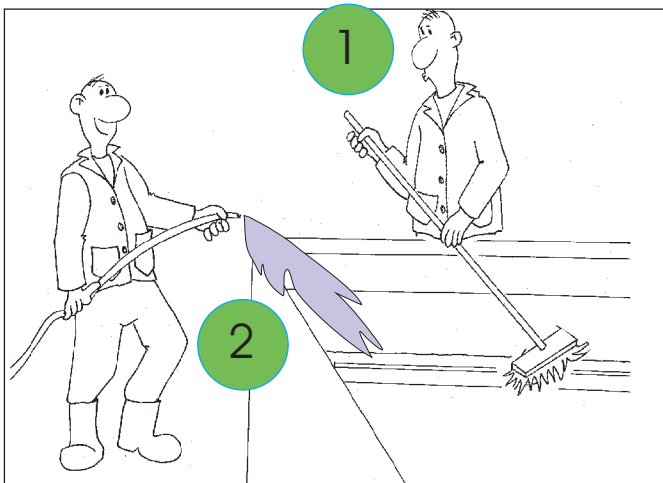
**!** The operator reports to the supervisor if there is a build-up of sludge

## DESLUDGING



The operator removes the sludge from the sedimentation tank with the desludge valve. This should be done at least once every shift

*On rectangular tanks without any mechanical sludge scraping equipment not all sludge can be removed through the desludge valves. When the sludge build-up becomes visible it is usually time to clean out the tank completely*



The operator brushes and hoses the sides and bottom of the sedimentation tank until all the sludge has been removed

### Notes.....

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## SEDIMENTATION 4



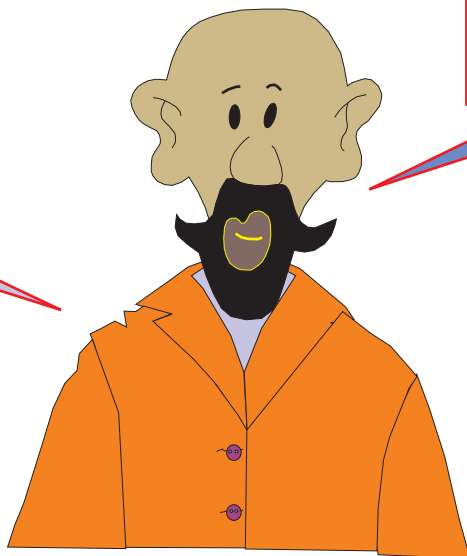
## SUMMARY

The operator makes sure that the flow over the weir is even

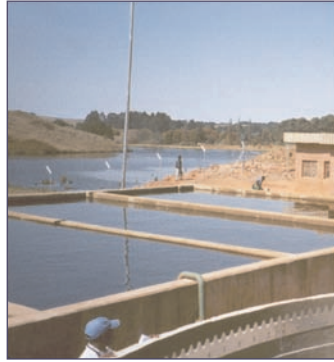
The operator reports all problems to the supervisor

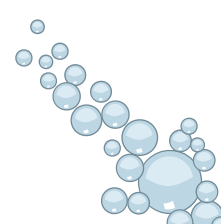

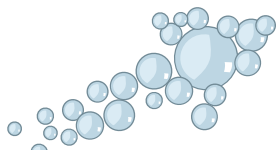
The operator keeps the unit and plates clean

The operator makes sure that desludging takes place



# FILTRATION 5



- 
1. Slow sand filtration
  2. Rapid gravity filtration
  3. Pressure filtration
- 
- 

## FILTRATION 5

# TRANSLATIONS

English	Filtration
Iszulu	Ukuhluzwa - indlela yenqubo yokususa okuthile emanzini Ngokukuhluzwa ngehluzo (ishlabathi, amatshana, amalahle)
Isixhosa	Indlela yokususa uhlalutya, isanti okanye amalahle usebenzisa isihluzo
Siswati	Yindlela yekususa iparticulate matter emantini ngekuti kwengce entfweni lesisefo
Sesotho	Tlhotlo - ho tlhotlo ma mokhoa oa ho tlosa mafoforetsane, metsing ka sefe. Ekaba lehlabathe, mahlohlojane, kapa mashala
Setswana	Go tlosa particulate matter mo metsing gore metsi a kone go feta mo filter media, jaaka santa, matlapana kgotsa malatlha
Sepedi	Go sefa - tsela ya go tloša diripana tša dilo tšeo di lego ka meetseng ka go ediša meetse mo sefong ya mašobana yeo e dirilwego ka mobu wa lekgwara
Isitsonga	Ndlela yo humesela ehandle ntsuri ematini hi ndlela yo sefa
Venda	Ubvisa zwithu zwino nga muthavha madini nga shumisa porous filter
Afrikaans	Filtrasie

## THE PURPOSE OF FILTRATION

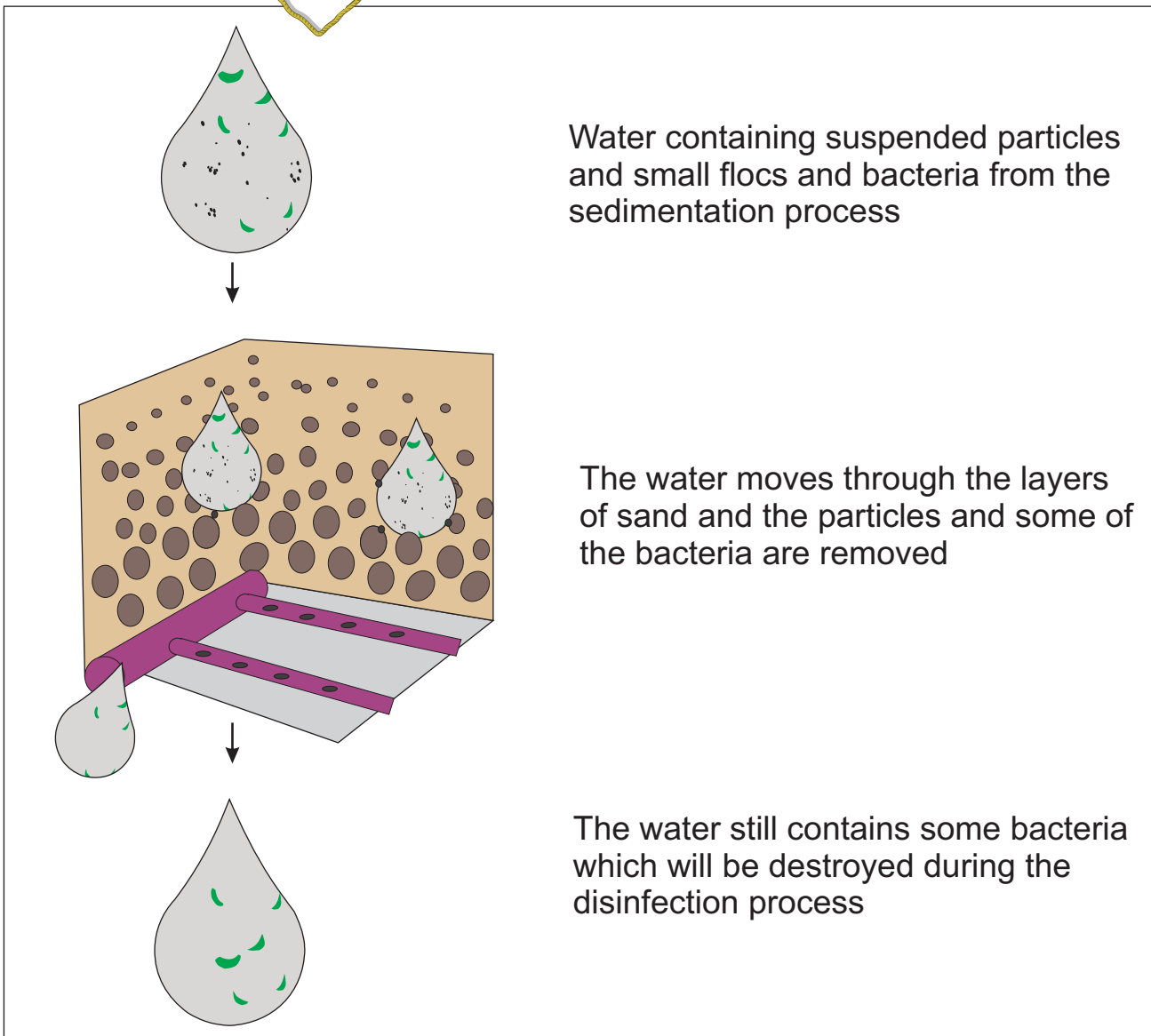
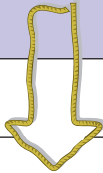
Water filtration is a \*physical process in which suspended particles, not removed in the sedimentation process, are removed from the water as it passes through the filter media. The media normally comprises of layers of silica sand, pebbles and/or antracite.

\* See Glossary

# FILTRATION 5

## THIS IS THE EFFECT OF FILTRATION ON THE WATER

The water from the sedimentation tank is filtrated to remove the remaining suspended particles and small flocs and some of the bacteria



Disease causing bacteria

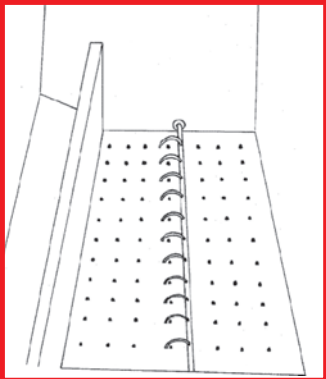


Fine solids

FILTRATION 5

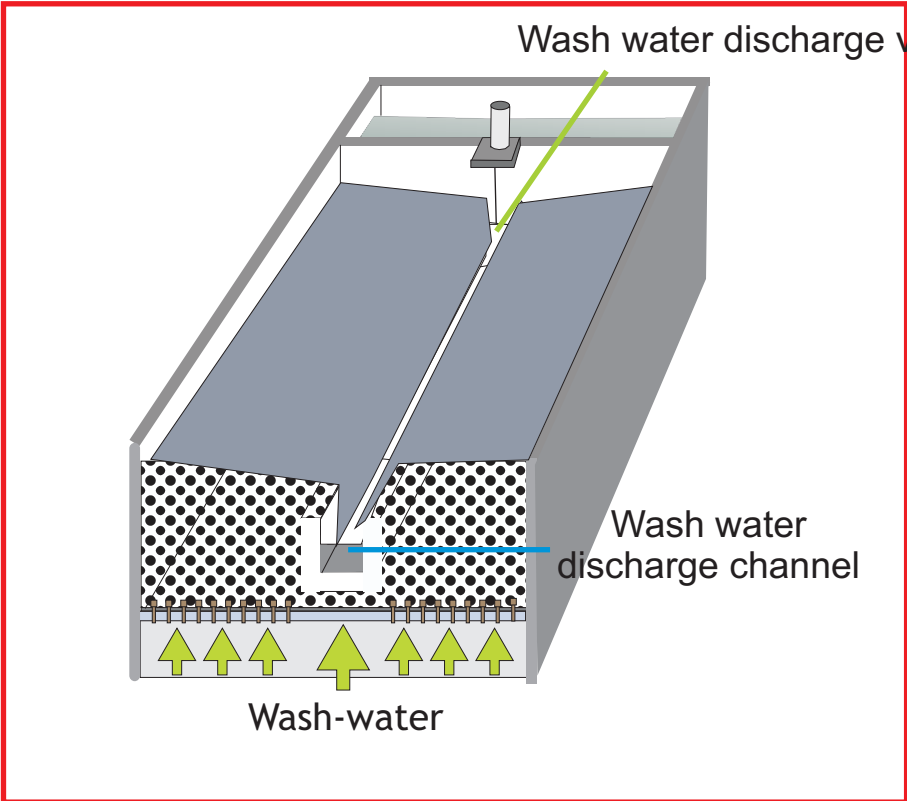
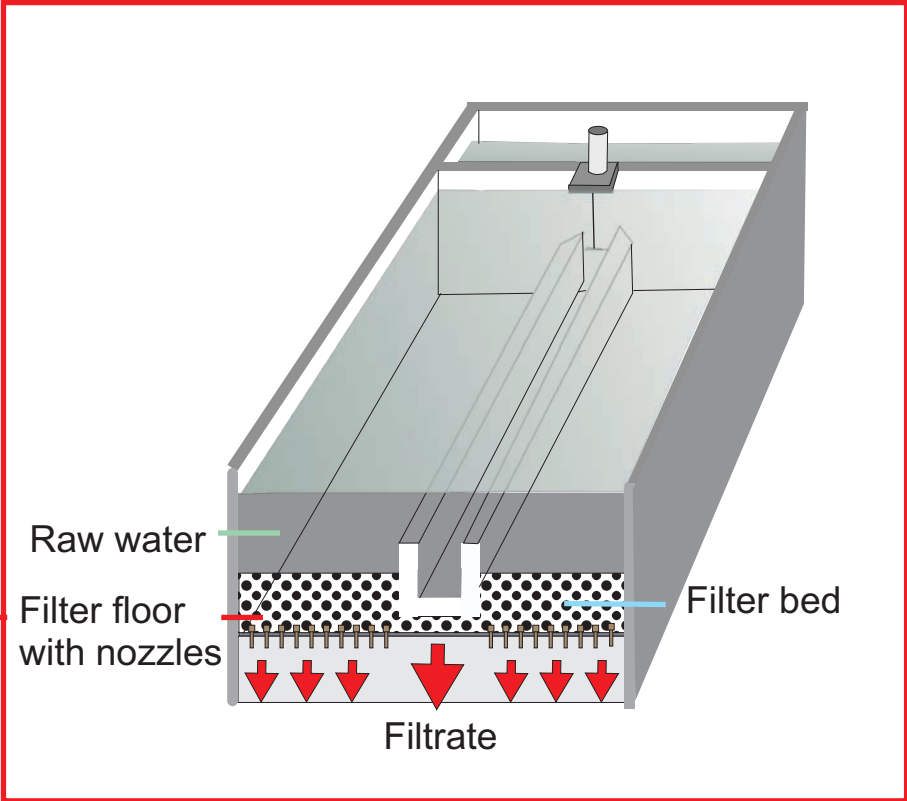
RAPID GRAVITY FILTRATION TANKS

1  
TANK DURING A  
FILTRATION CYCLE



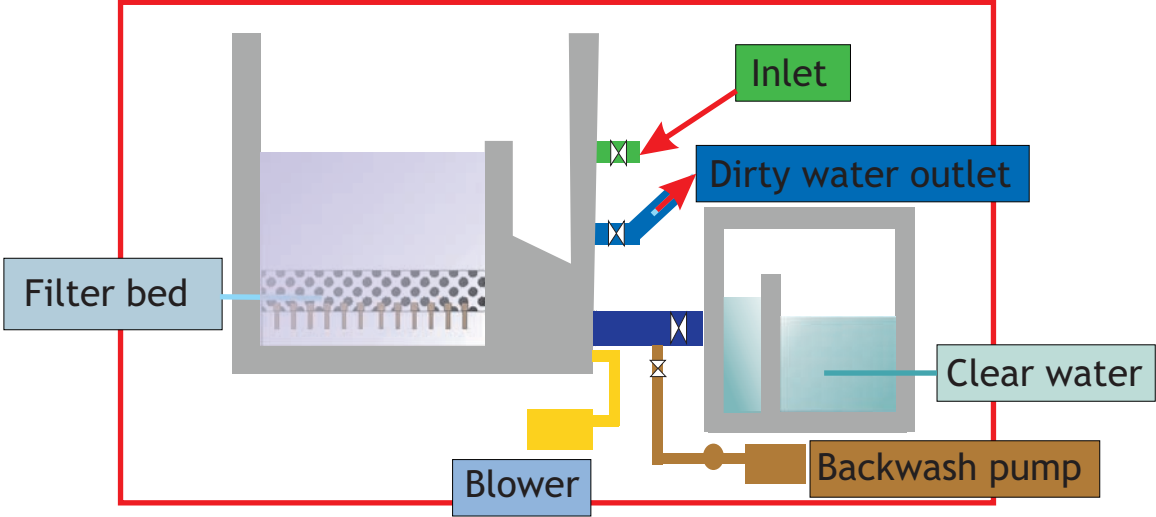
NOZZLE BED  
(underneath sand bed)

2  
TANK DURING A  
WASHING CYCLE

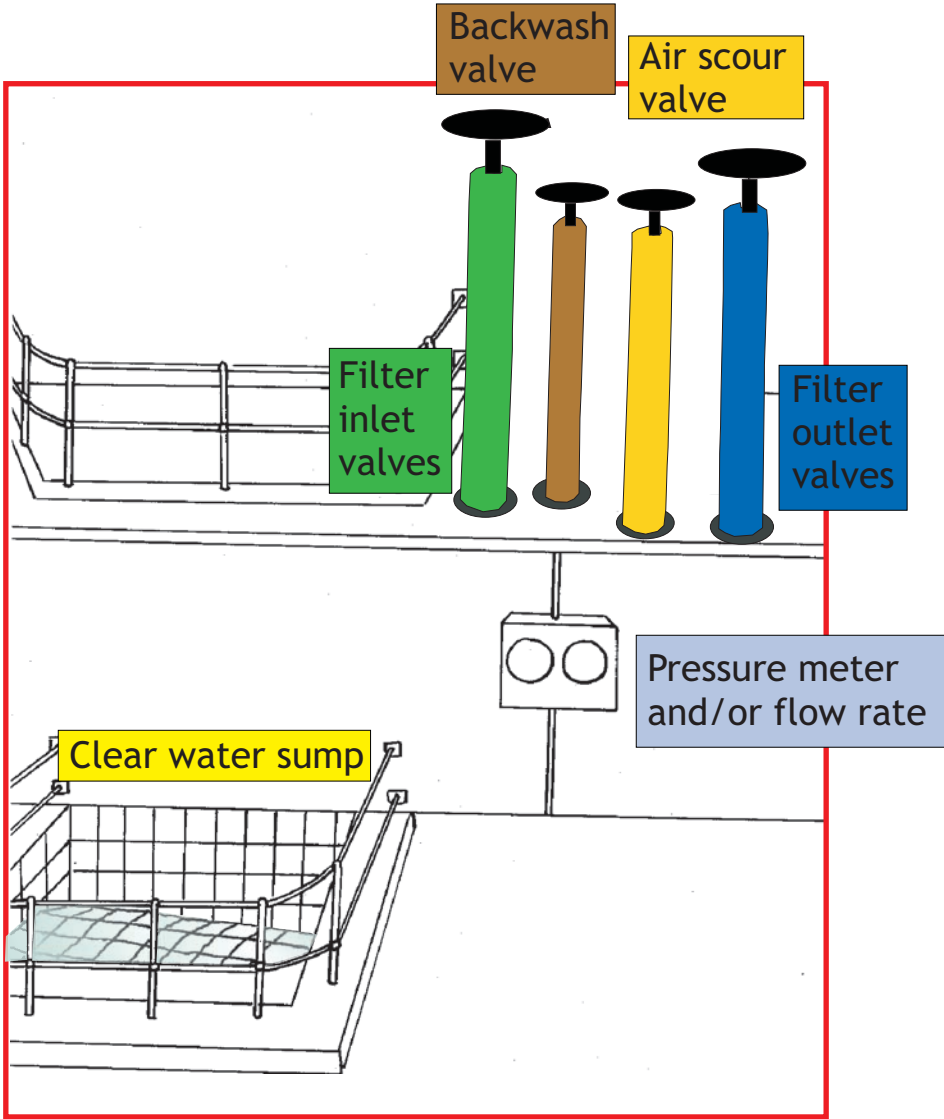


# FILTRATION 5

## CROSS-SECTION OF TANK



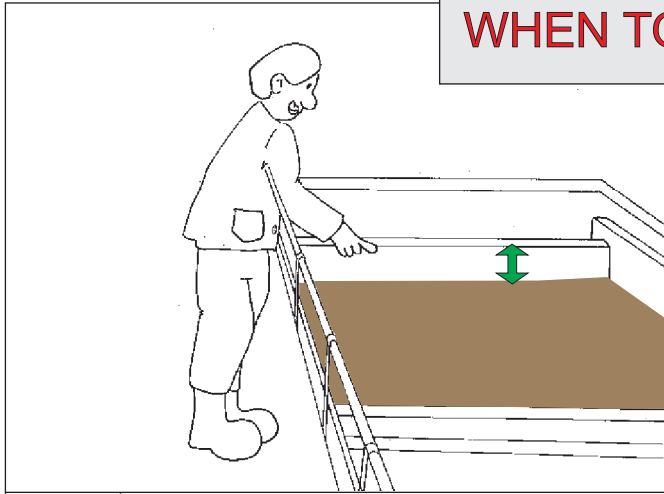
## FILTER GALLERY



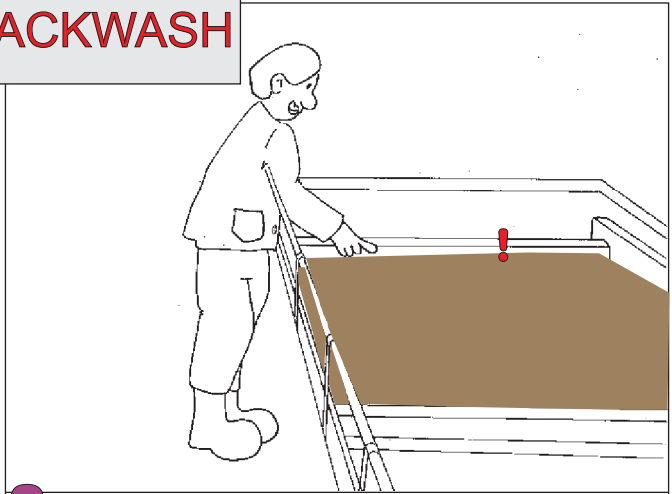


# FILTRATION 5

## WHEN TO BACKWASH



✓ The operator notes the level of the water during every shift



! A rise in the water level to a certain level is an indication to start the backwash procedure

Notes.....

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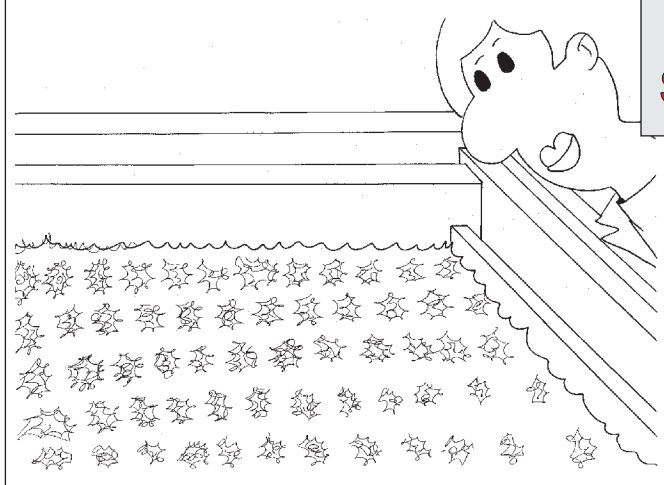
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## WHAT BACKWASH SHOULD LOOK LIKE

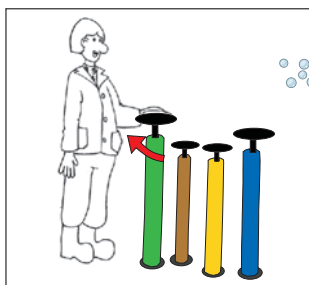


The operator makes sure that there is even air flow through all the nozzles

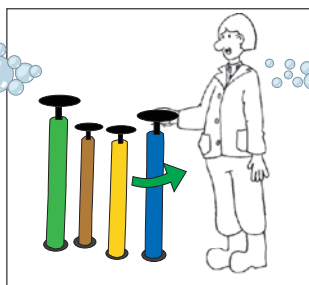


# FILTRATION 5

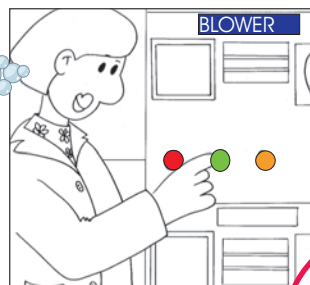
## BACKWASH PROCEDURE



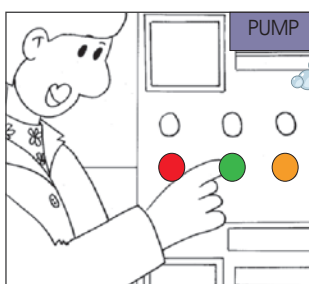
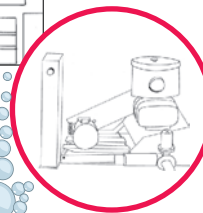
1. Close the inlet valve



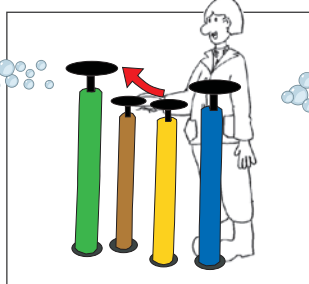
2. Open the dirty water outlet valve



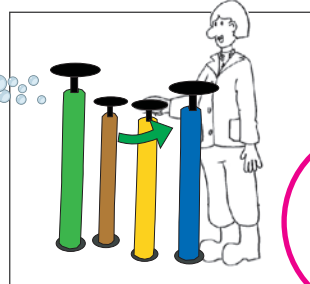
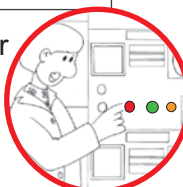
3. Put blower on



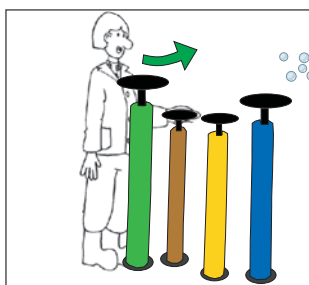
6. Put the pump on



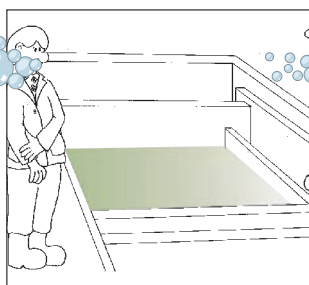
5. Close the air valve and put the blower off



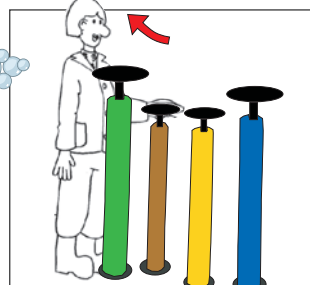
4. Open valve for air scour for 2 min. This loosens the sand so that the dirt can be washed out



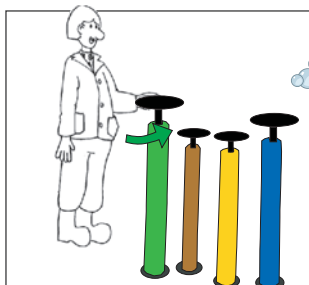
7. Open backwash valve



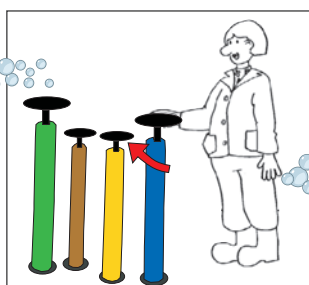
8. Wash until clean



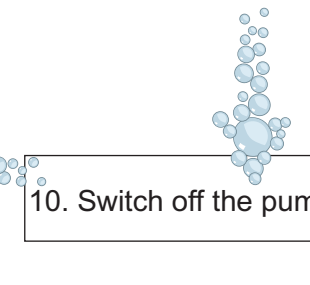
9. Close the backwash valve



12. Open the inlet valve



11. Close the outlet valve



10. Switch off the pump

# FILTRATION 5

Notes.....

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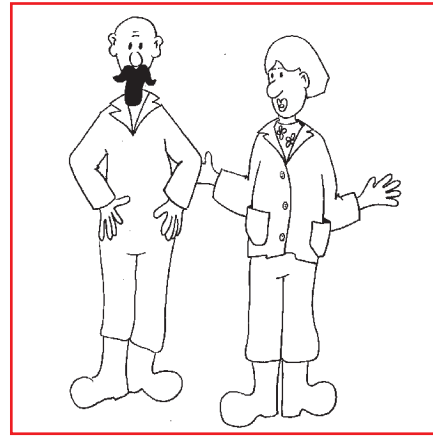
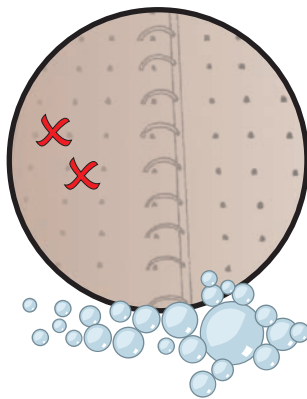
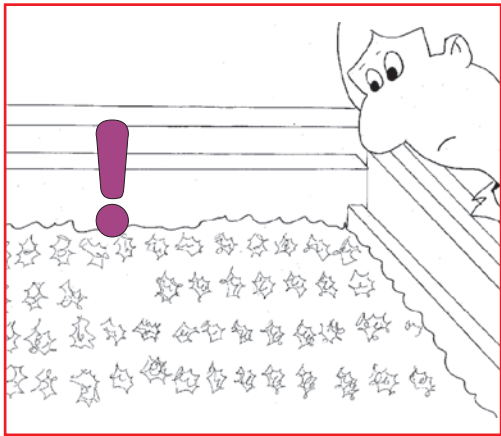
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## POSSIBLE PROBLEMS

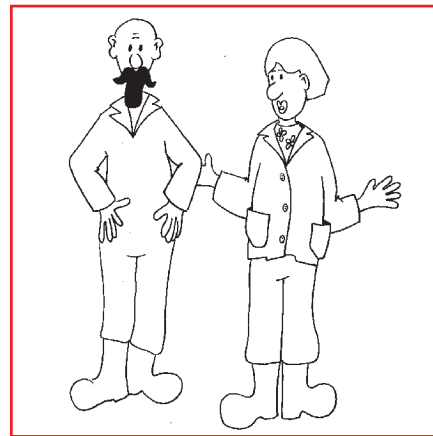
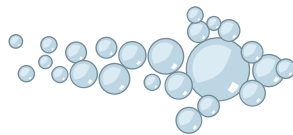
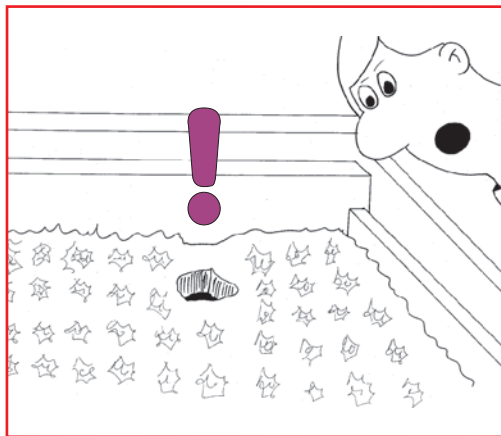
1

Uneven flow might be an indication of a broken nozzle



2

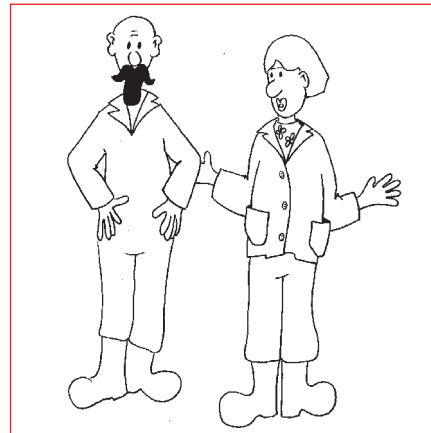
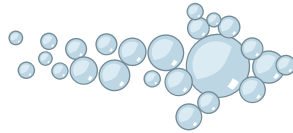
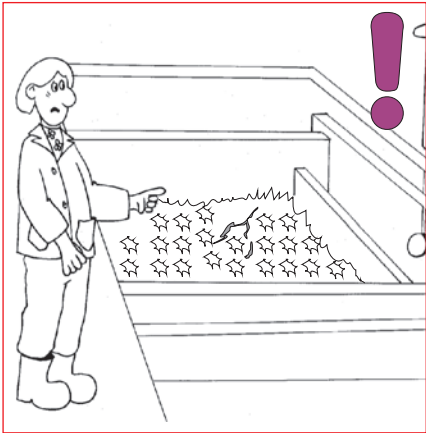
A hole forming in the media might be an indication of a broken nozzle



# FILTRATION 5

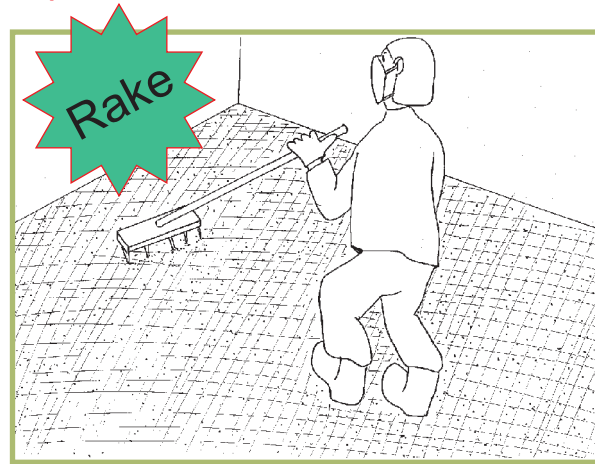
3

## Mudballing or cracks in the medium

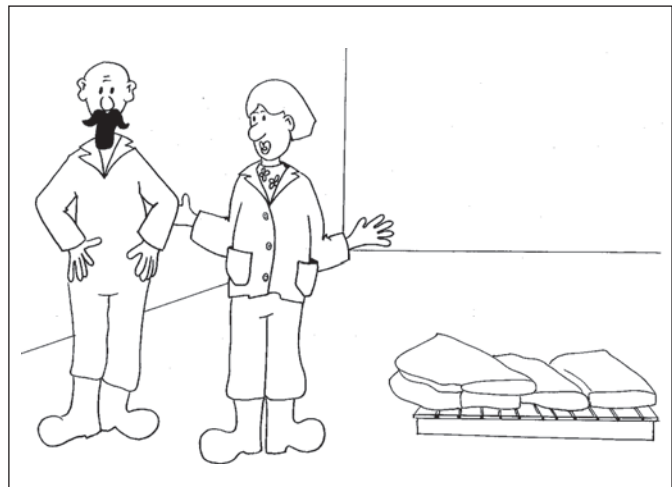


Mudballing causes that water flows through the filter bed without filtering.

The medium needs to be raked and then treated with chlorine or replaced



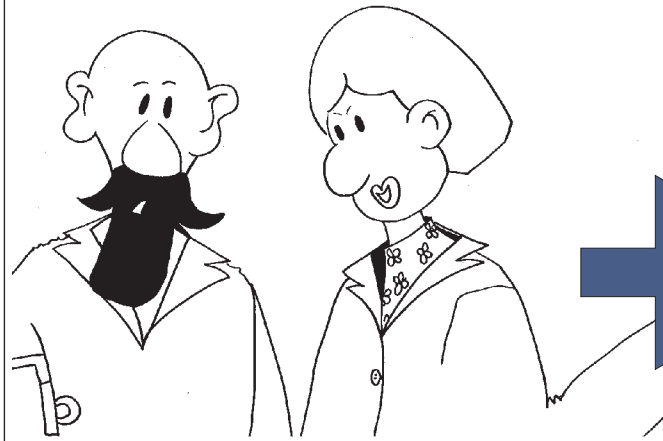
When working with granular chlorine the operator wears a dust mask and gloves



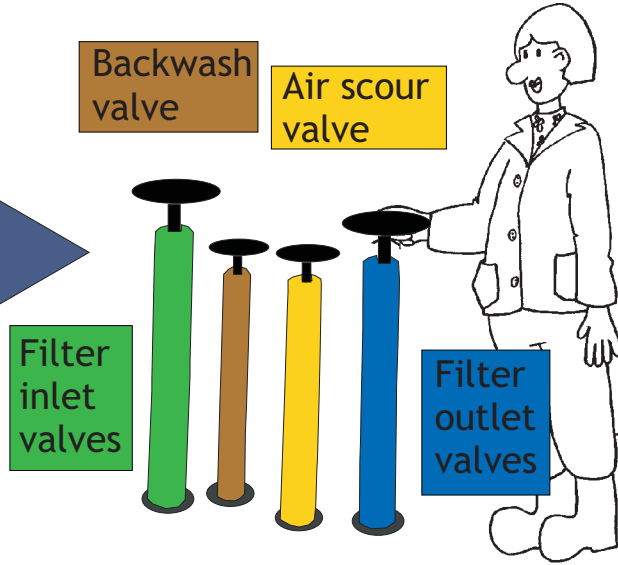
The operator informs the supervisor when he needs to order new media and granular chlorine

# FILTRATION 5

## FILTER GALLERY



The supervisor will train the operator which valves to open and close



### Notes.....

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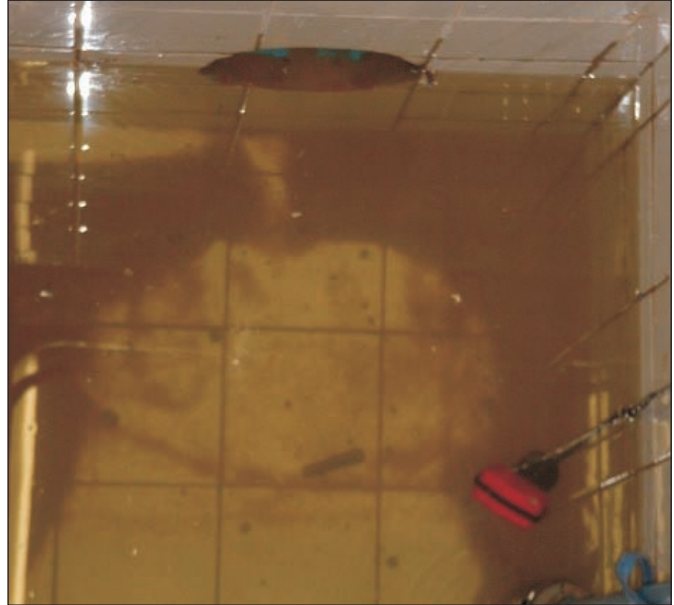
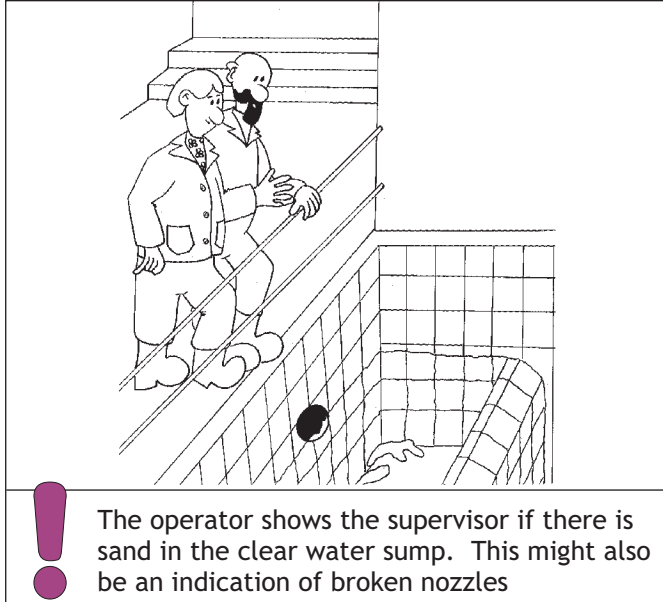
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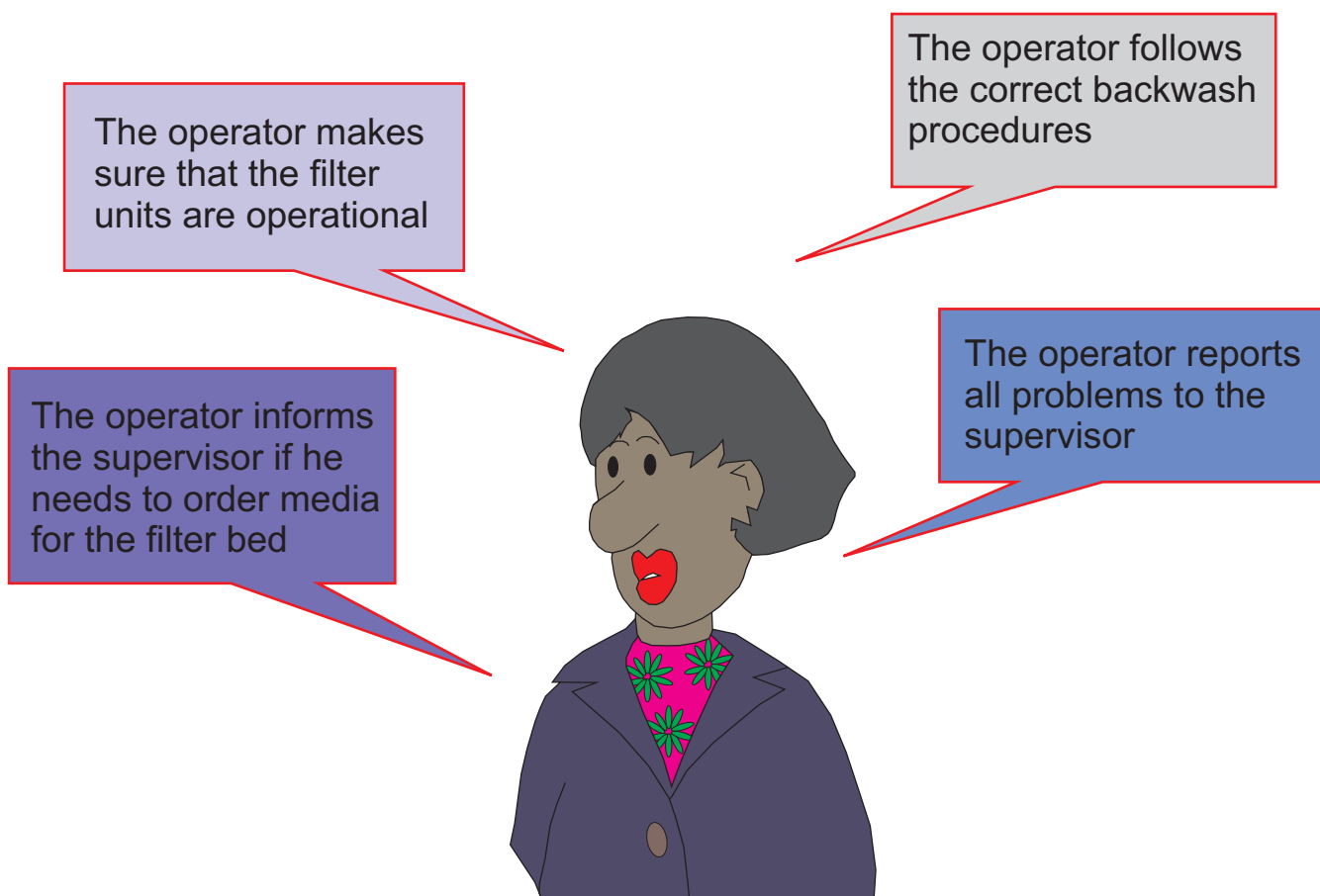




## FILTRATION 5



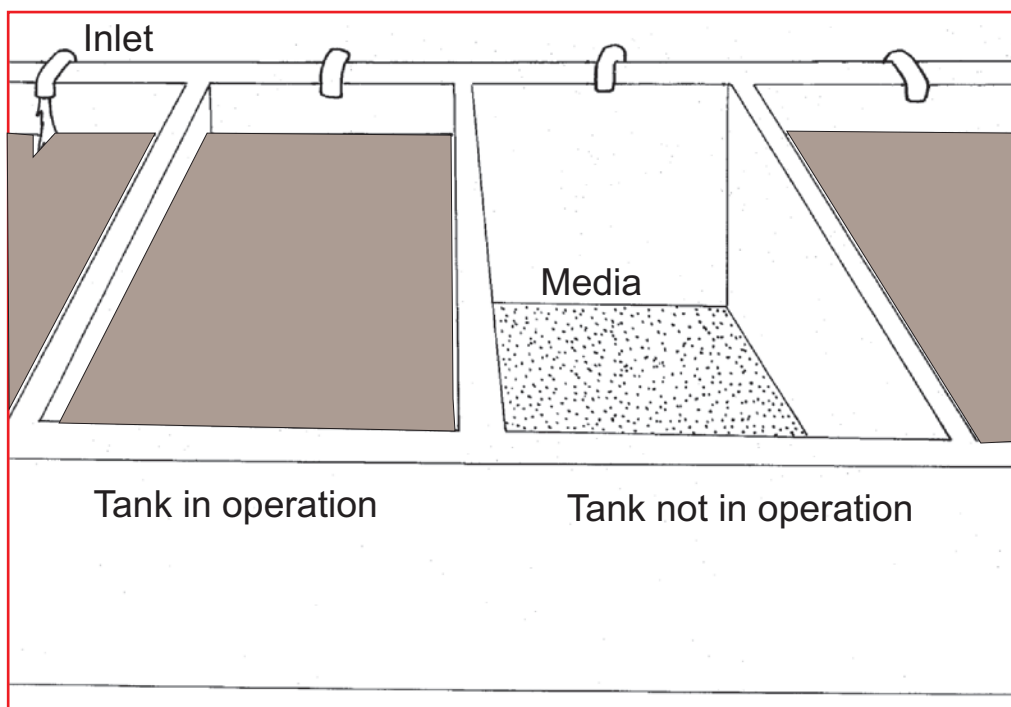
## SUMMARY



# FILTRATION 5

## SLOW SAND FILTRATION

SLOW SAND FILTRATION TANKS



### WORK PROCEDURE



The operator closes the inlet valve when there is sludge build-up and he wants to take the tank out of operation

Notes.....

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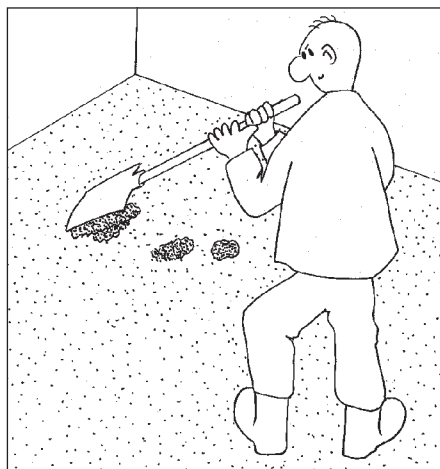
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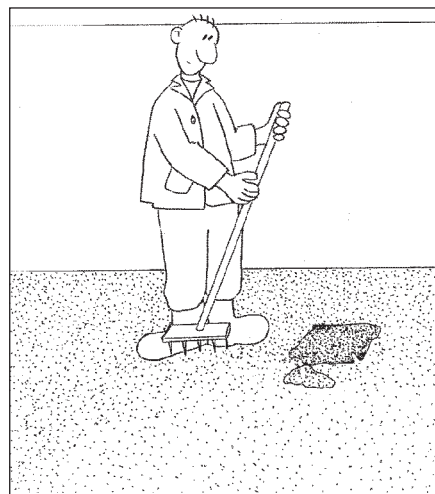
## FILTRATION 5



The operator scrapes off the surface of the top layer of sand. Taking care not to disturb the deeper layer

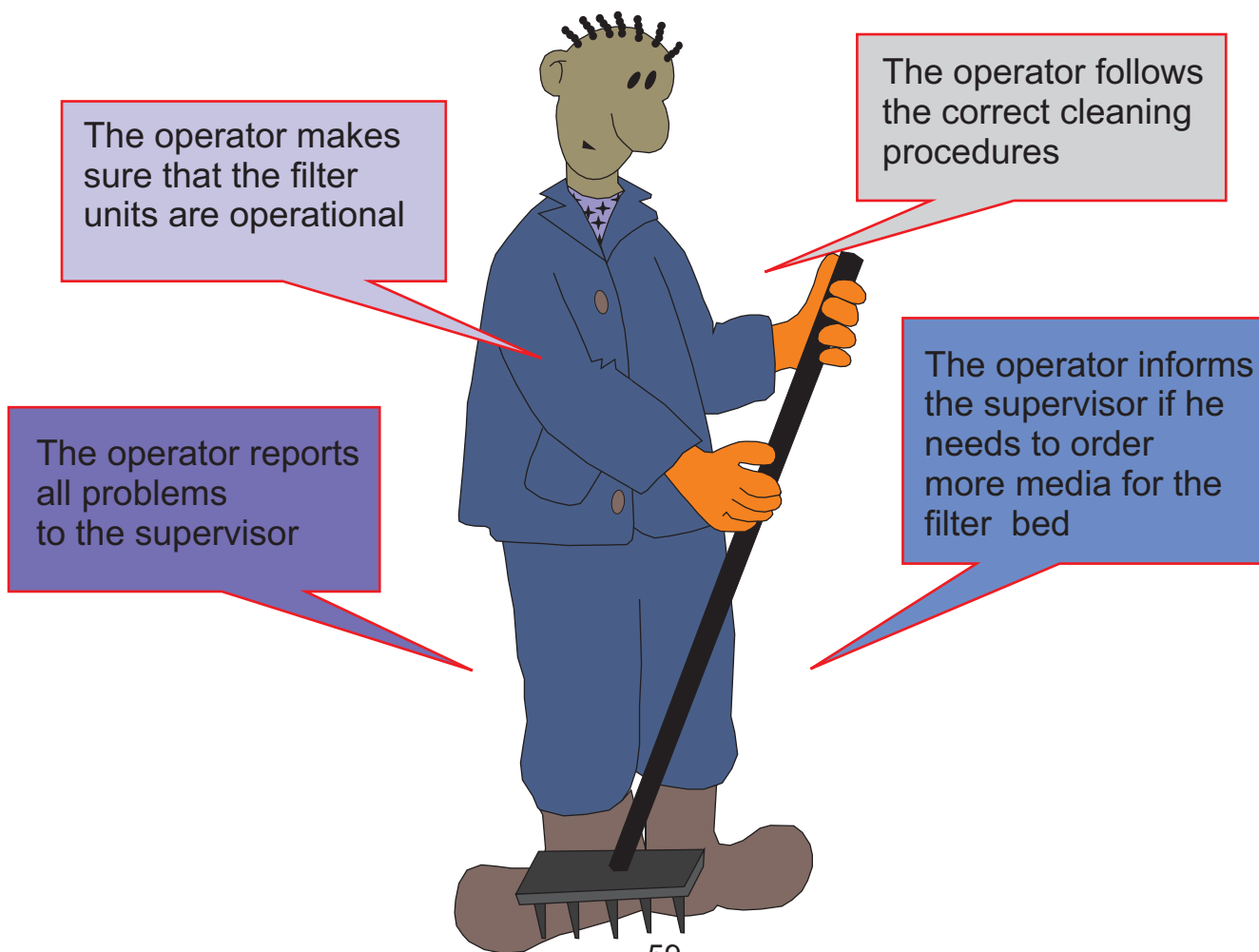


The operator replaces the sand that he has removed with new sand



The operator evens out the new layer of sand. The filter is now ready to go back in operation

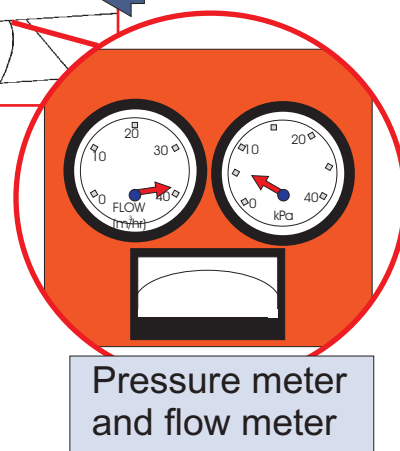
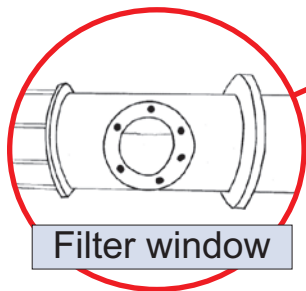
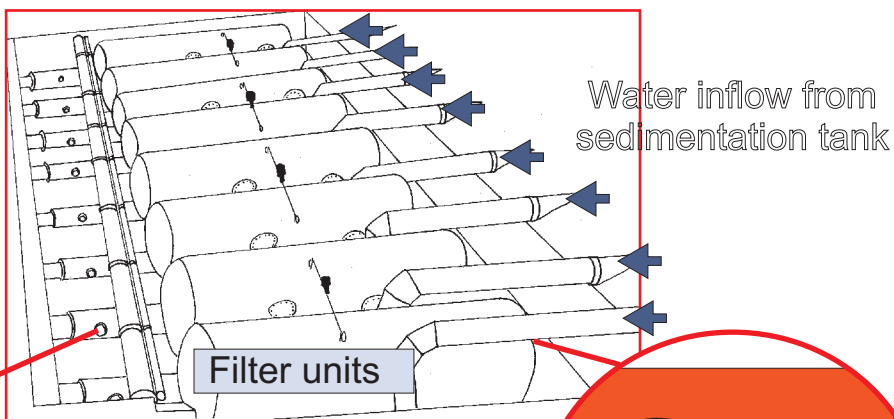
## SUMMARY



# FILTRATION 5

## HIGH PRESSURE FILTRATION

HORIZONTAL FILTRATION TANK



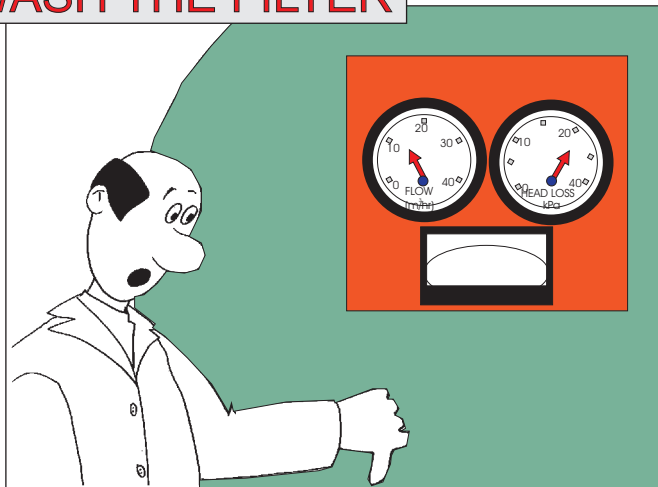
VERTICAL FILTRATION TANK



### WHEN TO BACKWASH THE FILTER



The operator sees that there is a normal reading on the meter, i.e. High flow rate and low head loss



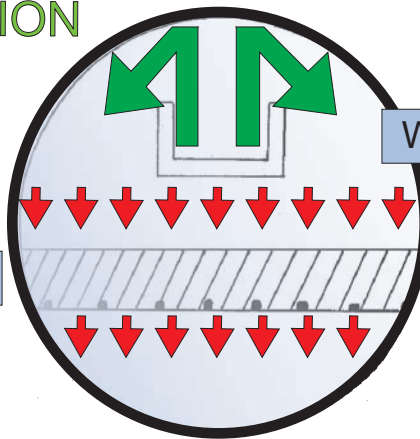
The operator sees that he needs to wash the filter. The reading on the meter shows a low rate and a high head loss

# FILTRATION 5

## INSIDE THE FILTRATION UNIT

### NORMAL FILTRATION under pressure

Tank is filled with water



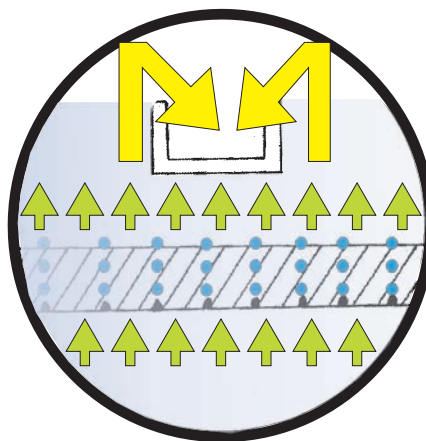
Water flows in channel

Media

Perforated plate with nozzles

### BACK WASH no pressure

Tank is not filled with water



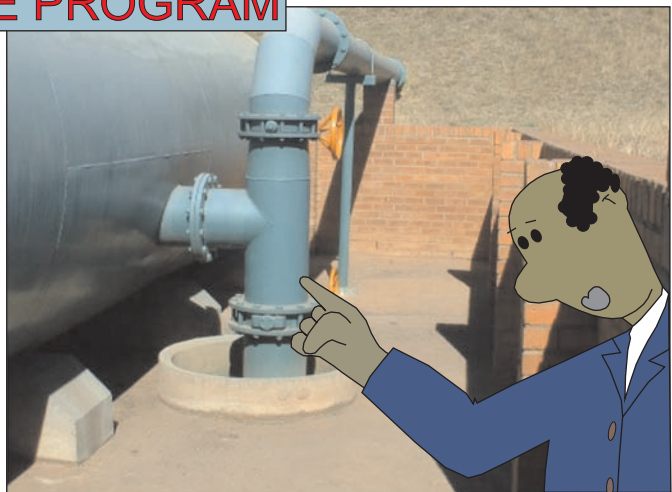
Perforated plate with nozzles that washes the media with water

Media

## MAINTENANCE PROGRAM



The operator discusses the cleaning of the filters with the supervisor. It is best to work according to a 3 monthly cleaning or maintenance plan.



The supervisor is responsible for training the operator in the correct backwash procedure

# FILTRATION 5



Notes.....

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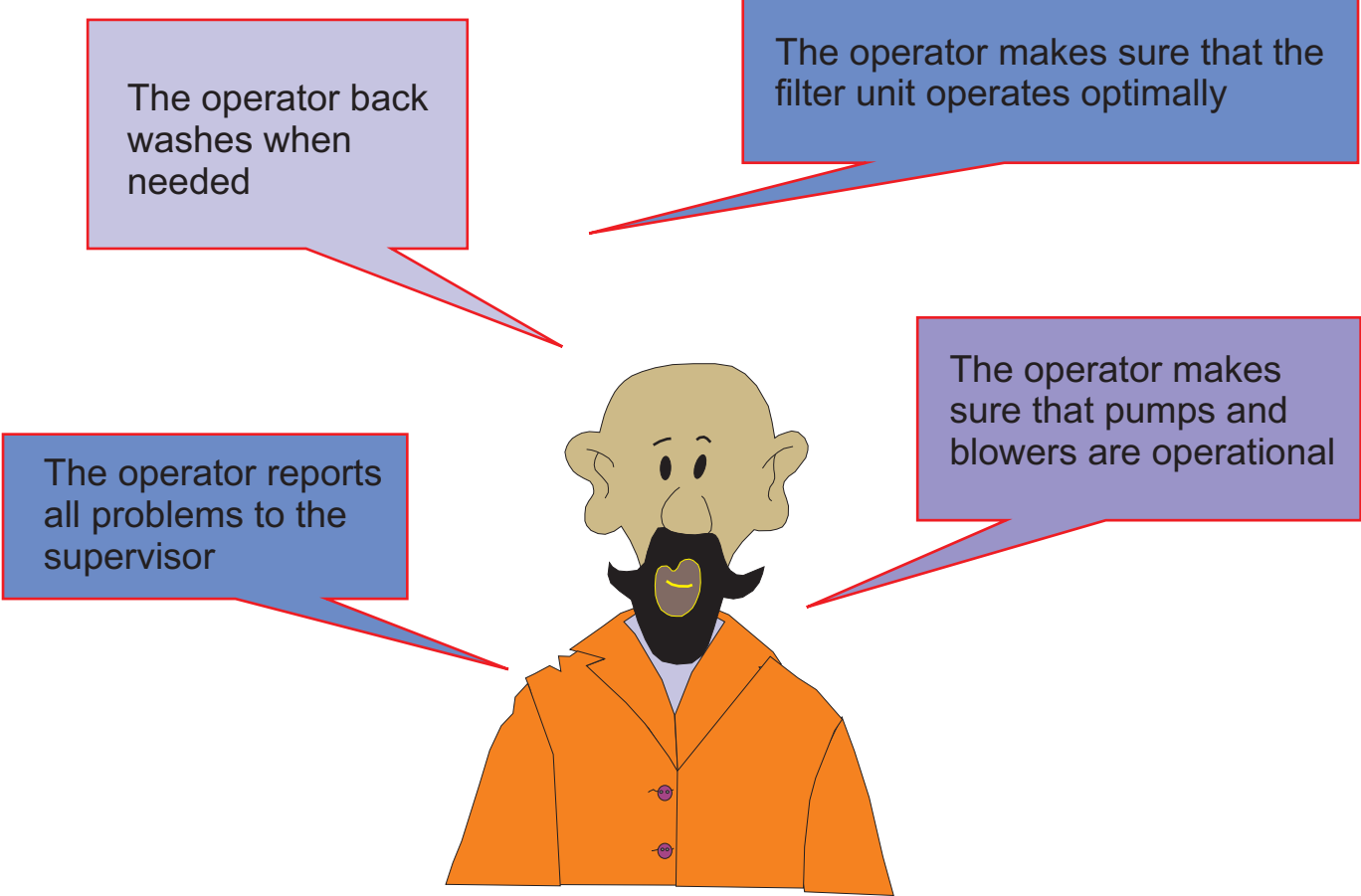
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## SUMMARY



## DISINFECTION 6

# DISINFECTION 6



## DISINFECTION 6

# TRANSLATIONS

English	Disinfection
Isizulu	Ukubulala imbewu yokufa – indlela yenqubo yokubulala okuphilayo okuncane kakhulu okungabonakal ngamehlo okuse manzini. Lokhu kubandakanya namabhakthiriya abanga izifo
Isixhosa	Yindlela yokubulala ezinye zeentsholonwane ezingabonakaliyo emanzini kunye nezinye nje iintsholongwane
Siswati	Yindlela yekubulala tilwane letingcane kakhulu letihlala emantini lekufaka ekhatsi emagciwane
Sesotho	Tlhoekiso – mokhoa oa ho bolaea likokoana-hloko ka metsing ho kenyeletsa le tse hlahisang maloetse
Setswana	Tiragalo ya go bolaya dikokwanatlhoko mo metsing go akaretsa le bacteria e e lwatsang
Sepedi	Hlwekišo - tsela ya go bolaya diphidinyana tša go se bonwe ka leihlo ka gare ga meetse gammogo le dikokwana tša go hlola malwetši
Ixitsonga	Ndlela yo dlaya switsotswana ematini hinkwaswo leswi Vangaka mavabyi
Venda	Maitela a u vhulaya (ha) zwikho khonono zwa madini zwi vhonehalo nga microscopi, zwine zwa vhang a zwitshili
Afrikaans	Ontsmetting

## THE PURPOSE OF DISINFECTION

Disinfection of water is required for the removal of harmful \*pathogenic organisms to render the water safe to drink.

Disinfection is generally the last process following filtration, before the water is discharged to a reservoir or into the reticulation network. The furthest point in the supply network should have a residual chlorine concentration of between 0,05 to 1,0 mg/l. For more information on the residual chlorine concentration refer to page 93.

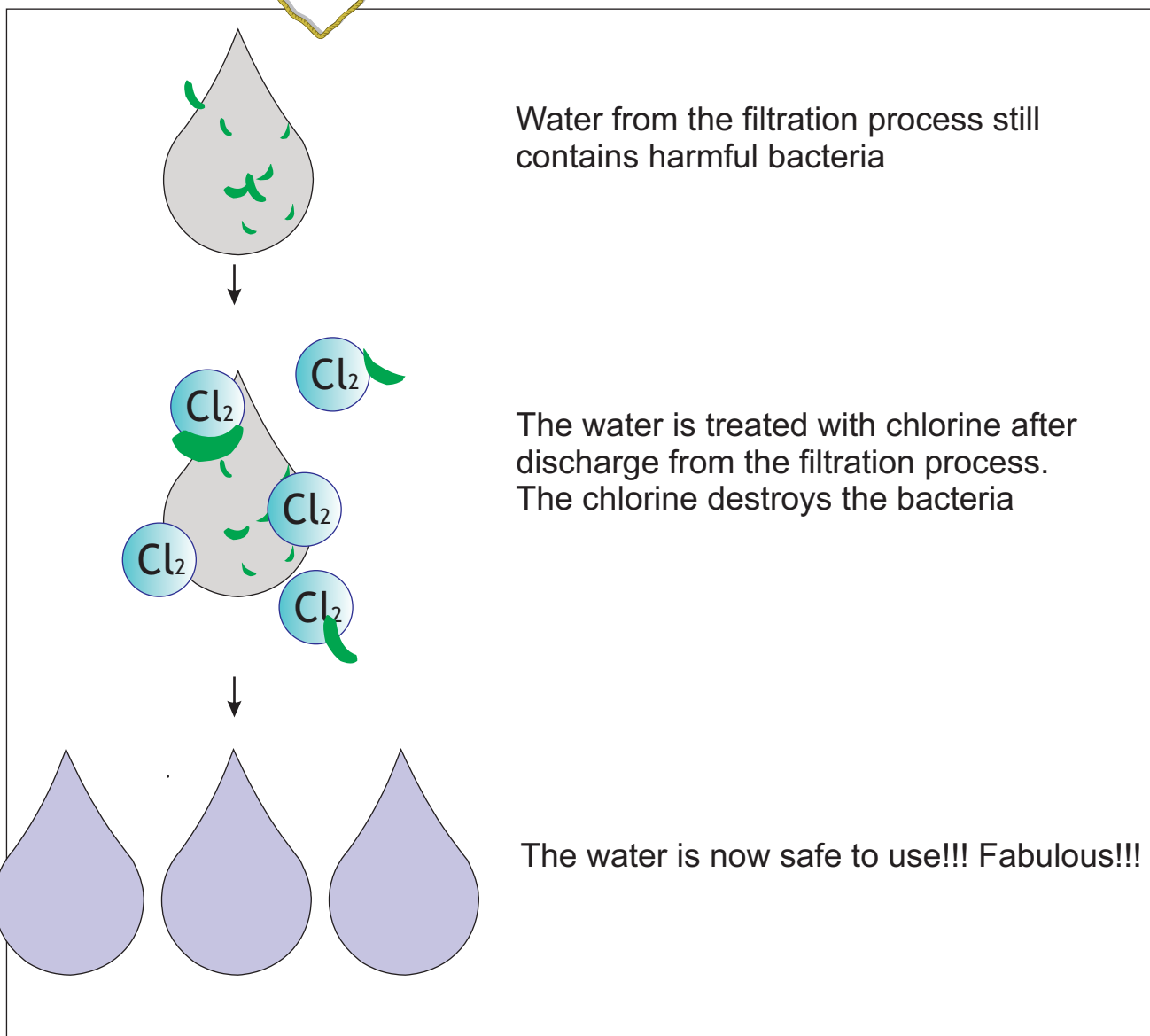
Some plants also have the option to dose in the flocculation channel as this could assist to prevent excessive algae growth in the sedimentation tanks.



# DISINFECTION 6

## THIS IS THE EFFECT OF DISINFECTION ON THE WATER

The treatment of the water with chlorine kills the harmful bacteria that is left in the water. These bacteria if not successfully removed will cause illness in people.



Disease causing bacteria



Chlorine



# DISINFECTION

THE OUTSIDE OF THE CHLORINE ROOM

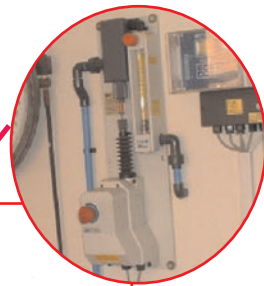


Gas mask for safety

THE INSIDE OF THE CHLORINE ROOM



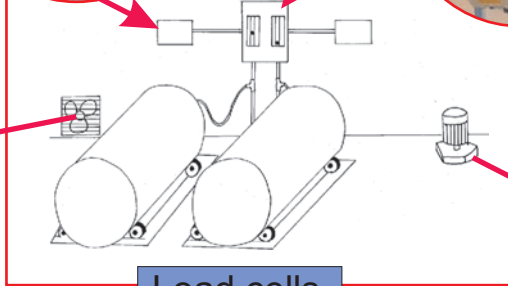
Electronic display



Gas flow rate level measuring unit



Extraction fan



Load cells



Booster pump

CHLORINATION

PRE-CHLORINATION CAN SOMETIMES BE DONE IN THE FLOCCULATION CHANNEL



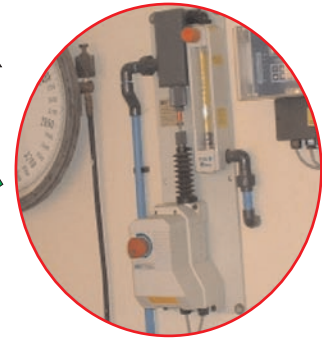
FINAL CHLORINATION IS DONE AFTER FILTRATION IN A CLOSED CONTACT TANK



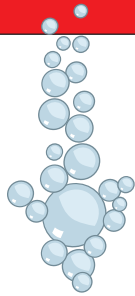
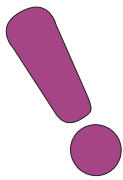
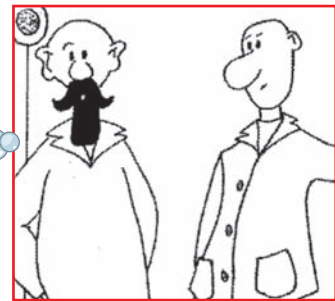
# DISINFECTION 6

## THE FLOW LEVEL INDICATOR

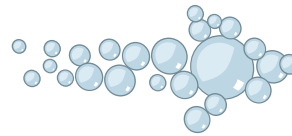
NORMAL



LOW - NO GAS



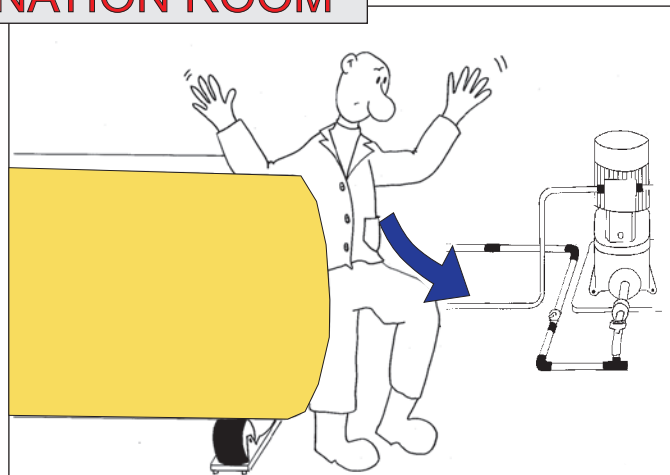
MAKE THE NECESSARY ADJUSTMENTS



## IN THE CHLORINATION ROOM



The operator makes sure that the extraction fan is working



The operator makes sure that the booster pump is operational

# DISINFECTION 6

## CHLORINE TANKS

ONE TON CHLORINE CYLINDERS



68 kg CHLORINE CYLINDERS



## ENOUGH CHLORINE?

The loading cells measure the cylinder. The operator should look at the electronic display which would indicate if the cylinder is empty

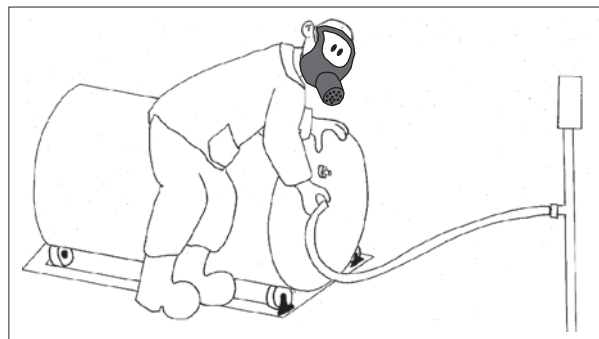


LOADING CELLS



ELECTRONIC DISPLAY

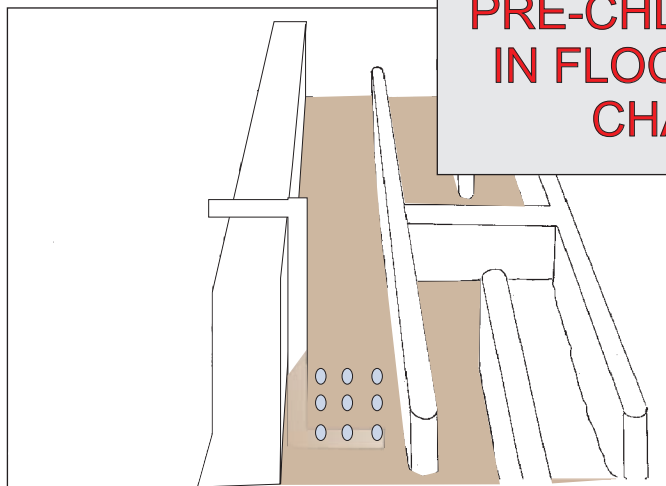
The operator switches the attachment to a new full chlorine cylinder. The operator tests for possible chlorine leaks with the liquid ammonia



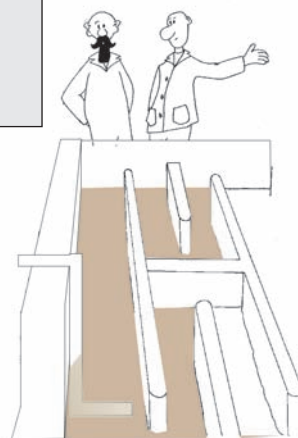



## DISINFECTION 6

### PRE-CHLORINATION IN FLOCCULATION CHANNEL



Where there is pre-chlorination in the flocculation tank, the operator makes sure that chlorination takes place



 The operator reports any problems to the supervisor

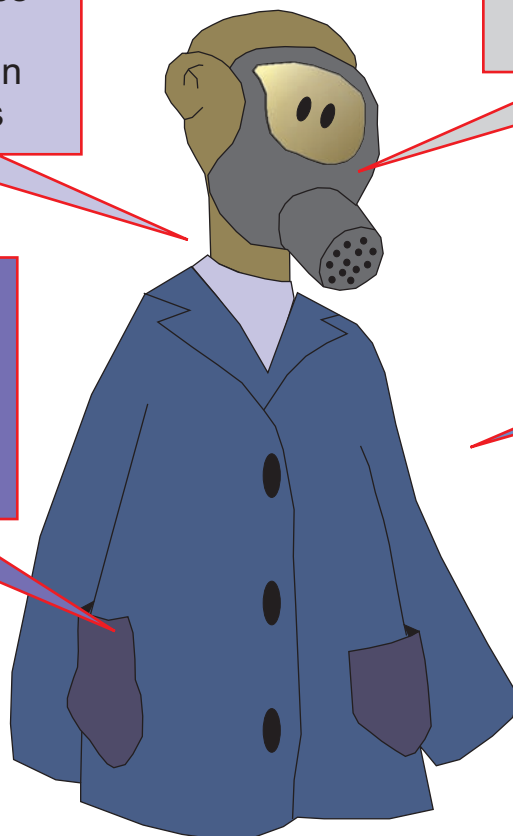
## SUMMARY

The operator makes sure that there is sufficient chlorine in the tanks/cylinders

The operator ensures that chlorine dosing takes place at the correct dosage level

The operator and supervisor test for gas leaks on a regular basis or whenever required

The operator and supervisor follow safety procedures



# PUMP STATIONS AND ELECTRICAL BOARDS 7



## TRANSLATIONS

English	Pump stations and electrical boards
Isizulu	Isiteshi sokumpompa – isakhiwo esigcine ompompi abasetshenziselwa ukumpompa amanzi aye ezindaweni eziphakemeyo
Isixhosa	Umashini ojikelezayo kwimpompo ewenzelwa ukumpompa okanye ukuphakanyiswa kwamanzi
Siswati	Indzawo yemhpompi, indzawo lapho kulawulwa khona gezi
Sesotho	Tulo eo dipompo, tulo ho laoloang motlakase
Setswana	Tulo ya dipompo, tulo fa go laolwang motlakase
Sepedi	Tulo ya dipompo, taolong ya motlakatse
Ixitsonga	Xitixi laha ku pomperiwaka kona, laha ku lawuriwaka kona
Venda	Ho no dzula bombo, ho no langulwa mudagasi
Afrikaans	Pompstasies en elektriese borde

## THE PURPOSE OF PUMP STATIONS AND ELECTRICAL BOARDS

### **PUMP STATIONS**

Pump stations are provided for the pumping of chemicals, backwash water for the filters, pumping of clear water to distribute to reservoirs and sometimes for internal recycling or sludge pumping.

### **ELECTRICAL BOARDS**

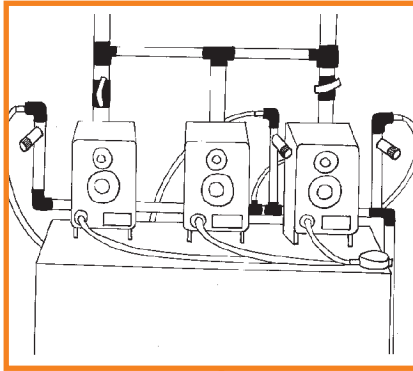
Electrical control boards are necessary to ensure that the correct power is supplied to each mechanical item and to protect equipment from damage by lightning. Electrical control panels also provide information on the operation of the mechanical equipment.

\* See Glossary

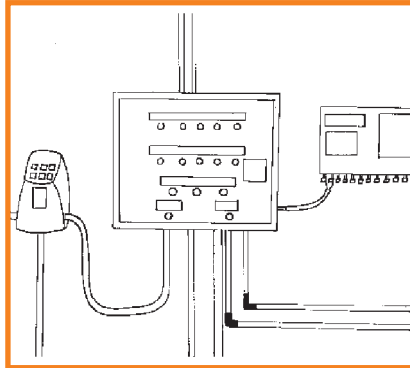


# PUMP STATION

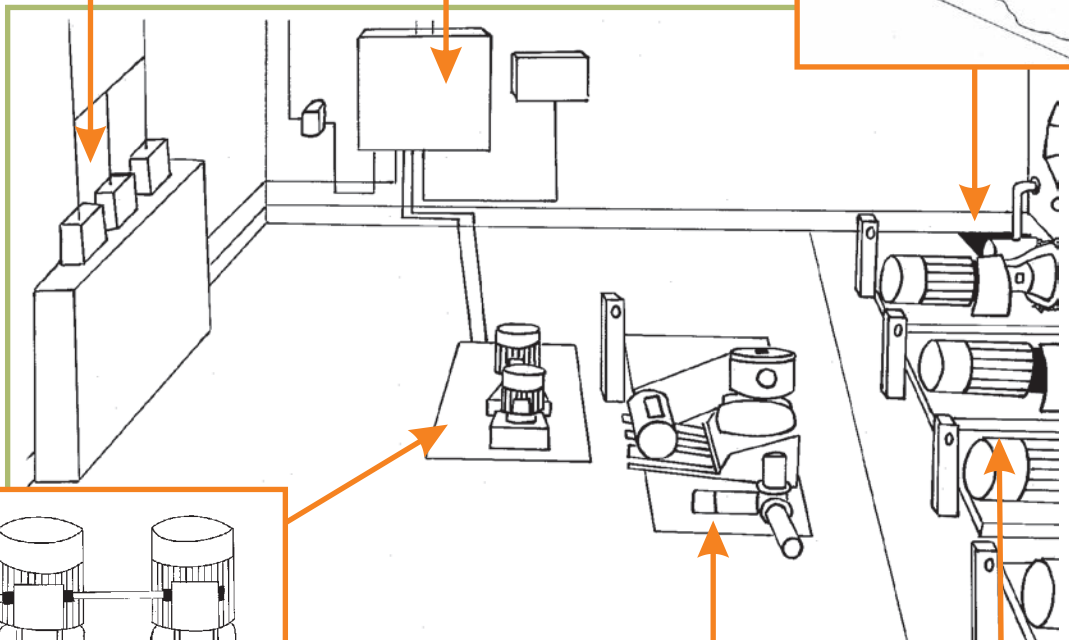
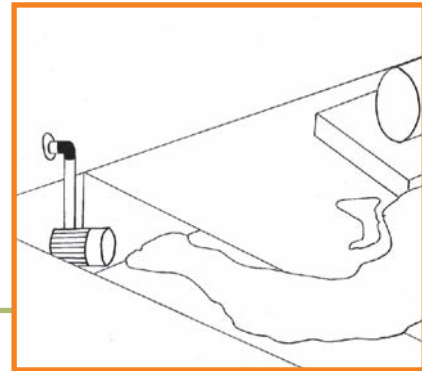
CHEMICAL DOSING PUMPS



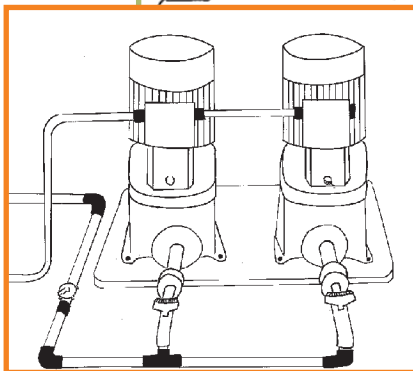
CONTROL PANEL



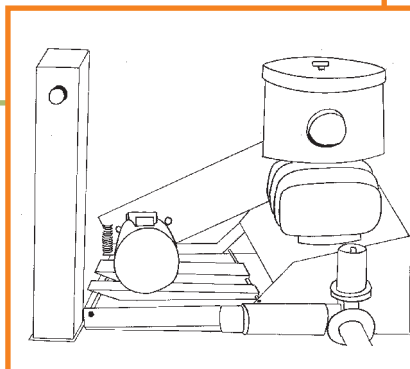
SUMP PUMP



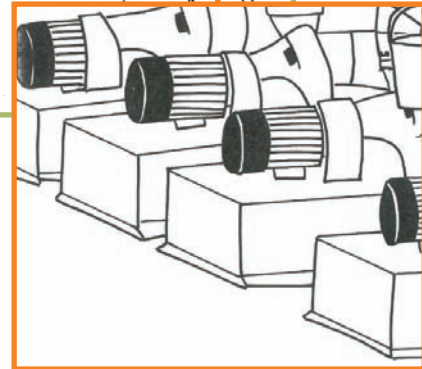
CHLORINE DOSING PUMPS



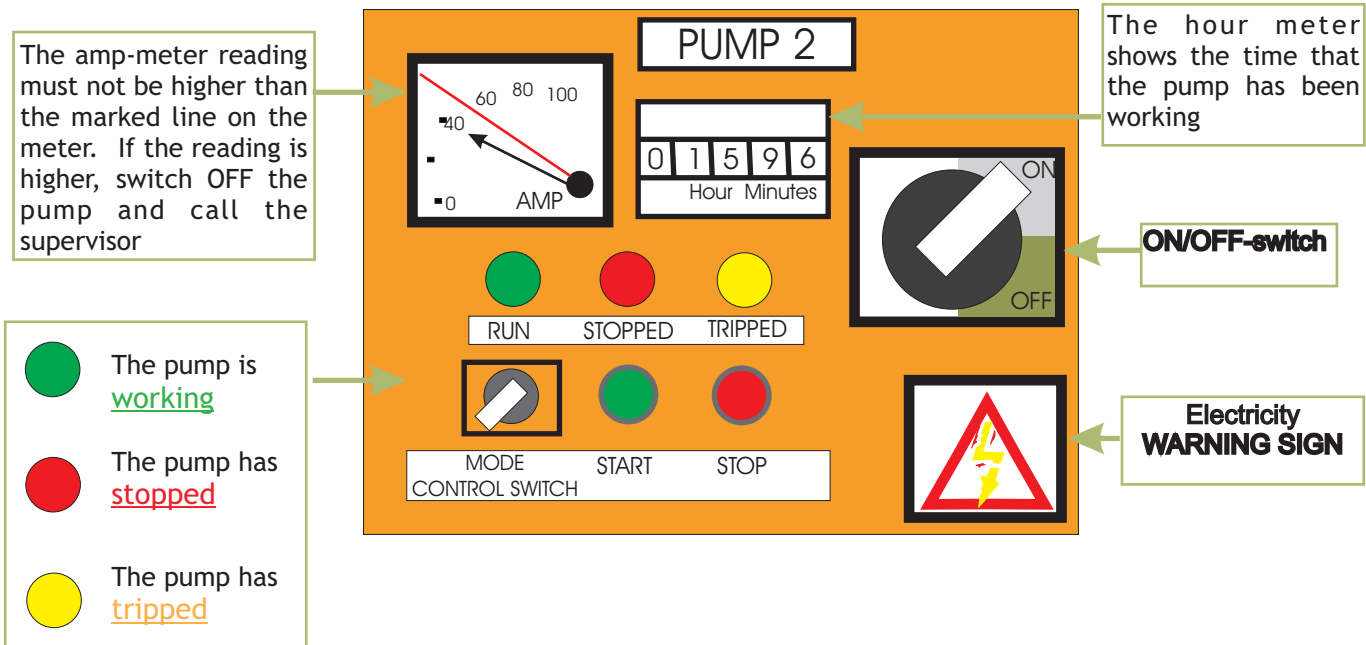
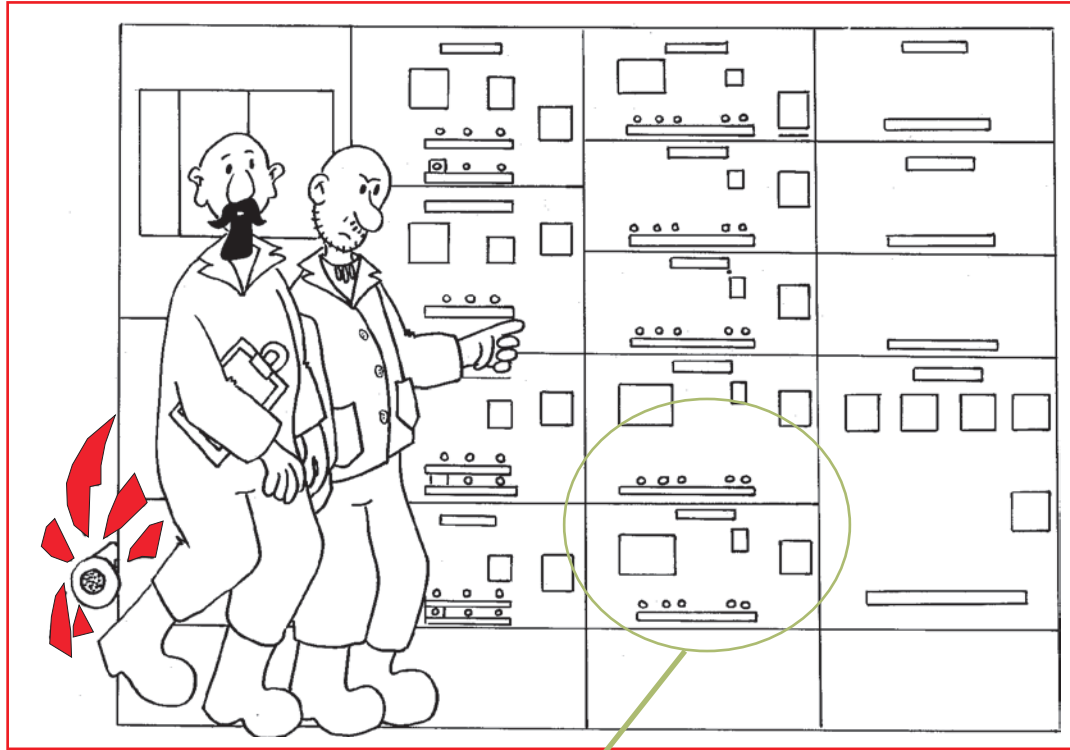
THE BLOWER



BACKWASH AND CLEARWATER PUMPS

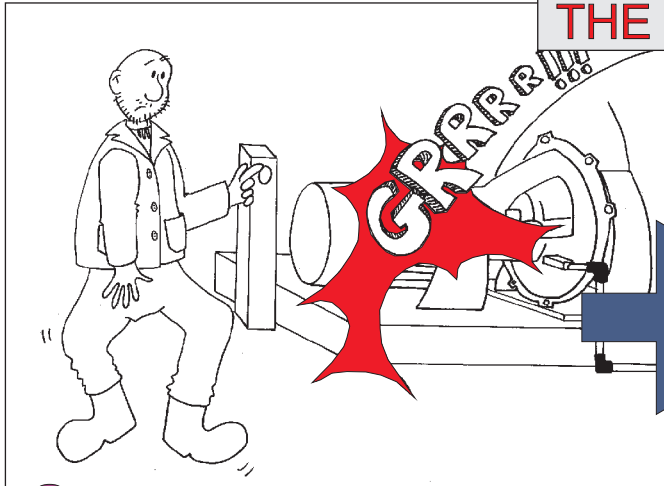


# ELECTRICAL BOARDS

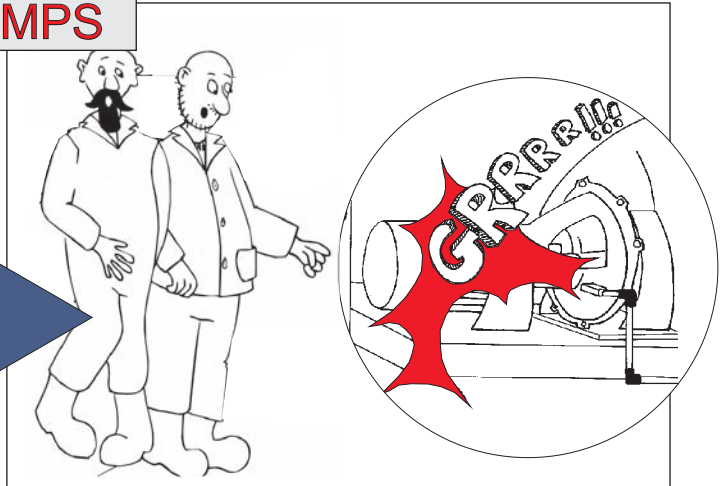


# PUMP STATIONS AND ELECTRICAL BOARDS 7

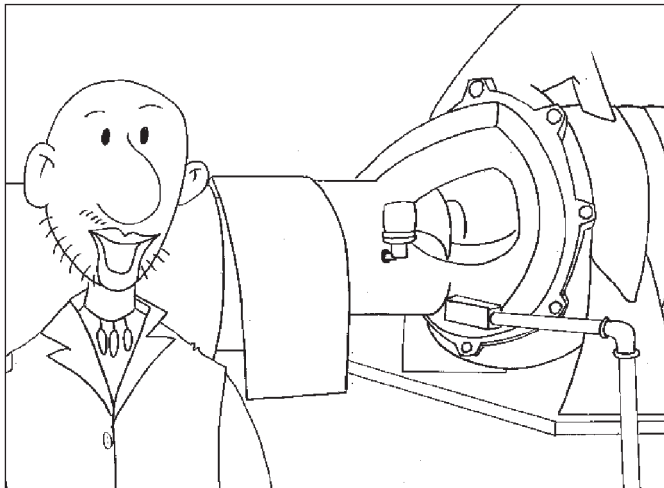
## THE PUMPS



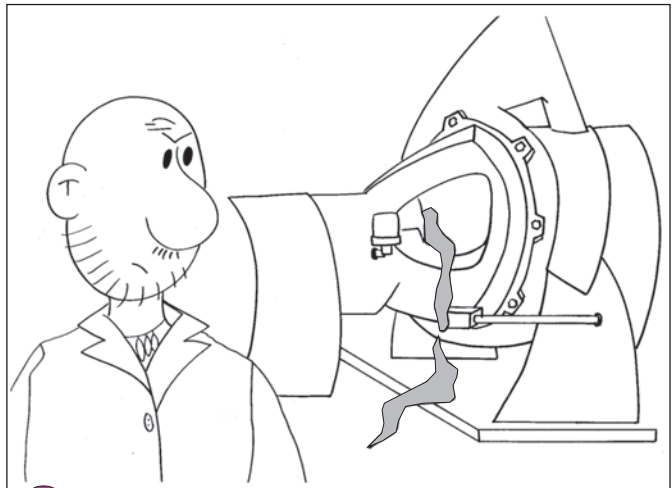
! The operator notes that the pump is overheating and making a noise



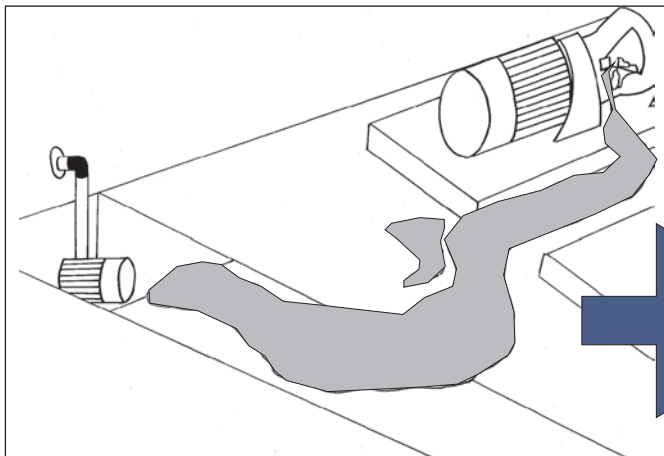
The operator report any noises and overheating to the supervisor



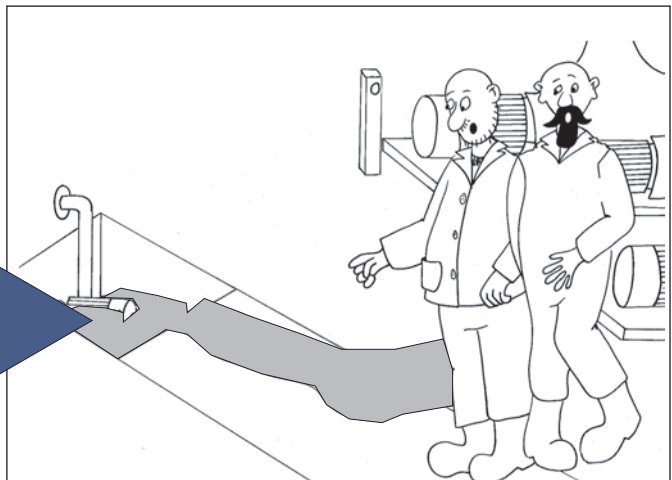
The operator sees that there is not any excessive water leaking from the gland



! The operator sees that there is excessive water leaking from the gland (not the normal slow drip). He reports this to the supervisor



! The operator sees that the water from the leaks runs down the sloped floor towards the drainage sump. The sump pump removes the water from the room to avoid flooding



! The operator calls the supervisor if he sees that the sump pump is not working and that the water is not being pump out



# PUMP STATIONS AND ELECTRICAL BOARDS 7



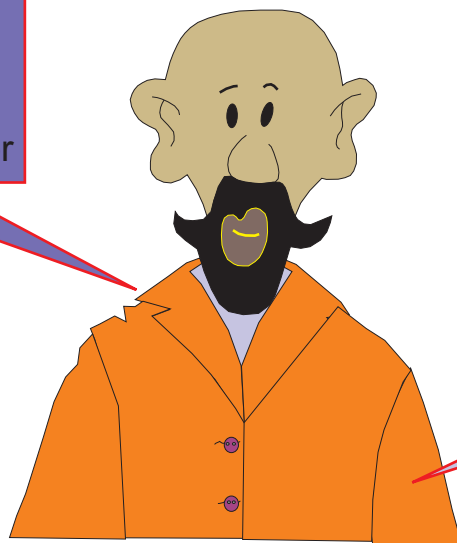
## SUMMARY

The operator makes sure that all the pumps are operational

The operator makes sure that the sump pump is operational to prevent flooding of the pump station

The operator reports all problems like overheating and noises from the pumps to the supervisor

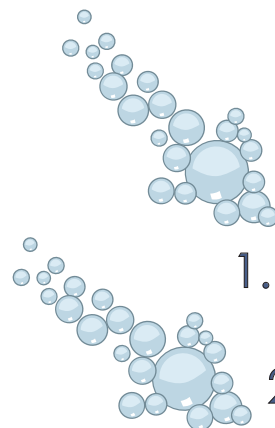
The operator makes sure that problems resulting in pumps that have tripped or stopped are reported and sorted out





# SLUDGE TREATMENT BEDS 8



- 
1. Sludge drying beds
  2. Sludge lagoons

## SLUDGE TREATMENT BEDS 8

### TRANSLATIONS

English	Sludge treatment beds
Isizulu	Ukomisa (udaka) – ukomisa udaka ukuze lubambeke lulahlwe
Isixhosa	Udaka olomileyo oluye lulahlwe
Siswati	Komisa sludge kwentelwe kutsi sitokhona kuphatskeka siphindze silahlwe
Sesotho	Seretse – ho omisa seretse hore e be se ka nkeha e be sea lahluoa
Setswana	Go omisa sludge gore se kgone go tshwarega le go tlošwa kgotsa go latlhiwa
Sepedi	Go omiša seretse / leraga gore se tle se kgone go tlošwa sa lahlwa
Ixitsonga	Kususa ridadaka leswaku rita tekeriwa goza ku ricukumeta kule
Venda	U omisa matope u itela uri a kone u bviselwa nda
Afrikaans	Slykbehandelingsbeddings

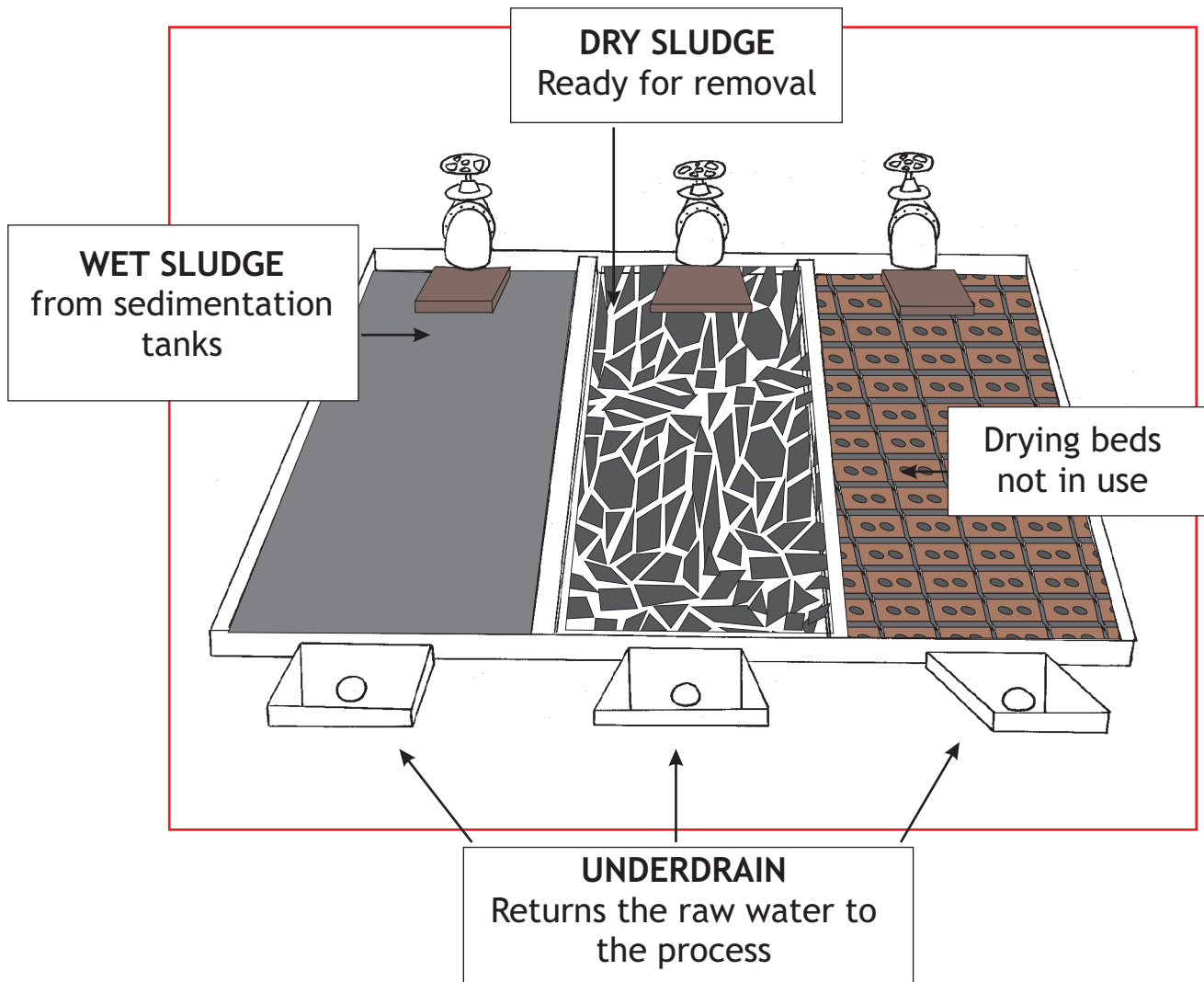
### THE PURPOSE OF SLUDGE TREATMENT BEDS

Sludge treatment beds are provided to allow sludge that is drawn from the process to dry for easier handling.

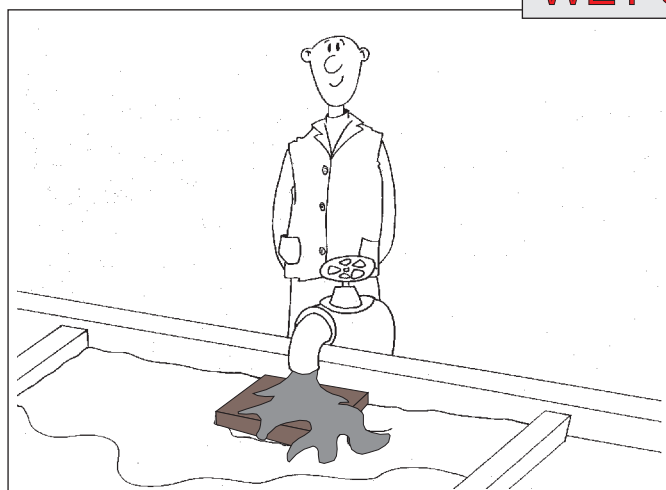


# SLUDGE TREATMENT BEDS 8

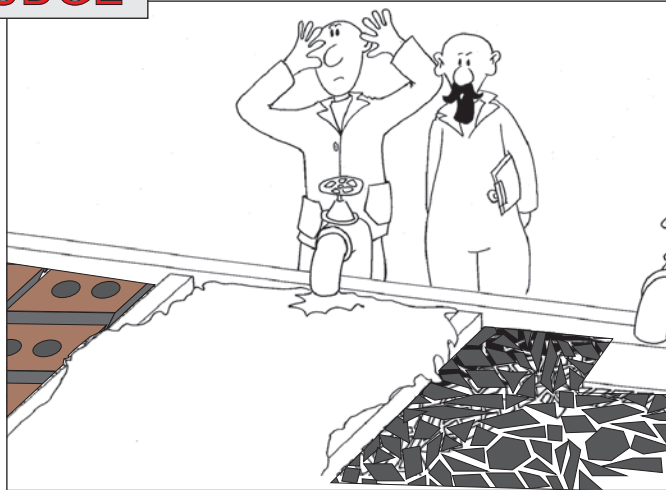
## SLUDGE DRYING BEDS



### WET SLUDGE

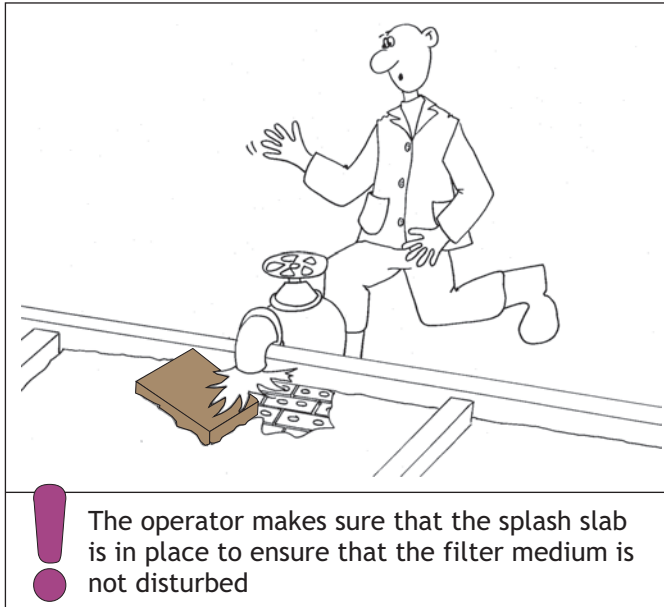


✓ The operator makes sure that the sludge is wasted to the recommended depth of 300 mm



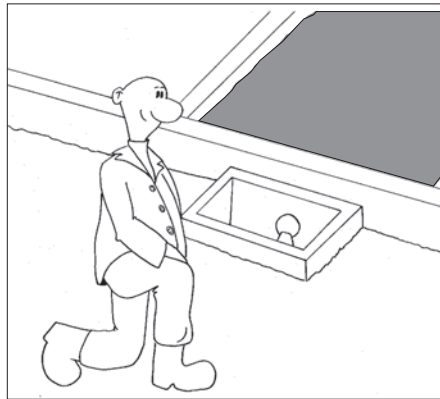
✗ The operator makes sure that the sludge drying beds are not filled to the brim

# SLUDGE TREATMENT BEDS 8

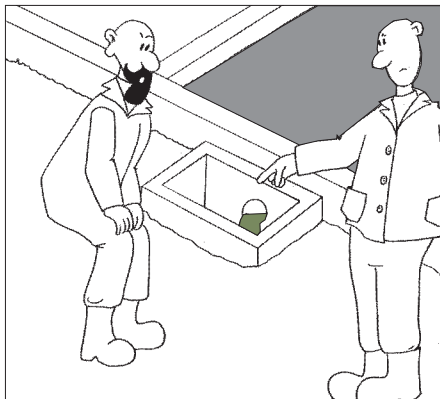


## FLOW FROM THE UNDERDRAIN

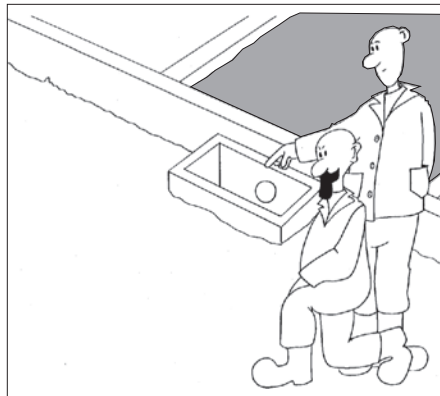
CLEAR FLOW



COLOURED FLOW



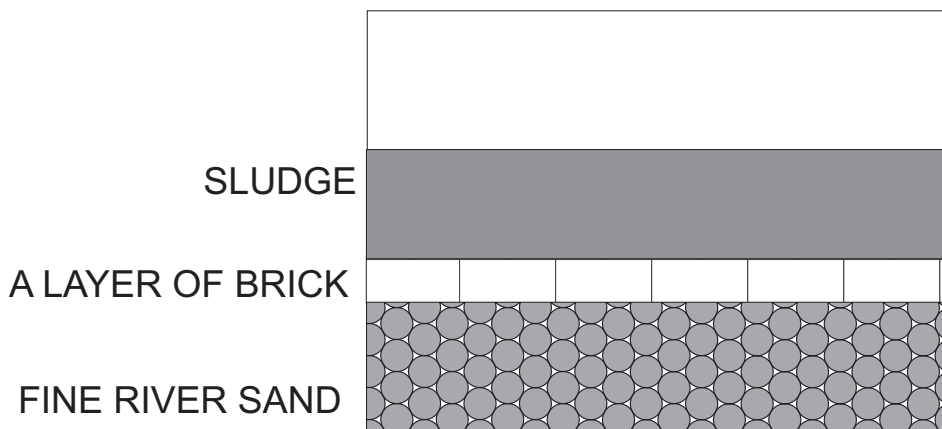
NO FLOW



**Call supervisor**

# SLUDGE TREATMENT BEDS 8

## THE DIFFERENT LAYERS OF THE DRYING BED



### DRIED SLUDGE

✓ Once the sludge has dried, the operator should remove it from the drying beds to make space for wasting more sludge



**X** If the dry sludge in the drying beds gets wet again there might be no beds to waste sludge to

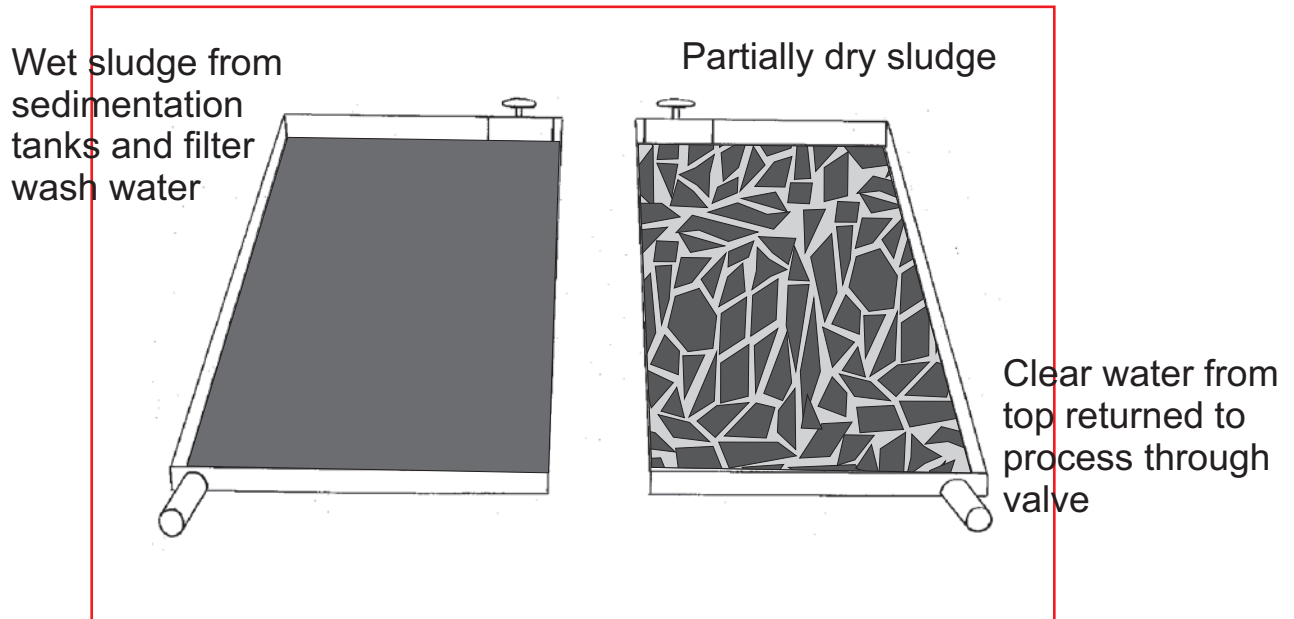
## DISPOSAL OF DRIED SLUDGE

The operator removes the dried sludge

The operator places the dried sludge in a specific place for disposal at the nearest landfill site

# SLUDGE TREATMENT BEDS 8

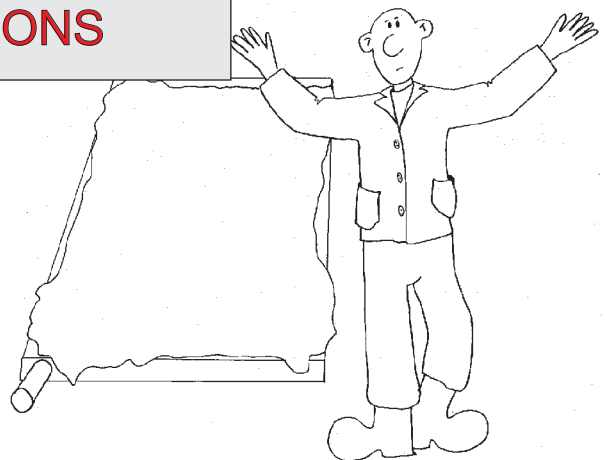
## SLUDGE LAGOONS



### WASTING SLUDGE TO THE LAGOONS

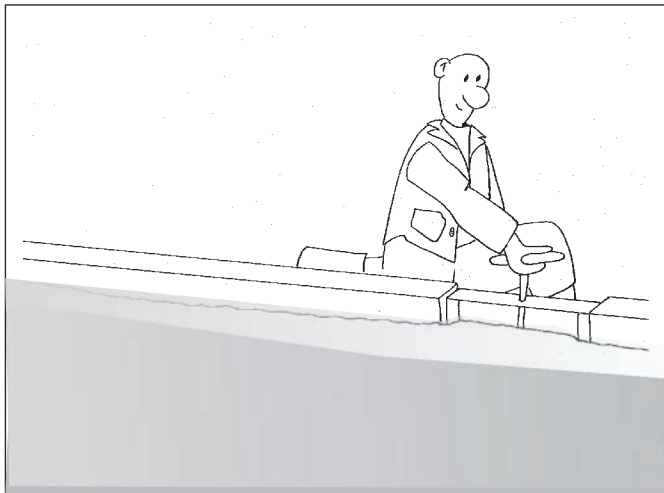


✓ The operator makes sure that the sludge is wasted into the correct lagoon and filled to the correct depth



✗ The operator makes sure that the sludge lagoons does not overflow when wasting sludge

# SLUDGE TREATMENT BEDS 8



The operator allows the sludge to settle and then the the top water is decanted and returned to the process

**When no more sludge can be wasted to the sludge lagoon, the operator takes it out of operation and allows the sludge to dry**

## DISPOSAL OF DRIED SLUDGE



The operator removes the dried sludge



The operator places the dried sludge in a specific place for disposal at the nearest landfill site

Notes.....

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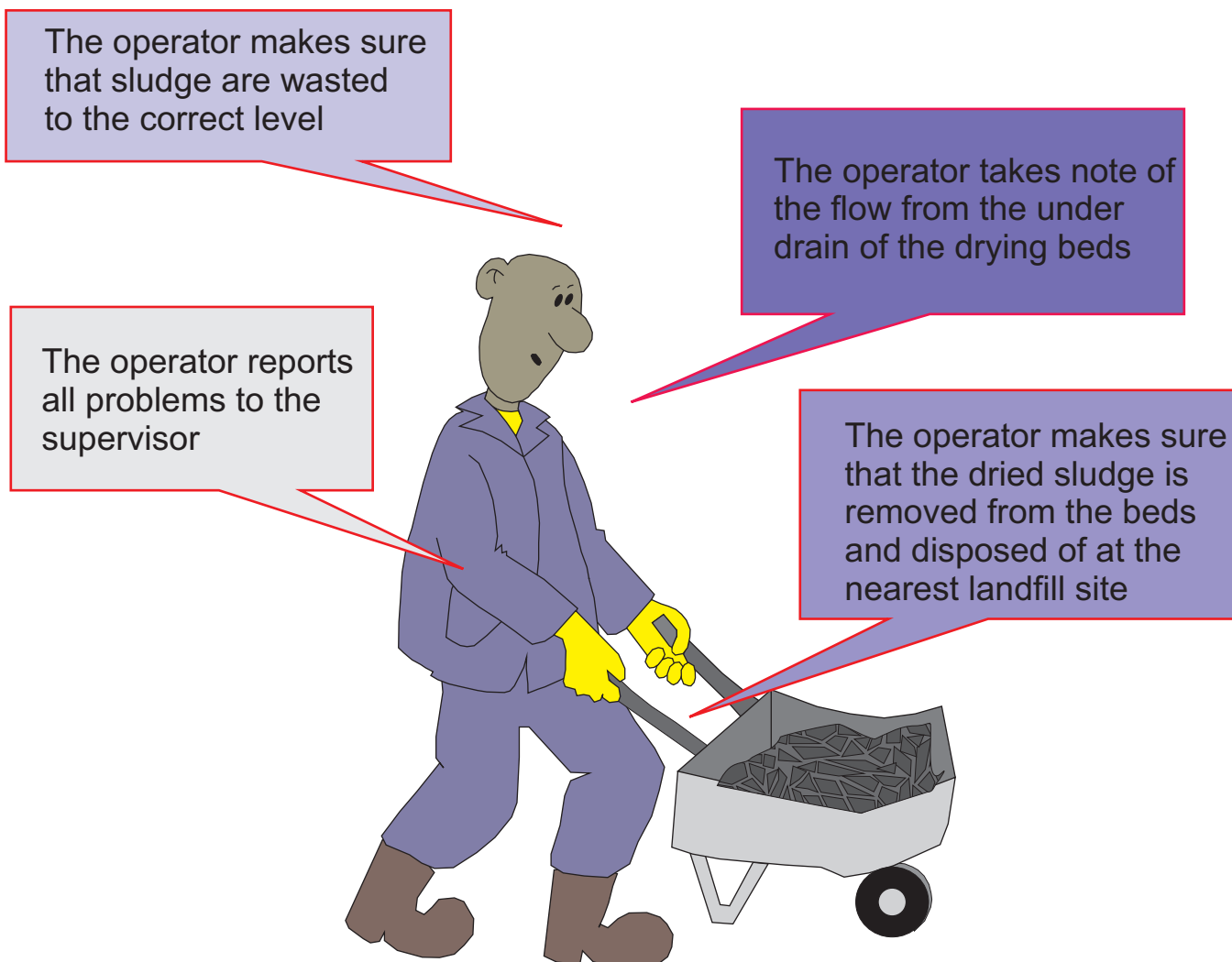
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.....

# SUMMARY





# STORAGE OF WATER 9



1. Reservoir

2. Reservoir with pressure tower



## STORAGE OF WATER 9

### TRANSLATIONS

English	Storage of water
Isizulu	Ugcino – ukuqokelela noma ukwandisa, isibonelo, okwamanzi
Isixhosa	Ukuqokelelwa okanye ukwanda mhlawumbi kwamanzi
Siswati	Lapho kugcinwa khona, njengemanti
Sesotho	Polokeho – pokeleho kapa khomamelletsa mmoho hoa, mohlala metsi
Setswana	Go kokoanngwa le go ntsifatsa (sekao: ga metsi)
Sepedi	Polokelo - go kgoboketšwa goba go kgobokanywa ga meetse
Ixitsonga	Ku hlengeletywa / ku hlayisa xikombiso mati
Venda	U kuvhanganya madi
Afrikaans	Stoor van water

### THE PURPOSE OF STORAGE

Storage of purified water is required to cater for variations in flow, emergencies, such as pipe bursts, power failures or for planned treatment plant shut-downs for maintenance. Allowance is usually made for between 1 to 2 days storage, depending on the reliability of the source and infra structure.

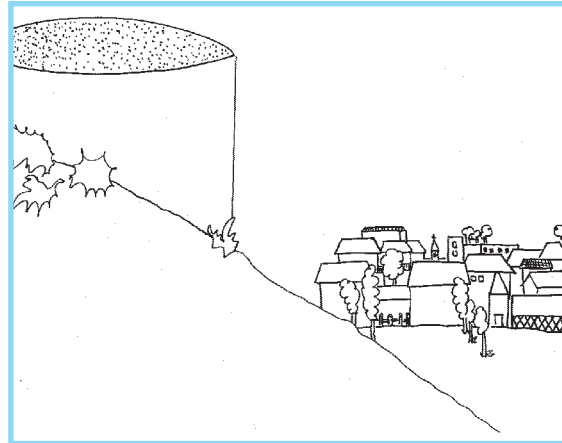
Reservoirs are usually situated in the highest area in order for the stored water to be fed through gravity at sufficient pressure to the area it serves. When the reservoir can not be placed high enough an additional elevated tank is provided.

\* See Glossary

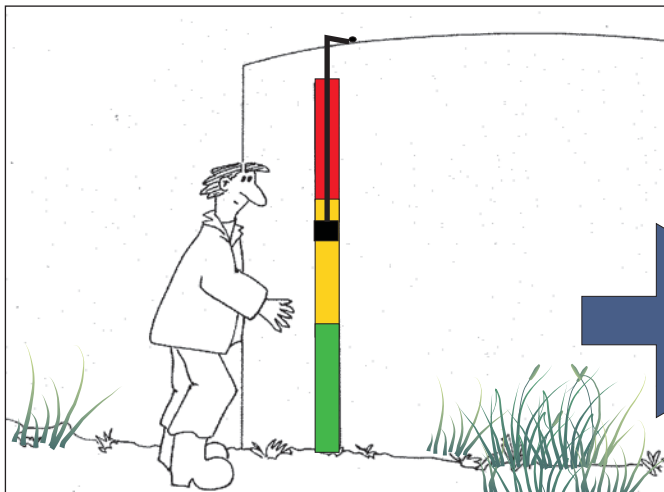
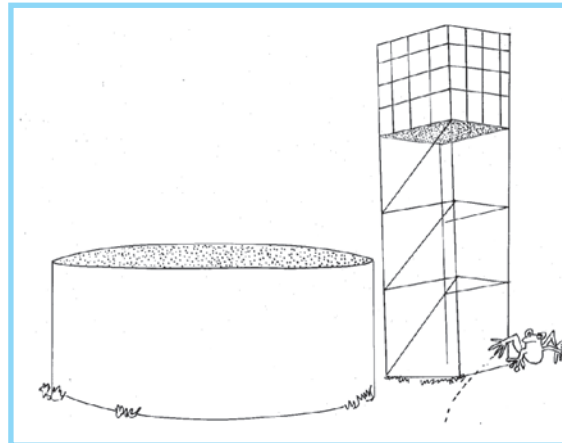
# STORAGE OF WATER 9

## THE STORAGE UNITS

RESERVOIR WITHOUT  
PRESSURE TOWER



RESERVOIR WITH  
PRESSURE TOWER

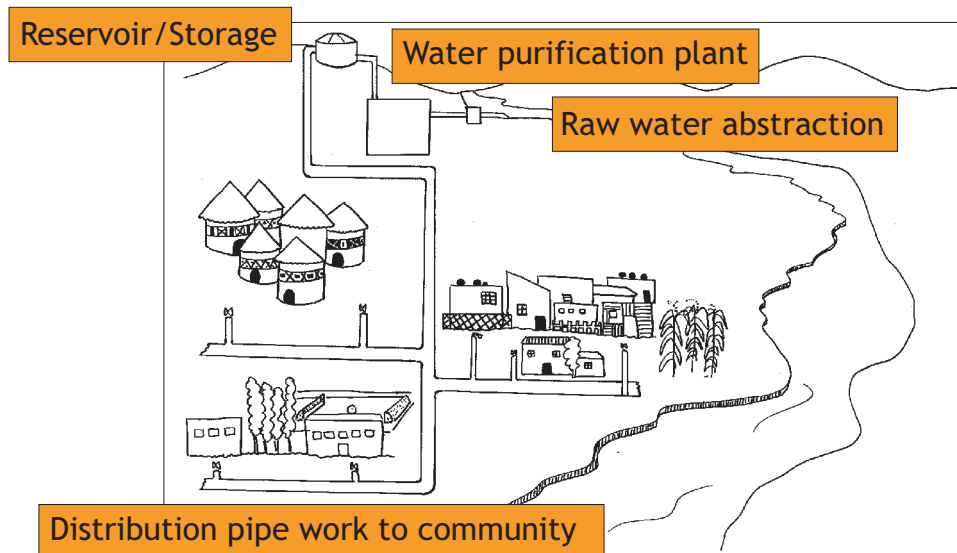


The operator checks to see if there is water in the reservoir



The operator reports any irregularities to the supervisor

# STORAGE OF WATER 9



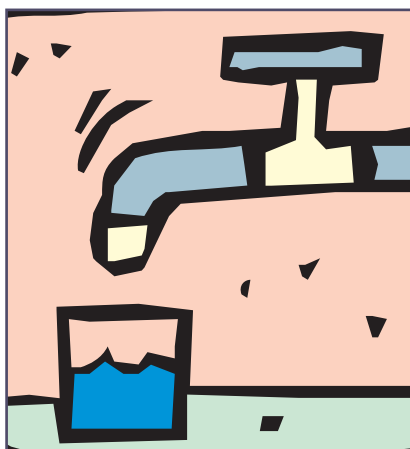
## SUMMARY

The operator makes sure that there is water in the reservoir

The operator reports all problems to the supervisor

The operator informs the supervisor if there are any leaks

# WATER QUALITY 10



## WATER QUALITY 10

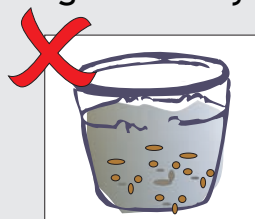
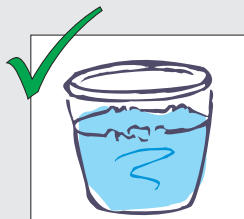
### TRANSLATIONS

English	Water quality
Isizulu	Ubunjalo bamanzi – isimilo samanzi ngokwezithako, ngokwesimo nangoke sayensi okubhekwa ngaso ukufameleka kwamanzi ukusetshenziselwa okuthize, njekokuphuza ngabant
isixhosa	Limpawu zamanzi apho amandla amanzi akho khona Ngenxa yeemeko ezithile ezifana nokuselwa kwamanzi ngabantu
Siswati	Ngitotonkhe timphawu temanti letenta kutsi abesezingeni okusetjentiswa njengasekunatseni bantfu
Sesotho	Metsi a boleng – mekhoa ea metsi e fapaneng, ekaba ka mokhoa oo a entsoeng kateng, ka mokhoa oo a kopantsoeng kateng kapa ka mokhoa oo a hloliloeng kateng moo ho phethahala ha metsi ana ho itshetlehileng bakeng sa mosebetsi oo itseng, joalo ka hore a nooe ke batho
Setswana	Bong jwa metse jwa khemikhale, go tobilwe tiriso ya metsi ao, sekao go ka nowa ke batho
Sepedi	Bomakgonthe bja meetse - mोग्वा woo meetse a tswakilwego, a bopegilego le ka moo a hlolegilego ka wona, woo go ka dumelwago gore meetse ao a ka šomišwa ke batho go nwa.
Venda	Vhudi ha madi ho se dzava dzi chemicals, zwithu zwa mupo zwine ngomu madini, zwine zwa ita uri madi a vhe o lugelwa u shumiswa kana unwiwa na a vhathu
Ixitsonga	Matengelo, rihanyu, vuhlayiseki lebyi hlawulekisaka mati ku kombisa konka wamati kuya hiku hlawula matirhiselo ya mati Kufana na kun'wiwa ka mati
Afrikaans	Watergehalte

### WATER QUALITY

Raw water needs to be purified in order to make water both aesthetically pleasing, and healthy to drink. Another aspect is to address corrosivity.

Even if water is healthy to drink, but is not clear, or has a taste or odour, consumers will view it as being unhealthy.



# WATER QUALITY 10

A complete analysis of the water cannot be carried out on a routine basis. Certain basic tests should however be carried out routinely and provide an adequate check of the quality. These routine checks should include the following:

- Turbidity
- Conductivity
- pH
- Residual chlorine

## TURBIDITY

Turbidity is a measure of the clarity of the water and an indicator of the suspended solids or particles in the water.

In accordance with SABS 241, the turbidity of the final or potable water must be below 1 turbidity units.

Operators should familiarise themselves with the turbidity levels of the raw water, clarified water, filtered water and final water. Increases in turbidity will be an indication that the flocculant dosage should be increased and a decrease in turbidity will again indicate that the flocculant dosage can be decreased.



## CONDUCTIVITY

Conductivity is an indication of the dissolved solids in water. The conductivity must be below 70 mS/m. The maximum allowable is 300 mS/m. Water with a conductivity above 70 mS/m will have a noticeable salty taste. Conductivity levels above 150 mS/m is an indication that corrosion can be expected.

Some dissolved solids will be removed in the coagulation process, but others will require advanced expensive processes that do not form part of conventional water treatment. The conductivity must however be known to check that good quality water is supplied to the community.

# WATER QUALITY 10

## pH

pH readings range from 1 to 14 with 7 being neutral. pH values below 7 are acid, and above 7 are alkaline. In accordance with SABS the pH of the treated water should range between 6,0 and 9,0, but is still acceptable if it ranges between 5,5 to 9,5. The treated water pH must always be compared with the raw water pH. As a general rule, the treated water pH must be 0,5 below the raw water pH. If the treated water pH is lower than this, it is an indication that the water can be corrosive, and if the pH is higher, it is an indication that the water can be scale forming.

If the pH is not in line with the recommendations corrective measures must be taken with the dosing of lime or soda ash to increase the pH, or acid to reduce the pH, as discussed in section 2.

## RESIDUAL CHLORINE

Chlorine is added to the water to disinfect and remove pathogenic organisms. A residual chlorine concentration is kept to ensure that the protection is maintained throughout the reticulation system.

The supervisor must determine the required level of the residual chlorine in the treated water leaving the plant by testing the residual chlorine concentration at various points in the network.

This value will be based on the requirement to ensure that the furthest point in the supply network still has a residual of between 0,05 to 0,1 mg/l. The free residual chlorine in the water leaving the plant should preferably be below 0,5 mg/l but should never exceed 1 mg/l.





## WATER QUALITY 10

# TARGET WATER QUALITY GUIDELINE RANGES

### TABLE 1 Physical, organoleptic and chemical requirements

DETERMINANTS	UNITS	CLASS 0 (Ideal)	CLASS 1 (acceptable)	CLASS 2 (max allowable)
<b>Physical and organoleptic requirements</b>				
Colour	mg/l Pt	<15	15 - 20	>20 - 50
Conductivity at 25°C	mS/m	<70	70 - 150	>150 - 370
Dissolved solids	mg/l	<450	450 - 1 000	>1 000 - 2 400
Odour	TON	<1	1 - 5	>5 - 10
pH value at 25°C	pH units	6,0 - 9,0	5,0 - 9,5	4,0 - 10,0
Taste	FTN	<1	1 - 5	>5 - 10
Turbidity	NTU	<0,1	0,1 - 1	>1 - 10
<b>Chemical requirements - macro-determinants</b>				
Ammonia as N	mg/l	<0,2	0,2 - 1,0	>1,0 - 2,0
Calcium as Ca	mg/l	<80	80 - 150	>150 - 300
Chloride as Cl	mg/l	<100	100 - 200	>200 - 600
Fluoride as F	mg/l	<0,7	0,7 - 1,0	>1,0 - 1,5
Magnesium as Mg	mg/l	<30	30 - 70	>70 - 100
(Nitrate and Nitrite) as N	mg/l	<6,0	6,0 - 10,0	>10,0 - 20,0
Potassium as K	mg/l	<25	25 - 50	>50 - 100
Sodium as Na	mg/l	<100	100 - 200	>200 - 400
Sulfate as So <sub>4</sub>	mg/l	<200	200 - 400	>400 - 600
Zinc as Zn	mg/l	<3,0	3,0 - 5,0	>5,0 - 10,0
<b>Chemical requirements - micro-determinants</b>				
Aluminium as Al	µg/l	<150	150 - 300	>300 - 500
Antimony as Sb	µg/l	<5	5 - 10	>10 - 50
Arsenic as As	µg/l	<10	10 - 50	>50 - 200
Cadmium as Cd	µg/l	<3	3 - 5	>5 - 10
Chromium as Cr	µg/l	<50	50 - 100	>100 - 500
Cobalt as Co	µg/l	<250	250 - 500	>500 - 1 000
Copper as Cu	µg/l	<500	500 - 1 000	>1 000 - 2 000
Cyanide (free CN <sup>-</sup> )	µg/l	<30	30 - 50	>50 - 70
Cyanide (recoverable as CN <sup>-</sup> )	µg/l	<70	70 - 200	>200 - 300
Iron as Fe	µg/l	<10	10 - 200	>200 - 2 000
Lead as Pb	µg/l	<10	10 - 50	>50 - 100
Manganese as Mn	µg/l	<50	50 - 100	>100 - 1 000
Mercury as Hg	µg/l	<1	1 - 2	>2 - 5
Nickel as Ni	µg/l	<50	50 - 150	>150 - 350
Selenium as Se	µg/l	<10	10 - 20	>20 - 50
Vanadium as V	µg/l	<100	100 - 200	>200 - 500
<b>Chemical requirements- organic determinants</b>				
Dissolved organic carbon as C	mg/l	<5	5 - 10	>10 - 20
Total trihalomethanes	µg/l	<100	100 - 200	>200 - 300
Phenols	µg/l	<5	5 - 10	>10 - 70

# WATER QUALITY 10

## TABLE 2 Microbiological requirements

1 DETERMINANTS	2 UNITS	3 ALLOWABLE COMPLIANCE CONTRIBUTION <sup>a</sup>		
		95% OF SAMPLES Min UPPER LIMITS	45% OF SAMPLES Max UPPER LIMITS	15% OF SAMPLES Max UPPER LIMITS
Heterotropic plate count	count/ml	100	1 000	10 000
Total coliform bacteria	count/100ml	Not detected	10	100
Faecal coliform bacteria <sup>b</sup>	count/100ml	Not detected	1	10
<i>E.coli</i> <sup>b</sup>	count/100ml	Not detected	Not detected	1
Somatic coliphages	count/100ml	Not detected	1	10
Enteric viruses	count/100ml	Not detected	1	10
Protozoan parasites ( <i>Giardia/Cryptosporidium</i> )	count/10ml	Not detected	Not detected	1

<sup>A</sup>The allowable compliance contribution shall be at least 95% to the limits indicated in column 3, with a maximum of 4% and 1%, to the limits indicated in columns 4 and 5. The objective of disinfection should, nevertheless, be to attain 100% compliance to the limits indicated in column 3

<sup>B</sup> In most instances it will not be necessary to conduct both these tests, one or the other will normally suffice as the required indicator

## GLOSSARIES

Glossary 1 English-Isizulu	96
Glossary 2 English-Isixhosa	101
Glossary 3 English-Setswati	105
Glossary 4 English-Sesotho	109
Glossary 5 English-Setswana	114
Glossary 6 English-Sepedi	118
Glossary 7 English-Venda	123
Glossary 8 English-Isitsonga	127
Glossary 9 English-Afrikaans	131

## GLOSSARY 1

## TRANSLATION: English – Isizulu

Abstraction – the withdrawal of water from natural or other water sources.

Ukundonsa – ukundonswa kwamanzi esuka emithonjeni yemuelo noma kweminye.

Aesthetically – relating to concepts of beauty and purity.

Ngobuthandabuhle – okugondene nemicabango ephathelene nobuhle nobumsulwa.

Agglomeration – to form or be formed into a mass or cluster.

Ukubuthelela – ukwakha noma ukuhlanganisa kube yisixuku noma is xukwana.

Aggression – pH unstable water resulting in the cement content in fibre cement or concrete pipes, or concrete structures being dissolved.

Ukugalwa – amanzi ane pH engazinzile agcina esegukethe usimende enxozeni kasimende noma ancibilikisa amapayipi nokunye okuginileyo.

Algae – microscopic plants that contain chlorophyll and live floating or suspended in water.

I-almi – izithombo ezinci kakhulu ezibonakala kuphela ngo ngomasikilophu ezintanta emanzini.

Alkali – various soluble salts, principally sodium, potassium, magnesium and calcium that have the property of combining with acids to form neutral salts.

i-Alikhali – umuthi oyinhlanganisela yehayidrojini ne-oksijini nokunye onamandla okubulala amandla e asidi ngokulumbana nalo.

Alkalinity – the capacity of water to neutralize acids. Alkalinity is a measure of how much acid can be added to a liquid without causing a big change in pH.

Ubu-alkhali – amandla amanzi okubulala ama asidi. Ubualkhalini bu yisilinganiso sokuthi ingakanani i asidi engafakwa oketshezini koolwa ingaphazamisi i pH yalolo ketshezi.

Backwash – the process of reversing the flow of water back through the filter media to remove entrapped solids.

Ibuya – indlela yokuphindisela emuva ukugeleza kwamanzi kusivovo (filter media) ukuze kususwe okubhajiwe okuqinile.

Bacteria – microscopic living organisms usually consisting of a single cell.

I-bhakthiriya – i oganizimu encane kakhulu evame ukuba neseli elilolodwa.

Bentonite – soft porous rock comprising mainly of clay mineral particles, with the property to expand in water as much as 30 times its own dry volume.

i-Bentonayithi – yidwala elinezimbotshana ezithambile elengiwe ngezixenyana zamaminerali obumba, elikwazi ukukhukhumala ngokuphindwe ka-30-emanzini ukwedlula nxa lingekho emanzini.

Calibration – a procedure which checks or adjusts an instrument's accuracy by comparison.

Ukulinganisa ubukhulu bembobo – indlelayenqubo eholisisa noma ilinganise ukulunga kwesikhali somsebenzi ngokugathanisa.

Chemical dosing – administering of chemicals, in this case to remove organisms and for disinfection.

Ithamo elilinganisiweyo lesithako – ukusetshenziswa kwesithako ukuze kususwe okuphilayo, nokusetshenziswa kwesithako njengomphungo.

Coagulant – a substance added to destabilise colloids that will cause particles to form flocs.

Into edala ukushuqungana – into efakwa ukuze iguqule ama khloyidi azo kwakha amaflokisi.

Contaminant – any physical, chemical, biological or radiological substance or matter that has an adverse effect on air, water or soil.

Into edungayo – ikhemisteli namo isithako esidunga yonakalise umoya, amanzi, noma umhlabathi.

Collide – to come together with an impact.

Ngqubuzana – ukushayisana noma ukungqubuzana ngamandla.

Colloids – very small, finely divided solids (particles that do not dissolve) that remain dispersed in a liquid for a long time due to their small size and electrical charge.

Amakhologyidi – izingxenywe eziqinile ezingancibiliki ezihlala isikhathi eside kokuluketshezi ngenxa yobuncane bazo.

Corrosion – chemical reaction between water and metal components resulting in dissolution (rusting) of the metal (or steel pipes).

Ukugevuzeka – ukulumbana kwezithako okwenzeka phakothi kwezinxenywe zensimbi namanzi okuyaye kube nomphumela wokugqwala ensimbini.

Corrosive – the corrosiveness of water is defined by the water's pH, alkalinity, hardness, temperature, total dissolved solids, dissolved oxygen concentration, and the Langelier Index.

Gevuzayo – ukugevuza kwamanzi kuchazwa nge pH yawo, nobu alkali bawo, noku ginakwawo, nezingalawo lokushisa, nokuncibilika kwe oksijini eqogeneyo, nokunye.

Detention time – the time during which an amount of water is retained in a tank at a given rate of flow.

Isikhathi sokubhajwa – isi khathi okugcinwe ngaso inani lamanzi ethangini egeleza ngesilinganiso esithize.

Dewater (sludge) – to dry sludge so that it can be handled and disposed off.

Ukomisa (udaka) – ukomisa udaka ukuze lubambeke lulahlwe.

Disinfection – a process to kill most microorganisms in water including all pathogenic (disease causing) bacteria.

Ukubulala imbewu yokufa – indlela yenqubo yokubulala okuphilayo okuncane kakhulu okungabonakal ngamehlo okuse manzini. Lokhu kubandakanya namabhakthiriya abanga izifo.

Dissolved (solids) – a measure of the amount of various inorganic salts dissolved in water. A high dissolved solid concentration in water can lead to a salty taste and/or corrosion of pipes.

Okuncibilikileyo (okuginile) – isilinganiso so sawoti abehlukene abangenampilo abancibilikiswe emanzini. Isilinganiso esiphakeme sokuqinileyo okuncibilikiswe emanzini kungaholela ekutheni amanzi anambitheke sasawoti noma kudleke amapayipi.

Dosage – the quantity of chemicals administered in a certain period.

Ithamo elilinganisiweyo – isilinganiso somuthi wokwelapha.

Electrical boards – electrical panels containing the switch gear for the various equipment.

Amabhodi kagesi – amapulungwe kagesi anamagiya oku lawula izisetshenziswa ezehlukeneyo.

Elevated tank – a storage tank for water, which is installed at a certain level above ground to provide pressure, for example to a water network.

Ithangi eliphakemeyo – ithangi lokugcina amanzi elibekwe phezulu ukuze livumele ukugeleza kwamanzi.

Filtration – a process for removing particulate matter from water by passage through porous filter media (sand, pebbles, coal).

Ukuhluzwa – indlela yenqubo yokususa okuthile emanzini ngokukuhluzwa ngehluzo (isihlabathi, amatshana, amalahle).

Flocculation – the binding together of fine particles in water by gentle mixing after the addition of coagulant chemicals to form larger flocs.

Ukubumbana kwezinxenyana ezincane emanzini ngemva kokuthi kufakwe isithako esishuqungayo dokhu kuhlanguka kwakha amaflokisi.

Flocs – clumps of bacteria and particulate impurities that have come together and formed a cluster.  
Amaflokisi – izihleke zebhakthiriya nezingxenyana ezingahlambulukile ezihlangene ndawonye zenza isixuku.

Hydraulic mixing – utilising the hydraulic energy of water flowing over or through static devices for mixing.

Ukuxuba ngamanzi – ukusebenzisa amandla amanzi agelezela kuzisetshenziswa ezimiyo lapho kuxutshwa.

Infrastructure – engineering services such as water supply facilities, sewerage, sewage disposal etc.

Inggalasizinda – izinkonzo noma imisebenzi yobunjiniyela yokuletha amanzi nokuhambisa indle noma amanyala.

Langelier Index – an index reflecting the equilibrium pH of water in relation to calcium and alkalinity.

Inkomba ye langeliya – inkomba ebonisa ukuzinza kahle kwamanzi malungana nekhalsiyamu ne alkali.

Mechanical mixing – the induction of energy into liquid for mixing by means of an external source such as a motor driven propeller.

Ukuxuba ngomshini – ukuxuba okuthile okuluketshezi kusetshenziswa umshini.

Media (filter media) – porous filter material normally comprising of graded sand, pebbles and coal.

Into yokuhluzo – yizinto ezakhe ihluzo elinezimbotshana, phakathi kwazo kukhona isihlabathi, amatshana kanye namalahle.

Monitoring – measuring concentrations of substances to determine the effectiveness of the water purification processes.

Ukuqaphela – ukulinganisa ukuqoqana kweziqa ezisemanzini ukuze kubonakale impumelelo ekuhlanzweni kwamanzi okuqhubekayo.

Organisms – any form of animal or plant life.

Okuphilayo – yinoma yisiphi isimo sokuphilayo, isitshalo noma isilwane.

Particles – a tiny portion, for example, of sand.

Amahlayihlayi – ingxenyana encane, isibonelo eyesihlabathi.

Pathogenic – organisms, including bacteria and viruses, capable of causing diseases.

Okunokubanga izifo – okuphilayo okukwazi ukudala izifo, phakathi kwakho kunga balwa amabhakthiriya kanye namagciwane.

Pathogens – micro organisms that can cause disease in other organisms, humans, animals and plants. Pathogens include bacteria, viruses, and parasites, and are often found in sewage.

Okudala izifo – okuphilayo okuncane, okungabonakali ngamehlo okudala izifo ku bantu, ezilwaneni kanye nasezithombeni. Lezizidalazifo zibandakanya amabhakthiriya, amagcinwane kanye nama pharasayidi futhi zivame emanyaleni.

pH – the intensity of the alkalinity or acidity condition of a substance. The pH may range from 0 to 14, where 0 is most acid, and 14 most alkaline, and a pH of 7 is neutral.

pH – amandla e alkali noma e asidi entweni. I pH ingasuka ku 0-14. Uma iku-0 iyi asidi kakhulu, uma iku-14, iyi alkali kakhulu. Uma iku 7 i phakathi nendawo.

Pollution – generally the presence of matter that produces undesired environmental effects.

Ukungcolisa – ngokwejwayelekile ubukhona bokuthile okukhiqiza imiphumela engathandeki endaweni.

Polymers – a chemical formed by combining monomers and used with other chemical coagulants to aid in binding small suspended particles to larger chemical flocs for their removal from water.

Izithako ezihlangene – Isithako esakhiwe ngokuhlanganisa izingxenye ezingazodwana kanye nezinye izithako ezidala ukushuqungana ukuze zincele ukuhlanganisa izingxenye ezintantayo ukuze zisuswe emanzini.

Potable (water) – water that is safe and satisfactory for drinking and cooking.

Amanzi apathekayo – amanzi aphephile nalungele ukuphuza nokupheka.

Precipitation – pH unstable water resulting in calcium or iron minerals being deposited on the walls of pipes, which could result in blockages.

Ukuzikiswa – amanzi ane pH engazinzile okwenza ukuthi amaminerali ayiayoni nekhalsigamu abekelwe emithangaleni yamayipu, okwenza ukuthi amapayipu agcine esevalekile.

Propeller – a rotating component in a pump designed to pump or lift water.

Iphini eliphephezelayo – ingxenye ejikelezayo empompini eyenzelwe ukumpompa noma ukuphakamis amanzi.

Pump station – structure housing pumps, which are generally used to pump water to higher levels.

Isiteshi sokumpompa – isakhiwo esigcine ompompi abasetshenziselwa ukumpompa amanzi aye ezindaweni eziphakemeyo.

Quality – the value of usefulness of water, determined by the combined effects of its physical attributes and its chemical constituents.

Ubunjani – ubungako bokusetshenziswa kwamanzi okuphawulwe ngemiphumela ehlangene yemvelo neyezithako ezingamalunga.

Reservoir – any natural or artificial basin for collecting and holding a supply of water.

Ithange eliyichibi – yisigodi noma ubheseni wemvelo noma owenziwe ogcigcina uphinde ulethe amanzi.

Residual (chlorine) – the amount of free and/or available chlorine remaining in water after a specific contact time.

Insalela (klorini) – isilinganiso seklorini ekhululekileyo netholakala emanzini ngemva kwesikhathi ezithize sokuthintana.

Sedimentation – process in which solid particles settle out or sink from the water being treated.

Ukuzikisa – yinquba lapho izingxenye eziqinileyo zizenza noma zicwile emanzini elashwayo.

Sink – the settling of particles where they can accumulate and be removed.

Ukucwila – ukuzinza kwezingxenyana lapho zikwazi ukwanda khona bese zisuswa.

Stabilisation – adjusting the pH of water in order to minimise the effects of corrosion, aggression or precipitation.

Ukuqiniswa – ukulungisa i pH yamanzi ukuze kuncishiswe imiphumela yokugevuzeka.

Storage – the collection or accumulation, for example, of water.

Ugcino – ukuqokelela noma ukwandisa, isibonelo, okwamanzi.

Suspended (solids) – solids that either float on the surface or are suspended in water or other liquids, and which are largely removable by filtering.

Okumisiwe (okuqinile) – okuqinileyo okuntanta ngaphandle noma okumiswe emanzini noma kolunye uketshezi okusuka kakhulu ngokuhluzwa.



Turbidity – the cloudy appearance of water caused by the presence of suspended and colloidal matter.

Ukudungeka – ukubukeke okufiphazekile kwamanzi ngenxa yobukhona bezinto ezimisiwe kuwo.

Virus – the smallest form of micro organisms capable of causing disease.

Igciwane – isimo sokuphilayo okuncane kakhulu okukwazi ukudala izifo. Ubunjalo bamanzi.

Water quality – the chemical, physical and biological characteristics of water on which the fitness of the water is based for a specific use, such as drinking water for humans.

Ubunjalo bamanzi – isimilo samanzi ngokwezithako, ngokwesimo nangoke sayensi okubhekwa ngaso ukufameleka kwamanzi ukusetshenziselwa okuthize, njekukuphuza ngabant.

## GLOSSARY 2

## TRANSLATION: English – Isixhosa

Abstraction – the withdrawal of water from natural or other water sources.

Ukususa – ukuhlehliswa kwamanzi kwindawo yawo esisigxina okanye kwezinye iindawo ezinolwelo.

Aesthetically – relating to concepts of beauty and purity.

Ubuhle – inxulumene nobuhle kwa nococeko.

Agglomeration – to form or be formed into a mass or cluster.

Uqokelelo – ukuqokeleleka kwezinto zenze imbumba enkulu.

Aggression – pH unstable water resulting in the cement content in fibre cement or concrete pipes, or concrete structures being dissolved.

Ukulwa -

Algae – microscopic plants that contain chlorophyll and live floating or suspended in water.

Ubulembu - Izityalo ezincinane ezingabonakaliyo ngeliso lenyama ezikhula ngaphantsi kwamanzi ezinebala eliluhlaza.

Alkali – various soluble salts, principally sodium, potassium, magnesium and calcium that have the property of combining with acids to form neutral salts.

Iindidi zetyuwa ezinyibilikayo nezikwaziyo nokuba xa zidityaniswe ne Asidi zenze ityiwa engakheti cala.

Alkalinity – the capacity of water to neutralize acids. Alkalinity is a measure of how much acid can be added to a liquid without causing a big change in pH.

Ubungakanani bamanzi okuxuba iAsidi. Obu bungakanani bamanzi benza umlinganiselo wokuba ingakanani iAsidi engadityaniswa namanzi ngaphandle kokwenza utshintsho olukhulu.

Backwash – the process of reversing the flow of water back through the filter media to remove entrapped solids.

Ukubuyiselwa emva kwamanzi ukewenzela ukususa uhlalutya olubambekileyo ngesihluzo.

Bacteria – microscopic living organisms usually consisting of a single cell.

Yintsholongwane ezingabonakaliyo ngeliso lenyama, idla ngokuba neSeli enye kuphela.

Bentonite – soft porous rock comprising mainly of clay mineral particles, with the property to expand in water as much as 30 times its own dry volume.

Lilitye elithambileyo elivumela amanzi ukuba angene, lineentwana-ntwana zodaka. Liyakwazi ukwanda emanzini kangangamaxesha alishumi elinesithathu.

Calibration – a procedure which checks or adjusts an instrument's accuracy by comparison.

Indlela yokujonga okanye yokunciphisa ubunyani bento ngokufanisa.

Chemical dosing – administering of chemicals, in this case to remove organisms and for disinfection.

Ukuhoya iikhemikhals ekususeni izinto eziphilayo nasekuoceni.

Coagulant – a substance added to destabilise colloids that will cause particles to form flocs.

Into edityanisiweyo eyenzela ukuthuthisa izinto ezincamathelelayo ezingenza ingqokelela yoboya.

Contaminant – any physical, chemical, biological or radiological substance or matter that has an adverse effect on air, water or soil.

Yiyo nayiphi na into ebalulekileyo enokonakalisa umoya, amazi nomhlaba.

Collide – to come together with an impact.  
Ukutshayisana kwezinto ngamandla.

Colloids – very small, finely divided solids (particles that do not dissolve) that remain dispersed in a liquid for a long time due to their small size and electrical charge.  
Amatyana ampuluswa amancinane ahlala ahlukene kulwelo ixesha elide ngenxa yobuncinane bawo nangenxa yombane anawo.

Corrosion – chemical reaction between water and metal components resulting in dissolution (rusting) of the metal (or steel pipes).  
Yimbonakalo yeekhemikhals ephakathi kwamanzi nezinto ezenziwe ngesinyithi eyenza ukuba isinyithi sibe nomhlwa.

Corrosive – the corrosiveness of water is defined by the water's pH, alkalinity, hardness, temperature, total dissolved solids, dissolved oxygen concentration, and the Langelier Index.

Detention time – the time during which an amount of water is retained in a tank at a given rate of flow.  
Lixesha apho umlinganiselo wamanzi ugcinwa etankini uze uphalale ngokomlinganiselo obekiweyo.

Dewater (sludge) – to dry sludge so that it can be handled and disposed off.  
Udaka olomileyo oluye lulahlwe.

Disinfection – a process to kill most microorganisms in water including all pathogenic (disease causing) bacteria.  
Yindlela yokubulala ezinye zeentsholonwane ezingabonakaliyo emanzini kunye nezinye nje iintsholongwane.

Dissolved (solids) – a measure of the amount of various inorganic salts dissolved in water. A high dissolved solid concentration in water can lead to a salty taste and/or corrosion of pipes.  
Umlinganiselo weentlobo-ntlobo zetyuwa ezithi zinyibilikiswe emanzini. Umlinganiselo omkhulu wezityiwa uye wenze ukuba amanzi abe nencasa ebutyuwarha, okanye enze imibhobho ibe nomhlwa.

Dosage – the quantity of chemicals administered in a certain period.  
Ngumlinganiselo weekhemikhals ezisetyenziswayo ngexesha elithile.

Electrical boards – electrical panels containing the switch gear for the various equipment.  
Ziibhodi zombane ezineentlobo-ntlobo zeegiyeri zeendidi zeentsimbi zokusebenza umbane.

Elevated tank – a storage tank for water, which is installed at a certain level above ground to provide pressure, for example to a water network.  
Litanki likugcina amanzi elibekwe kwinqanaba elithile phezu komhlaba ukunika uxinzelelo lomoya nobushushu.

Filtration – a process for removing particulate matter from water by passage through porous filter media (sand, pebbles, coal).  
Indlela yokususa uhlalutya, isanti okanye amalahlwe usebenzisa isihluzo.

Flocculation – the binding together of fine particles in water by gentle mixing after the addition of coagulant chemicals to form larger flocs.  
Ukubotshwa kunye kwezinto ezincinci emanxini ngokuzixuba ngobunono emva kokudibana kweCoagulant ezenza ingqokelela yoboya enkulu.

Flocs – clumps of bacteria and particulate impurities that have come together and formed a cluster.

Yingqokelela yoboya eyenziwa zizinto ezincinci ezincamatheleneyo.

Hydraulic mixing – utilising the hydraulic energy of water flowing over or through static devices for mixing.

Kukusetyenziswa kwamandla amanzi aqukuqela phezu okanye phakathi kweendlela zobunzima bokuxuba.

Infrastructure – engineering services such as water supply facilities, sewerage, sewage disposal etc.

Izinto ezisetyenziselwa ukulungisa ezifana nezinto zokwenza amanzi nokuhlwa kwelindle.

Langelier Index – an index reflecting the equilibrium pH of water in relation to calcium and alkalinity.

Isikhombise esibonakalisa umqolo wamanzi malunga nesinyithi nobungakanani bamanzi okuxuba.

Mechanical mixing – the induction of energy into liquid for mixing by means of an external source such as a motor driven propeller.

Ukwaziswa kwamandla kulwelo ukwenzela ukuxuba ngendlela yemvelaphi engaphandle efana nesithuthi esiya phaphimbili.

Media (filter media) – porous filter material normally comprising of graded sand, pebbles and coal. Sisihluzo esenziwe ngesanti, uhlalutya namalahle.

Monitoring – measuring concentrations of substances to determine the effectiveness of the water purification processes.

Umlinganiselo wezinto ezijonga ukusebenza kwamanzi.

Organisms – any form of animal or plant life.

Naluphi na uhlobo lobomi lwezilwanyana nabantu.

Particles – a tiny portion, for example, of sand.

Izinto ezincinci kakhulu ezifana nesanti.

Pathogenic – organisms, including bacteria and viruses, capable of causing diseases.

Naluphi na uhlobo lobomi lwezilwanyana nabantu kunye neentsholongwane ezingenza isigulo.

Pathogens – micro organisms that can cause disease in other organisms, humans, animals and plants. Pathogens include bacteria, viruses, and parasites, and are often found in sewage.

Iintlobo zezinto ezincinci kakhulu ezingenza isigulo kwezinye izilwanyana, izityalo nabantu. Ziquka iintsholongwane nezinambuzane ezifunxa igazi, ikakhulu zifumaneka kwilindlae.

pH – the intensity of the alkalinity or acidity condition of a substance. The pH may range from 0 to 14, where 0 is most acid, and 14 most alkaline, and a pH of 7 is neutral.

Pollution – generally the presence of matter that produces undesired environmental effects.

Ukubakho kwezinto ezimdaka ezenza ukungcola kwindawo ehlala abantu.

Polymers – a chemical formed by combining monomers and used with other chemical coagulants to aid in binding small suspended particles to larger chemical flocs for their removal from water.

Potable (water) – water that is safe and satisfactory for drinking and cooking.

Amanzi acocekileyo nanelisayo okusela nokupheka.

Precipitation – pH unstable water resulting in calcium or iron minerals being deposited on the walls of pipes, which could result in blockages.

Amanzi angenasigxina adala izakhamzimba ukuba zisiwe kwiindonga zeempompo, nto leyo engadala ukuvingceka kweempompo.

Propeller – a rotating component in a pump designed to pump or lift water.

Umashini ojikelezayo kwimpompo ewenzelwa ukumpompa okanye ukuphakanyiswa kwamanzi.

Pump station – structure housing pumps, which are generally used to pump water to higher levels. Zizindlu ezineempompo ezisetyenziselwa ukumpompela amanzi neekhemikhals ezikhethiweyo.

Quality – the value of usefulness of water, determined by the combined effects of its physical attributes and its chemical constituents.

Reservoir – any natural or artificial basin for collecting and holding a supply of water.

Isitya sendalo okanye esenziweyo sokuqokelela amanzi abe ndawoninye.

Residual (chlorine) – the amount of free and/or available chlorine remaining in water after a specific contact time.

Ubungakanani okanye ubukho berhasi enevumba elitsarhayo eshiyekileyo emanzini emva kwexesha elithile.

Sedimentation – process in which solid particles settle out or sink from the water being treated.

Indlela apho uhlatutya luthi luphume okanye lutshone emanzini alungisiweyo.

Sink – the settling of particles where they can accumulate and be removed.

Ukutshona kwezinto ezincinane apho zingathi zikhule ze zisuswe.

Stabilisation – adjusting the pH of water in order to minimise the effects of corrosion, aggression or precipitation.

Ukunciphiswa kwerhasi yamanzi ukwenzela ukunciphisa iCorrosion, aggression okanye iPrecipitation.

Storage – the collection or accumulation, for example, of water.

Ukuqokelelwa okanye ukwanda mhlawumbi kwamanzi.

Suspended (solids) – solids that either float on the surface or are suspended in water or other liquids, and which are largely removable by filtering.

Uhlatutya oluthi ludade emanzini oluthi luhluzwe ngesihluzo.

Turbidity – the cloudy appearance of water caused by the presence of suspended and colloidal matter.

Umophu wamanzi owenziwa bubukho bokuxhonywa okanye ukuncamathela kwento.

Virus – the smallest form of micro organisms capable of causing disease.

Iintsholongwane ezincinci ezinakho ukudala isigulo.

Water quality – the chemical, physical and biological characteristics of water on which the fitness of the water is based for a specific use, such as drinking water for humans.

Limpawu zamanzi apho amandla amanzi akho khona ngenxa yeemeko ezithile ezifana nokuselwa kwamanzi ngabantu.

## GLOSSARY 3

## TRANSLATION: English – Siswati

Abstraction – the withdrawal of water from natural or other water sources.  
Kudvoswa kwemanti etindzaweni temvelo.

Aesthetically – relating to concepts of beauty and purity.  
Lokuhambisana nebuhle nekuhloba.

Agglomeration – to form or be formed into a mass or cluster.  
Lokwakhiwe kwahlangana.

Aggression – pH unstable water resulting in the cement content in fibre cement or concrete pipes, or concrete structures being dissolved.  
Kuncibilika kwa semaphayiphini lakhiwe ngasemende uma ahlangana nemantini.

Algae – microscopic plants that contain chlorophyll and live floating or suspended in water.  
Tihlahla litincane kakhulu letine chlorophyll tiphindze tiphile ngekundanda emantini.

Alkali – various soluble salts, principally sodium, potassium, magnesium and calcium that have the property of combining with acids to form neutral salts.  
Butswayi lobuncibilikako, njenge sodium, potassium, magnesium ne calcium labakhona kubhicana nema acids kwakheke botswayi labasemkhatsini.

Alkalinity – the capacity of water to neutralize acids. Alkalinity is a measure of how much acid can be added to a liquid without causing a big change in pH.  
Emandla emanti eku neutralize ema acids.

Backwash – the process of reversing the flow of water back through the filter media to remove entrapped solids.  
Yindlela yeku buyisela emuva kuhamba kwemanti kutsi aphume ku filter media kuto susa tinfo letibambekile.

Bacteria – microscopic living organisms usually consisting of a single cell.  
Tinfo letiphilako letincane kakhulu letivame kuba ne cell yinye.

Bentonite – soft porous rock comprising mainly of clay mineral particles, with the property to expand in water as much as 30 times its own dry volume.  
Libumba lolutsambile mawulifake emantini luyakhukhumuka.

Calibration – a procedure which checks or adjusts an instrument's accuracy by comparison.

Chemical dosing – administering of chemicals, in this case to remove organisms and for disinfection.  
Kutsatsa umutsi wentele kususa ema organisms ne disinfection.

Coagulant – a substance added to destabilise colloids that will cause particles to form flocs.  
Intfo lefakelwa ku destabilize ema colloids letakwenta ema particles kutsi akhe ema flocs.

Contaminant – any physical, chemical, biological or radiological substance or matter that has an adverse effect on air, water or soil.  
Nobe ngabe yini lokutongcolisa umoya, emanti noma umhlabatsi.

Collide – to come together with an impact.  
Kushayisana kamatima.

Colloids – very small, finely divided solids (particles that do not dissolve) that remain dispersed in a liquid for a long time due to their small size and electrical charge.  
Tintfo leticane letisala tihlakatekile kuliquid sikhatsi lesidze tentiwe kutsi tincane ne electrical charge.

Corrosion – chemical reaction between water and metal components resulting in dissolution (rusting) of the metal (or steel pipes).  
Kuhlangana kwemanti nema metal components lekugcina kwente idissolution etinsimbini.

Corrosive – the corrosiveness of water is defined by the water's pH, alkalinity, hardness, temperature, total dissolved solids, dissolved oxygen concentration, and the Langelier Index.

Detention time – the time during which an amount of water is retained in a tank at a given rate of flow.  
Sikhatsi lapho linani letisite lemanti leligciniwe ethangeni liphuma ngendlela lanikwete wona.

Dewater (sludge) – to dry sludge so that it can be handled and disposed off.  
Komisa sludge kwentelwe kutsi sitokhona kuphatskeka siphindze silahlwe.

Disinfection – a process to kill most microorganisms in water including all pathogenic (disease causing) bacteria.  
Yindlela yekubulala tilwane letingcane kakhulu letihlala emantini lekufaka ekhatsi emagciwane.

Dissolved (solids) – a measure of the amount of various inorganic salts dissolved in water. A high dissolved solid concentration in water can lead to a salty taste and/or corrosion of pipes.

Dosage – the quantity of chemicals administered in a certain period.  
Bunengi bemutsi lobusetjentsiwe sikhatsi lesitsite.

Electrical boards – electrical panels containing the switch gear for the various equipment.  
Emabhokisi agezi lalumeke khona imishini noma emathulusi agezi.

Elevated tank – a storage tank for water, which is installed at a certain level above ground to provide pressure, for example to a water network.  
Lithange lekugcina emanti, lelifakwa libengetulu kwemhlabatsi kwentelwe ipressure, sibonelo kungaba iwater network.

Filtration – a process for removing particulate matter from water by passage through porous filter media (sand, pebbles, coal).  
Yindlela yekususa iparticulate matter emantini ngekutsi kwengce entfweni lesisefo.

Flocculation – the binding together of fine particles in water by gentle mixing after the addition of coagulant chemicals to form larger flocs.  
Kunamatselana kwema particles emantini ngekutsi kuhlanganiswe emva kwekufakwa kwema coagulant chemicals kutsi kwakhe ema flocs.

Flocs – clumps of bacteria and particulate impurities that have come together and formed a cluster.  
Tincunjana temagciwane nekungcola lokubuya ndzawonye labese akha emacluster.

Hydraulic mixing – utilising the hydraulic energy of water flowing over or through static devices for mixing.  
Kusebentisa ihydraulic energy yemanti lahambako.

Infrastructure – engineering services such as water supply facilities, sewerage, sewage disposal etc.  
Emaphayiphi laletsa emanti lahlobile nalahambisa lokungcolile etindlini nasemadolobheni.



Langelier Index – an index reflecting the equilibrium pH of water in relation to calcium and alkalinity.  
I index lekhombisa kulingana kwe pH yemanti macondzana ne calcium ne alkalinity.

Mechanical mixing – the induction of energy into liquid for mixing by means of an external source such as a motor driven propeller.

Kuhlanganisa ngemshini wagezi kwemanti nalokunye.

Media (filter media) – porous filter material normally comprising of graded sand, pebbles and coal.

Monitoring – measuring concentrations of substances to determine the effectiveness of the water purification processes.

Kuhlolwa kuhloba kwemanti.

Organisms – any form of animal or plant life.

Tilwane netihlahla ngoba ngabe ngutiphi.

Particles – a tiny portion, for example, of sand.

Sihlabatsi lesincane.

Pathogenic – organisms, including bacteria and viruses, capable of causing diseases.

Ema organisms lafaka ekhatsi emagciwane lakhona kubanga tifo.

Pathogens – micro organisms that can cause disease in other organisms, humans, animals and plants. Pathogens include bacteria, viruses, and parasites, and are often found in sewage.

Tinfo letiphilako letigcane kakhulu letingabanga tifo kuletinye tinfo letiphilako njengasebantfwini, etilwaneni nasetihlahleni. Pathogens afaka ekhatsi ibacteria, viruses nemaparasites.

pH – the intensity of the alkalinity or acidity condition of a substance. The pH may range from 0 to 14, where 0 is most acid, and 14 most alkaline, and a pH of 7 is neutral.

Simo sekuba iacid noma ialkaline emantini. Lesimo siyashiyana kusukela ku 0 kute kufike ku 14. 0 usho buacid lobukhulu, 14 usho simo se alkaline lesikhulu.

Pollution – generally the presence of matter that produces undesired environmental effects.

Tinfo letitfolakalako letingcolisa indzawo.

Polymers – a chemical formed by combining monomers and used with other chemical coagulants to aid in binding small suspended particles to larger chemical flocs for their removal from water.

Ichemical leyakheka ngekuhlanganisa ema monomers iphindze isetjentiswe nalamanye emachemical coagulants kusita emaparticles lamancane lahlukene kutsi anamatselane ache ema chemical flocs lamakhulu.

Potable (water) – water that is safe and satisfactory for drinking and cooking.

Ngemanti lahlobile ngalokunetisako, lalungela kunatfwa nekutsi kuphekwe ngawo.

Precipitation – pH unstable water resulting in calcium or iron minerals being deposited on the walls of pipes, which could result in blockages.

Kuvaleka kwemaphayiphi emanti ngecaye tidzidzi letiphuma kulamanti.

Propeller – a rotating component in a pump designed to pump or lift water.

Yincenye ye pump legucukako leyakhelwe kufuca noma kuphakamisa emanti.

Pump station – structure housing pumps, which are generally used to pump water to higher levels.

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Quality – the value of usefulness of water, determined by the combined effects of its physical attributes and its chemical constituents.

Kuhloba kwemanti awuhlola tidzidzi letibekhatsi kwalamanti nekuba ne acid noma ialkaline.

Reservoir – any natural or artificial basin for collecting and holding a supply of water.  
Lidamu lemvelo noma lelakhiwe lekugcina emanti ekuwasebentiseni noma kuphi.

Residual (chlorine) – the amount of free and/or available chlorine remaining in water after a specific contact time.

Ichlorine lesal ingaka sebenti emantini emuva kwesikhatsi lesitsite.

Sedimentation – process in which solid particles settle out or sink from the water being treated.  
Indlela lesetjentiswako lapho ema solid particles ashona phansi emantini lahlobiswako.

Sink – the settling of particles where they can accumulate and be removed.  
Kushona phansi kwema particles lapho abayincwaba khona bese ayasuswa.

Stabilisation – adjusting the pH of water in order to minimise the effects of corrosion, aggression or precipitation.

Kulungisa iph yemanti khona kutoncipha umbangela we corrosion, aggression noma iprecipitation.

Storage – the collection or accumulation, for example, of water.  
Lapho kugcinwa khona, njengemanti.

Suspended (solids) – solids that either float on the surface or are suspended in water or other liquids, and which are largely removable by filtering.  
Emasolids landandako emantini phindze futsi akhishwa ngekutsi kwentiwe ifiltering.

Turbidity – the cloudy appearance of water caused by the presence of suspended and colloidal matter.

Kudvungeka kwemanti.

Virus – the smallest form of micro organisms capable of causing disease.  
Tilwanyana letincane kunatotonkhe longeke ute utibone ngemehlo kuphela letikhona kubangatifo.

Water quality – the chemical, physical and biological characteristics of water on which the fitness of the water is based for a specific use, such as drinking water for humans.

Ngitotonkhe timphawu temanti letenta kutsi abesezingeni okusetjentiswa njengasekunatseni bantfu.

## GLOSSARY 4

## TRANSLATION: English – Sesotho

Abstraction – the withdrawal of water from natural or other water sources.

Tlhotlo – ho tlhotla metsi lihloliloeng kapa metsing a mang.

Aesthetically – relating to concepts of beauty and purity.

Bohloeki – ho amangoa le botle le ho hloeka.

Agglomeration – to form or be formed into a mass or cluster.

Khomahanyo – ho bopa.

Aggression – pH unstable water resulting in the cement content in fibre cement or concrete pipes, or concrete structures being dissolved.

Bohale – pH mo metsi a a saiketlang a a etsang go bane le deteng tsa samente ka gare ga di peipi tsa setena kgotsa moago was setena wo o thubjang.

Algae – microscopic plants that contain chlorophyll and live floating or suspended in water.

Bohloa – limela tse sa bonahaleng tse nang le botala tse lulang li phaphametse ka metsing.

Alkali – various soluble salts, principally sodium, potassium, magnesium and calcium that have the property of combining with acids to form neutral salts.

Tse halabolloang ka tse bolila – linoko tse kang letsoai, manganese le calcium tse nang le matla a ho kopana le tse bolila ho etsa matsoai a hlabollotsoeng.

Alkalinity – the capacity of water to neutralize acids. Alkalinity is a measure of how much acid can be added to a liquid without causing a big change in pH.

Hlabolloso ka tse bolila – matla a metsi ho hlabolla tse bolila. Hlabolloso ka tse bolila ke mmetho o tshoaeang hore na me acid e kae e ka tsheloang lerong ntle le ho etsa pphapang e kholo ho pH.

Backwash – the process of reversing the flow of water back through the filter media to remove entrapped solids.

Tlhatso-morao – tshebetso ea ho khutlisetsa ho matha ha metsi ka sefe, ho ntsha matsoai.

Bacteria – microscopic living organisms usually consisting of a single cell.

Kokoana-hloko – lihloluo tse sa bonahaleng hangata li na le karoloana e le noe feela ea bophelo.

Bentonite – soft porous rock comprising mainly of clay mineral particles, with the property to expand in water as much as 30 times its own dry volume.

Letsopa – ke lefika le bonolo le likoti le kentseng haholo mafeforetsane a letsopa, le nang le matla a ho kokomoha ka makhetlo a mashome a mararo ho feta ke mokhoa oo le leng kateng ha le omme.

Calibration – a procedure which checks or adjusts an instrument's accuracy by comparison.

Bophara – mokhoa oa ho hlahloba le ho lokisa hore sesebelisuoa se nepahale ka ho bapisa

Chemical dosing – administering of chemicals, in this case to remove organisms and for disinfection.

Litlhare tse tsheloang – ho kenya meriana, tabeng eena ho tlosa lihloliloeng le likokoana hloko tse ka ntshang maloetse.

Coagulant – a substance added to destabilise colloids that will cause particles to form flocs.

Sekhomameliso – ntho e tsheloang ho qhala kapa ho hlaka-hlantsha lintho tse ipopileng tse ka hlahisang mafeforetsane ho etsa bosae.

Contaminant – any physical, chemical, biological or radiological substance or matter that has an adverse effect on air, water or soil.

Se silafatsang – ekaba ka bo eona, litlhareng, mmeleng kapa seiponeng, ntho e fe kapa e fe e nang le matshoao a mabe moeeng, metsing kapa mobung.

Collide – to come together with an impact.  
Thuloano – ho kopana ka baka la ho thulana.

Colloids – very small, finely divided solids (particles that do not dissolve) that remain dispersed in a liquid for a long time due to their small size and electrical charge.

Tse hlahisoang ke ho thulana – mafoforetsane a arohileng likoto, a manyenyane, a rellang (ke hore mafoforetsane a sa nokeheng) a lulang a qhalakanye ka lerong nako e telele ka lebaka la bonyane ba oona le motlakase a oona.

Corrosion – chemical reaction between water and metal components resulting in dissolution (rusting) of the metal (or steel pipes).

Ho rusa – se bonahalang ka mora hore metsi a kene likaroloaneng tsa tshepe ho tlisang ho rusa hoa tshepe kapa li-pipe.

Corrosive – the corrosiveness of water is defined by the water's pH, alkalinity, hardness, temperature, total dissolved solids, dissolved oxygen concentration, and the Langelier Index.

Ho ruseha – matla a ho rusa ha metsi ho tsoaloe ke pH ea metsi ano, hlaboloso ka tse bolila, bothata, mochoso, palo ea matsoai a nokehileng, matla e moea o hloekileng o nokehileng le tshupo ka Langelier.

Detention time – the time during which an amount of water is retained in a tank at a given rate of flow.

Nako ea polokeho – nako eo metsi a bolokehileng ka tankeng ho latela ka mokhoa oo a tsamaeang.

Dewater (sludge) – to dry sludge so that it can be handled and disposed off.

Seretse – ho omisa seretse hore e be se ka nkeha e be sea lahluoa.

Disinfection – a process to kill most microorganisms in water including all pathogenic (disease causing) bacteria.

Tlhoekiso – mokhoa oa ho bolaea likokoana-hloko ka metsing ho kenyeletsa le tse hlahisang maloetse.

Dissolved (solids) – a measure of the amount of various inorganic salts dissolved in water. A high dissolved solid concentration in water can lead to a salty taste and/or corrosion of pipes.

Matsoai a nokehang – ke mmetho oa matsoai a fapaneng a nokehang ka metsing. Matsoai a nokehileng haholo ka metsing a ka etsa tatso e letsoai le/kapa ho rusa ha lipipe.

Dosage – the quantity of chemicals administered in a certain period.

Mometho – palo ea lithare tse tsheloang ka nako e itseng.

Electrical boards – electrical panels containing the switch gear for the various equipment.

Sekete – lintho tsa motlakase tse kentsoeng tshepe ea ho tshuma bakeng sa lisebelisuo tse fapaneng.

Elevated tank – a storage tank for water, which is installed at a certain level above ground to provide pressure, for example to a water network.

Tanka ea metsi – tanka e bolokang metsi a beuoang moo ho itseng kaholima lefatshe ho etsa matla, mohlala tshebetso ea metsi.

Filtration – a process for removing particulate matter from water by passage through porous filter media (sand, pebbles, coal).

Tlhotlo – ho tlhotlo ma mokhoa oa ho tlosa mafoforetsane, metsing ka sefe. Ekaba lehlabathe, mahlohlojane, kapa mashala.

Flocculation – the binding together of fine particles in water by gentle mixing after the addition of coagulant chemicals to form larger flocs.

Khomamarellano – ho khomamareletsa mafoforetsane mmoho ka metsing ka ho kopanya ka mokhoa o motle kamora ho tshela litlhare tse ipopang e le ho etsa tse kholoanyane.

Flocs – clumps of bacteria and particulate impurities that have come together and formed a cluster.

Bosae – likokoana-hloko le litshila tse ipopileng ho etsa leqhubu.

Hydraulic mixing – utilising the hydraulic energy of water flowing over or through static devices for mixing.

Motsoako oa tse kang metsi – ho ho sebelisa matla a metsi a mathang holima, kapa ka har'a lisebelisioa tsa ho tsoaka.

Infrastructure – engineering services such as water supply facilities, sewerage, sewage disposal etc.

Ntlafatso – mesebetsi ea li-engineer e kareng phepo ea metsi kapa moo litshila li qhalloang teng.

Langelier Index – an index reflecting the equilibrium pH of water in relation to calcium and alkalinity.

Tshepe e bontshang boemo ea Langelier – ntho e methang e bontshang bolekanane ba pH ba metsi ho amangoa le calcium le tse ka hlabolloang ka bolila.

Mechanical mixing – the induction of energy into liquid for mixing by means of an external source such as a motor driven propeller.

Matsoakabele a ho kopanya – ho kenya matla ka lerong e le ho kopanya ka ho sebelisa lintho tse hlalang kante joale ka propeller e khannang koloi.

Media (filter media) – porous filter material normally comprising of graded sand, pebbles and coal.

Se sefehang – se sefehang seo hangata se nang le lehlabathe le phophorehileng, mahlohlojane kapa mashala.

Monitoring – measuring concentrations of substances to determine the effectiveness of the water purification processes.

Ho leta – ho metha matla a ho nokeha hoa lintho ho bontsha bohlokoa ba tlhoekiso ea metsi.

Organisms – any form of animal or plant life.

Lihloliloeng – ekaba phoofolo kapa bophelo ba semela.

Particles – a tiny portion, for example, of sand.

Mafoforetsane – nthoana e nyane, mohlala, lehlabathe.

Pathogenic – organisms, including bacteria and viruses, capable of causing diseases.

Tse hlahisang maloetse – lihloliloeng tse kenyeletsang likokoana-hloko le likokoana tse ka tlising mahloko.

Pathogens – micro organisms that can cause disease in other organisms, humans, animals and plants. Pathogens include bacteria, viruses, and parasites, and are often found in sewage.

Tse ka hlahisang maloetse – lihloliloeng tse sa bonahaleng tse ka tlising mahloko ho lihloloa tse ling tse kareng batho, li phoofolo le limela. Lintho tse kulisang ekaba likokoana-hloho, likokoana le likokoana tse phelalang ka tse ling, 'me hangata li fumanoa litshileng.

pH – the intensity of the alkalinity or acidity condition of a substance. The pH may range from 0 to 14, where 0 is most acid, and 14 most alkaline, and a pH of 7 is neutral.

Matla a metsi a methoang ka lithara a fanang ka mmetho oa bolila kapa tlhabolloso – matla a bobebe le bolila ba ntho. Matla ana a metsi a methoang ka lithara a fanang ka mmetho a bolila kapa tlhabolloso a ka tloha ho lefela kapa leshome le metso e mene, moo lefela e leng bolila haholo ha leshome le metso e mene e le bobebe haholo, 'me ea bosupa e mahareng.

Pollution – generally the presence of matter that produces undesired environmental effects.  
Tshilafatso – hangata ke boteng ba lintho tse hlahisang lintho tse sa batleheng tsa kantle.

Polymers – a chemical formed by combining monomers and used with other chemical coagulants to aid in binding small suspended particles to larger chemical flocs for their removal from water.

Metsoako o itseng o entsoeng ka lithhare – setlhare se entsoeng ka ho kopanya likaroloana 'me se sebelisoa le lithhare tse ling ho thusa ho kopanya mafoforetsane a mamanyane a kokometseng, ho lithhare tse ikopantseng tse kholo hore li tsebe ho ntshoa ka metsing.

Potable (water) – water that is safe and satisfactory for drinking and cooking.

Metsi a ho noa – metsi a hloekileng bakeng sa ho noa le ho pheba.

Precipitation – pH unstable water resulting in calcium or iron minerals being deposited on the walls of pipes, which could result in blockages.

Seretse – metsi a sa itekanelang a bakang litheferetsi tse nang le calcium kapa lithollo tsa tshepe tse tsamaeang ka mabota a li pipe tse ka bakang ho koaleha.

Propeller – a rotating component in a pump designed to pump or lift water.

Lefehlo – ntho e pota-potang kahara pompo e entsoeng hore e fehla kapa ho phahamisa metsi.

Pump station – structure housing pumps, which are generally used to pump water to higher levels.

Moo ho pompuoang – ntlo e etselitsoeng lipompo tseo li sebelisoang ho pompa metsi hore a ee holimo.

Quality – the value of usefulness of water, determined by the combined effects of its physical attributes and its chemical constituents.

Boleng – bohlokoa ba tshebeliso ea metsi, bo tsoaloang ke lihlahisoa tse tsoang ho oona metsi kapa metsoakong ea lithhare tsa oona.

Reservoir – any natural or artificial basin for collecting and holding a supply of water.

Mohloli – sekotlolo se entsoeng kapa se hloliloeng ho tshela le ho boloka phepo ea metsi.

Residual (chlorine) – the amount of free and/or available chlorine remaining in water after a specific contact time.

Chlorine e salletseng fatshe – chlorine e lokotsehang kapa e teng ka metsing ka mora nako e itseng e behiloeng.

Sedimentation – process in which solid particles settle out or sink from the water being treated.

Kineho – mokhoa oo mafoforetsane a tsoang kapa a qoelang ka metsing a hlahlojoang ka teng.

Sink – the settling of particles where they can accumulate and be removed.

Ho qoela – ho qita ha mafoforetsane moo a ka bokelletsoang teng e be a ntshua.

Stabilisation – adjusting the pH of water in order to minimise the effects of corrosion, aggression or precipitation.

Boiketlo – tokiso ea pH ea metsi e le ho fokotsa lihlahissia tsa hi rusa, bohale kapa ho etseha ha seretse.

Storage – the collection or accumulation, for example, of water.

Polokeho – pokeleho kapa khomamelletsa mmoho hoa, mohlala metsi.

Suspended (solids) – solids that either float on the surface or are suspended in water or other liquids, and which are largely removable by filtering.

Mafoforetsane a kokobetseng – mafoforetsane ao mohlomong a phaphametseng kapa a kokobetseng ka metsing, kapa marong a mang, ao hangata a tlosoang ka ho sefa.

Turbidity – the cloudy appearance of water caused by the presence of suspended and colloidal matter.

Seretse se thata se sa bonahaleng – ho shebahala hoa leholimo hoa metsi ho hlahisoang ke boteng ba ho kokobala le ho thulana hoa lintho.

Virus – the smallest form of micro organisms capable of causing disease.

Kokoana – lihloliloeng tse nyanyane ho feta tse ka hlahisang maloetse.

Water quality – the chemical, physical and biological characteristics of water on which the fitness of the water is based for a specific use, such as drinking water for humans.

Metsi a boleng – mekhoha ea metsi e fapaneng, ekaba ka mokhoa oo a entsoeng kateng, ka mokhoa oo a kopantsoeng kateng kapa ka mokhoa oo a hloliloeng kateng moo ho phethahala ha metsi ana ho itshetlehileng bakeng sa mosebetsi oo itseng, joalo ka hore a nooe ke batho.



## GLOSSARY 5

## TRANSLATION: English – Setswana

Abstraction – the withdrawal of water from natural or other water sources.  
Tshunyetso ya metsi go tswa mo metsweding ya one ya tlhago.

Aesthetically – relating to concepts of beauty and purity.  
Go go kayang bontle kgotsa bophepa.

Agglomeration – to form or be formed into a mass or cluster.  
Go ipopa kgotsa go bopa ngatana.

Aggression – pH unstable water resulting in the cement content in fibre cement or concrete pipes, or concrete structures being dissolved.  
Metsi a a fetofetogang a a dirang gore ditlhale tsa samente kgotsa dipeipi tsa konkreite di tlhologe.

Algae – microscopic plants that contain chlorophyll and live floating or suspended in water.  
Dijwalo tse di bonwang ka maekrosekoupu, di na le tlolorofele, di phela mo godimo ga metsi.

Alkali – various soluble salts, principally sodium, potassium, magnesium and calcium that have the property of combining with acids to form neutral salts.  
Matswai a mefutafuta, bogolo sodiamo, poteisiamo, maknesiamo le khalsiamo, a a kgonang go kopana le acid go tlhola matswai a a phepa.

Alkalinity – the capacity of water to neutralize acids. Alkalinity is a measure of how much acid can be added to a liquid without causing a big change in pH.  
Maatla kgotsa kgonego ya metsi go phepafatsa acid. Seno ke tekatekanyo ya gore: ke acid e le kana kang e e tlhokegang go tshelwa mo seeleng kwa ntle ga go flola pH thata.

Backwash – the process of reversing the flow of water back through the filter media to remove entrapped solids.  
Tiragalo ya go busetsa metsi kwa morago go kgabaganya filter media go tobilwe go tlosa dilo tse di kabeng di kgotlhagane kgotsa di thibile filter media.

Bacteria – microscopic living organisms usually consisting of a single cell.  
Ditshidi tse di bonwang ka maekrosekoupu ga ntsi di na le sele e le nngwe.

Bentonite – soft porous rock comprising mainly of clay mineral particles, with the property to expand in water as much as 30 times its own dry volume.  
Letlapa le le boleta le le dirilweng ka dimenerala tsa letsopa, le le kgonang go gola ga 30 mo mesing go feta bogolo jwa lone jwa tlhago fa lo omile.

Calibration – a procedure which checks or adjusts an instrument's accuracy by comparison.  
Tiragalo ya go tlhotlhomisa kgotsa go fetola go ikanyega ga sediriswa ka go se bapisa le tse dingwe.

Chemical dosing – administering of chemicals, in this case to remove organisms and for disinfection.  
Go dirisa dikhemikhale go tlosa di-organisms le go bolaya dikokwanatlhoko.

Coagulant – a substance added to destabilise colloids that will cause particles to form flocs.  
Sengwe se se diriswang gore di-coloids di se ke tsa tlhomama gore di tle di tlhole di-flocks.

Contaminant – any physical, chemical, biological or radiological substance or matter that has an adverse effect on air, water or soil.  
Sengwe le sengwe, e ka nna sa tlhago, kgotsa e se sa tlhago, se bonwa kgotsa nyaa, se se kgotlelang metsi, mmu kgotsa mowa.

Collide – to come together with an impact.  
Go thulana.

Colloids – very small, finely divided solids (particles that do not dissolve) that remain dispersed in a liquid for a long time due to their small size and electrical charge.  
Dikarolwana tse di nnye tse di sa tlhaologang mo metsing, tse di nnang di tlhakathakane mo metsing nako e telele ka ntlha ya bonnye le bong jwa tsone jwa motlagase.

Corrosion – chemical reaction between water and metal components resulting in dissolution (rusting) of the metal (or steel pipes).  
Go kopana ga metsi le tshipi go dira gore tshipi e ruse.

Corrosive – the corrosiveness of water is defined by the water's pH, alkalinity, hardness, temperature, total dissolved solids, dissolved oxygen concentration, and the Langelier Index.  
Go rusisa ga metsi go dirwa ke maatla a pH, alkaline, bothata, bolelo (tempereitsha), go tlhakathakana ga metsi le dikarolwana tse di mo go one, oksigene le Langelier Index.

Detention time – the time during which an amount of water is retained in a tank at a given rate of flow.  
Nako e metsi a nnang mo faking / tanking mo sebakeng se se rileng.

Dewater (sludge) – to dry sludge so that it can be handled and disposed off.  
Go omisa sludge gore se kgone go tshwarega le go tloswa kgotsa go latlhiwa.

Disinfection – a process to kill most microorganisms in water including all pathogenic (disease causing) bacteria.  
Tiragalo ya go bolaya dikokwanatlhoko mo metsing go akaretsa le bacteria e e lwatsang.

Dissolved (solids) – a measure of the amount of various inorganic salts dissolved in water. A high dissolved solid concentration in water can lead to a salty taste and/or corrosion of pipes.  
Kelo ya matswai a fapafapaneng a a mo metsing. Fa metsi a na le matswai a mantsi go ka dira gore meetsi ao a nne letswai thata le gore dipeipi di jeje.

Dosage – the quantity of chemicals administered in a certain period.  
Bontsi jwa dikhemikhale tse di diresitsweng mo nakong e e rileng.

Electrical boards – electrical panels containing the switch gear for the various equipment.  
Dipapetlana tsa motlagase tse di na leng kunupi e e nang le tiro e e rileng.

Elevated tank – a storage tank for water, which is installed at a certain level above ground to provide pressure, for example to a water network.  
Tanka kgotsa faki ya metsi e e beilweng e thatlositswe gore e nne le kgatelelo mo phepong ya metsi.

Filtration – a process for removing particulate matter from water by passage through porous filter media (sand, pebbles, coal).  
Go tlosa particulate matter mo metsing gore metsi a kgone go feta mo filter media, jaaka santa, matlapana kgotsa malatlha.

Flocculation – the binding together of fine particles in water by gentle mixing after the addition of coagulant chemicals to form larger flocs.  
Go kgotlhagangwa ga dikarolwana mo metsing ka go di kopanya ka tlhokomelo morago ga gore dikhemikhale tsa coagulant di tshelwe mo teng gore dibope di-flock tse di kgotlwane.

Flocs – clumps of bacteria and particulate impurities that have come together and formed a cluster. Dingatana tsa bacteria le particulate media tse di ipupileng mmogo.

Hydraulic mixing – utilising the hydraulic energy of water flowing over or through static devices for mixing.

Go dirisa maatla a hydraulic a meetsi a a elang mo godimo ga sediriswa sa static go tlhakanya.

Infrastructure – engineering services such as water supply facilities, sewerage, sewage disposal etc. Diterelo tsa ingeniene jaaka phepo ya meetsi, (kgogeloleswe) sureji, matlakala jaalo le jaalo.

Langelier Index – an index reflecting the equilibrium pH of water in relation to calcium and alkalinity. Index e e bontshang tekatekanyo ya pH ya metsi e nyalangwa le khalesiamo le alkalinity.

Mechanical mixing – the induction of energy into liquid for mixing by means of an external source such as a motor driven propeller.

Go dirisa maatla mo seeleng go tlhakanya ka motshene

Media (filter media) – porous filter material normally comprising of graded sand, pebbles and coal. Sediriswa sagantsi se na le santa, matlapana le malatlha.

Monitoring – measuring concentrations of substances to determine the effectiveness of the water purification processes.

Tekatekanyo ya sere (substance) go batlisisa bokgoni jwa tiragalo ya phepafatso ya metsi.

Organisms – any form of animal or plant life.

Mofuta mongwe le mongwe wa botshelo jwa diphologolo kgotsa dijwalo.

Particles – a tiny portion, for example, of sand.

Karolwana e nnye (seka) ya santa.

Pathogenic – organisms, including bacteria and viruses, capable of causing diseases.

Di-organisms, tse di akaretsang di-bacteria, megare (viruses) tse di tlisang malwetse.

Pathogens – micro organisms that can cause disease in other organisms, humans, animals and plants. Pathogens include bacteria, viruses, and parasites, and are often found in sewage.

Di-organisms tse di bonwang ka maekhroskoupu tse di ka tlisang malwetse mo di-organisms tse dingwe, batho, diphologolo le dijwalo. Di-pathogens di akaretsa di-bacteria, megare (viruses) le dinwamadi tse di fitlhelwang gantsi mo kgogelolesweng (sureji).

pH – the intensity of the alkalinity or acidity condition of a substance. The pH may range from 0 to 14, where 0 is most acid, and 14 most alkaline, and a pH of 7 is neutral.

Maatla a boemo jwa alkalinity kgotsa acidity a sere (substance). pH e ka nna magareng a 0 le 14. Mo 0 e leng acidic mme 14 e le alkaline, mme pH ya 7 e le tekano.

Pollution – generally the presence of matter that produces undesired environmental effects.

Ka kakaretso ke go nna teng ga dilo tse di tlhagisang tshwaetso e e sa batlegeng mo tikologong.

Polymers – a chemical formed by combining monomers and used with other chemical coagulants to aid in binding small suspended particles to larger chemical flocs for their removal from water.

Khemikhale e e dirilweng ke di-monomers di dirisiwa le di-coagulants tsa dikhemikhale tse dingwe go thusa ka go kopanya di-particles tse di nnye go tlhola di-flocs go ntshiwa mo metsing.

Potable (water) – water that is safe and satisfactory for drinking and cooking.

Metsi a a siametseng go nowa le go tsidifadiwa.

Precipitation – pH unstable water resulting in calcium or iron minerals being deposited on the walls of pipes, which could result in blockages.

Metsi a a fetofetogang pH a dira gore dimenerale tsa khalesiamo le a yone di nne mo dipeiping, seo se ka dira gore dipeipi di thibane.

Propeller – a rotating component in a pump designed to pump or lift water.

Sedirisiwa se se dikologang se diretswe go pompa kgotsa go tthatlosa metsi.

Pump station – structure housing pumps, which are generally used to pump water to higher levels.

Sedirisiwa se se nang le dipompo, se se dirisewang go pompa metsi go tthatloga.

Quality – the value of usefulness of water, determined by the combined effects of its physical attributes and its chemical constituents.

Tlhwathwa ya bothokwa jwa metsi, e e bonwang ka go tlotlhomisa boemo le dikhemikhale tse di mo go ona.

Reservoir – any natural or artificial basin for collecting and holding a supply of water.

Faki ngwe le ngwe ya tlhago kgotsa e se ya tlhago, e e diresewang go tshwara metse go ka diresiwa.

Residual (chlorine) – the amount of free and/or available chlorine remaining in water after a specific contact time.

Bontsi jwa tlolorine e e teng kgotsa e e setseng mo metsing morago ga nako e e rileng e le mo go one.

Sedimentation – process in which solid particles settle out or sink from the water being treated.

Tiragalo e dikarolwana (solid particles) di yang kwa tlase (sakang) ga metsi a go dirwang mo go one.

Sink – the settling of particles where they can accumulate and be removed.

Go saka ga dikarolwana mo di ka nnang mmogo le go tlosiwa.

Stabilisation – adjusting the pH of water in order to minimise the effects of corrosion, aggression or precipitation.

Go fetola maemo a pH ya metsi gore tshwaetso ya corrosion, aggression kgotsa precipitation e fokodiwe.

Storage – the collection or accumulation, for example, of water.

Go kokoanngwa le go ntsifatsa (sekao: ga metsi).

Suspended (solids) – solids that either float on the surface or are suspended in water or other liquids, and which are largely removable by filtering.

Dikalwana tse di kokobetseng kgotsa di sekegilwe mo metsing kgotsa diela tse dingwe tse di ka tlosiwang ka go tlotliwa (filtering).

Turbidity – the cloudy appearance of water caused by the presence of suspended and colloidal matter.

Ponalo ya metsi a le marunyana gotsa letobo ka ntlha ya dilo tse di suspended le tse colloidal.

Virus – the smallest form of micro organisms capable of causing disease.

Di-organisms (megare) tse di bonwang ka maekhroskoupu tse di ka tholang malwetse.

Water quality – the chemical, physical and biological characteristics of water on which the fitness of the water is based for a specific use, such as drinking water for humans.

Bong jwa metse jwa khemikhale, go tobilwe tiriso ya metsi ao, sekao go ka nowa ke batho.

## GLOSSARY 6

## TRANSLATION: English – Sepedi

Abstraction – the withdrawal of water from natural or other water sources.  
Go ntšha / goga meetse metsweding / methopong ya tlhago.

Aesthetically – relating to concepts of beauty and purity.  
Go tswalana / amana le dika tša bobotse le hlweko.

Agglomeration – to form or be formed into a mass or cluster.  
Go hlola / hlolwa ga mokgobo / kgobokano.

Aggression – pH unstable water resulting in the cement content in fibre cement or concrete pipes, or concrete structures being dissolved.

Kgalefo - meetse a pH (kelo ya esiti goba letswai) yeo e sa lekalekanego iketlago ka baka la go ba gona ga leraga le lethata kagare ga digare / ditlhale tša leragacement goba dipeipi tša di bopilwego ke leraga le lethata, yeo e tolotšwego.

Algae – microscopic plants that contain chlorophyll and live floating or suspended in water.

Dimelameetseng - dimelameetseng tše nnyane kudu tša go se bonwe ka leihlo tša goba le setalafatša merogo tšeo di phelago di elela goba di lekelela ka meetseng.

Alkali – various soluble salts, principally sodium, potassium, magnesium and calcium that have the property of combining with acids to form neutral salts.

Gotoka - matswai a mehuta-huta ao a tologago ka meetseng, kudu sodiamo, potasiamo le khalsiamo / kalaka, ao a nago le mokgwa wa go hlakana goba go kopana le esiti (go baba ga morara / hlabego) go bopa matswai a magareng / a go se babe.

Alkalinity – the capacity of water to neutralize acids. Alkalinity is a measure of how much acid can be added to a liquid without causing a big change in pH.

Gotoka - mokgwa wa meetse wa go fetšiša bogale bja esiti. Alkalinity ke mokgwa wa go ela gore na go ka tšhelwa esiti e kae ka gare ga seela / meetse ntle le go hlola phetogo e kgolo ya pH.

Backwash – the process of reversing the flow of water back through the filter media to remove entrapped solids.

Kgogelomorago - mokgwa wa go bušetša / fetola tsela yeo meetse a elago ka wona mo sefong go tloša dithata tšeo diswaregilego goba tšeo di sa kgonego go feta mo sefong.

Bacteria – microscopic living organisms usually consisting of a single cell.

Dibakteri - diphedi tše nnyane kudu tša go se bonwe ka leihlo tšeo di nago le sele e tee fela.

Bentonite – soft porous rock comprising mainly of clay mineral particles, with the property to expand in water as much as 30 times its own dry volume.

Leswika le boleta la mašobana leo le nago le diripana / dikarolwana tša mobu wa seloko woo o kgonago go gola / oketšega makga a 30 (masometharo) go feta ge le omile.

Calibration – a procedure which checks or adjusts an instrument's accuracy by comparison.

Tsela ya go lekola / lekodiša goba go beakanya nepagalo ya sedirišwa ka mokgwa wa go bapetša.

Chemical dosing – administering of chemicals, in this case to remove organisms and for disinfection.

Go šomiša dikhemikhale, go tloša diphidi le go thibela gore di se sa bowa.

Coagulant – a substance added to destabilise colloids that will cause particles to form flocs.

Motswako wo o tšhelwago go seela-thata go dira gore diripana di ipope mokgobo.



Contaminant – any physical, chemical, biological or radiological substance or matter that has an adverse effect on air, water or soil.

Se sengwe le se sengwe se se thata goba motswako, sa go phela goba sa mahlasedi a bogale seo se ka bago le ditlamorago tše mpe go moya, meetse le mobu.

Collide – to come together with an impact.

Thulana / Thulano - go kopana / kopanya ka matla / bogale / go thulana.

Colloids – very small, finely divided solids (particles that do not dissolve) that remain dispersed in a liquid for a long time due to their small size and electrical charge.

Dithata tšeo di arongantšwego ka bonnyane kudu tšeo di sa tologego tšeo di šalago di phatlaletše ka gare ga seela / meetse lebaka le letelele ka baka la bonyane bja tšona le go ba le motlagase ga tšona.

Corrosion – chemical reaction between water and metal components resulting in dissolution (rusting) of the metal (or steel pipes).

Kgobogo - phetogo yeo e diregago gare ga meetse le tšhipi / dilo tše di dirilwego ka metale, e hlolwa ke go rusa / hwibila ga tshipi / dipeipi tša setala.

Corrosive – the corrosiveness of water is defined by the water's pH, alkalinity, hardness, temperature, total dissolved solids, dissolved oxygen concentration, and the Langelier Index.

Kgobolo - mokgwa wa meetse wa go gohla / kgobola o hlalošwa ke pH, alkalinity, bothata / bopopota, themperetšha, go tologa ga dithata, go tologa ga gase ya oxygene le lenaneo la Langelier.

Detention time – the time during which an amount of water is retained in a tank at a given rate of flow.

Nako ya kgolego - nako yeo kelo e itšego ya meetse e bolokilwego / hupilwego / swerwego ka tankeng ka kelelo / tshologelo e rilego.

Dewater (sludge) – to dry sludge so that it can be handled and disposed off.

Go omiša seretse / leraga gore se tle se kgone go tlošwa sa lahlwa.

Disinfection – a process to kill most microorganisms in water including all pathogenic (disease causing) bacteria.

Hlwekišo - tsela ya go bolaya diphidinyana tša go se bonwe ka leihlo ka gare ga meetse gammogo le dikokwana tša go hlola malwetši.

Dissolved (solids) – a measure of the amount of various inorganic salts dissolved in water. A high dissolved solid concentration in water can lead to a salty taste and/or corrosion of pipes.

Dithata tše tologilego - kelo ya matswai a go fapafapana ao a tologetšego ka meetseng. Meetse ao go tologetšego dithata ka bontši a ka baba kudu goba a kgobola / gohla dipeipi.

Dosage – the quantity of chemicals administered in a certain period.

Tekanyetšo - kelo ya dikhemikhale tšeo di ka šomišwago mo nakong e itšego.

Electrical boards – electrical panels containing the switch gear for the various equipment.

Mafao a motlagase ao a nago le dikonopo tša go laola didirišwa tša go fapafapana.

Elevated tank – a storage tank for water, which is installed at a certain level above ground to provide pressure, for example to a water network.

Tanka ya godingwana - tanka ya go boloka meetse , yeo e hlomilwego godingwana go kgontšha tšhollelo ya meetse methapong ya fase.

Filtration – a process for removing particulate matter from water by passage through porous filter media (sand, pebbles, coal).

Flocculation – the binding together of fine particles in water by gentle mixing after the addition of coagulant chemicals to form larger flocs.

Go bofaganya diripana tše nyenyane tša leraga ka meetseng ka go di tswaka ka motswako wa khemikale woo o thatafatšago leraga gore le ipope dithokolo tše kgolwanyana.

Flocs – clumps of bacteria and particulate impurities that have come together and formed a cluster. Dikgokolo / mekgobo ya dibakteri / dihlolamalwetši le diripana tša ditšhila tše di kgobokanego mmogo.

Hydraulical mixing – utilising the hydraulic energy of water flowing over or through static devices for mixing.

Go šomiša maatla a go elala ga meetse ao mohlomong a elago ka dipeiping goba didirišwa tše dingwe, go duba goba go kopanya / tswaka.

Infrastructure – engineering services such as water supply facilities, sewerage, sewage disposal etc.

Ditirelo tša seenjinere, bjalo ka tshepedišo / phatlalatšo ya meetse, tshepedišo ya mantle le tše dingwe.

Langelier Index – an index reflecting the equilibrium pH of water in relation to calcium and alkalinity. Lenaneo le le bontšhago go lekalekanywa ga pH (esiti / letswai) ya meetse ka go e tswalanya le khalsiamo / kalaka le alkali / letswai.

Mechanical mixing – the induction of energy into liquid for mixing by means of an external source such as a motor driven propeller.

Go tsentšha / tšhela maatla ka gare go seela go se hlakanya / tswaka ka go šomiša selo sa go huduwa (lefehlo mohlomong).

Media (filter media) – porous filter material normally comprising of graded sand, pebbles and coal. Tsela / Mokgwa - sefo ya mašoba yeo e dirilwego mobu wa lekwara, matlapana le malahla.

Monitoring – measuring concentrations of substances to determine the effectiveness of the water purification processes.

Hlokomedišišo - go ela ditwakwa meetseng go hlokomedišiša go atlega ga tsela ya go hlwekiša meetse.

Organisms – any form of animal or plant life.

Diphedi - mehuta ya diphedi goba dimela.

Particles – a tiny portion, for example, of sand.

Dikarolwana - diripana / dikarolwana tša mobu.

Pathogenic – organisms, including bacteria and viruses, capable of causing diseases.

Diphedi, go akaretšwa dibakteri le megare yeo e kgonago go hlola malwetši.

Pathogens – micro organisms that can cause disease in other organisms, humans, animals and plants. Pathogens include bacteria, viruses, and parasites, and are often found in sewage.

Diphedi tša go se bonwe ka leihlo tše di ka hlolago malwetši ka gare ga diphedi tše dingwe, batho, diphoofolo le dimela. Piphedi tše di akaretšwa dibakteri, divirase le dinwamadi tše di hwetšwago ka mafelong a go sepetša mantle.



pH – the intensity of the alkalinity or acidity condition of a substance. The pH may range from 0 to 14, where 0 is most acid, and 14 most alkaline, and a pH of 7 is neutral.

Boleng bja matswai a kalaka goba esiti yeo e lego ka gare ga seela goba meetse. pH e ka elwa go tloga go 0-14, moo 0 e šupago gore go ne esiti entši gomme 14 e šupa gore go na le letswai le lentši, gomme pH ya 7 e ra gore e magareng.

Pollution – generally the presence of matter that produces undesired environmental effects.

Tšhilafatšo - go ba gona ga dilo tšeo di tšhilafatšago lefelo (moya, meetse, naga) gomme tša hlola ditlamorago tše mpe.

Polymers – a chemical formed by combining monomers and used with other chemical coagulants to aid in binding small suspended particles to larger chemical flocs for their removal from water.

Motswako woo o dirilwego ka go kopanya / hlakanya metswakwana ye boleta le motswako wa go thatafiša go thuša gore dikarolwana tša leraga tšeo di lokologilego di bofagane go bopa mokgobo wo mogolo woo o ka tlošwago ga bonolo ka meetseng.

Potable (water) – water that is safe and satisfactory for drinking and cooking.

Meetse ao a loketšego go nwa le go opeya.

Precipitation – pH unstable water resulting in calcium or iron minerals being deposited on the walls of pipes, which could result in blockages.

Go kgatlha - meetse a pH yeo e sa iketlago yeo e ka hlolago go ba gona ga kalaka goba morodi wa tshipi woo o ka kgobokanago mabotong a dipeipi gomme tša thibana.

Propeller – a rotating component in a pump designed to pump or lift water.

Lehuduo - setho seo se dikologago ka gare go pompo seo se diretšwego go pompa goba go kuka meetse.

Pump station – structure housing pumps, which are generally used to pump water to higher levels.

Seteše sa gopompa - moago wa dipompi tšeo di šomišwago go pompa meetse go ya mafelong a godingwana.

Quality – the value of usefulness of water, determined by the combined effects of its physical attributes and its chemical constituents.

Makgonthe - boleng bja bohlokwa bja meetse bjo bo dirwago ke ditlamorago goba diphetho tše kopanego tša sebopego sa meetse le tšeo meetse a tswakilwego ka tšona.

Reservoir – any natural or artificial basin for collecting and holding a supply of water.

Sediba / Letsha - sediba goba mothopo wa meetse wa tlhago goba wa go dirwa, woo o elelwago e bile o bolokago meetse.

Residual (chlorine) – the amount of free and/or available chlorine remaining in water after a specific contact time.

Kelo ya chlorine ye e lokologilego yeo e sa lago ka meetseng ka morago ga nako e rilego ya kopano.

Sedimentation – process in which solid particles settle out or sink from the water being treated.

Tsela yeo diripana tša dithata di itshekago goba di nwelelago ka meetseng ao a hlwekišwago.

Sink – the settling of particles where they can accumulate and be removed.

Go nwellla - go itsheka ga leraga / diripana tša dithata moo di ka kgobokanago tša kgona go tlošwa.

Stabilisation – adjusting the pH of water in order to minimise the effects of corrosion, aggression or precipitation.

Tekatekanyo ya pH ya meetse go fokotša / thibela kgobogo / kgwaego, bogale goba popego ya mahlwele.

Storage – the collection or accumulation, for example, of water.

Polokelo - go kgoboketšwa goba go kgobokanywa ga meetse.

Suspended (solids) – solids that either float on the surface or are suspended in water or other liquids, and which are largely removable by filtering.

Lekelela - dithata tšeo di phaphametšego goba di lekelelago ka meetseng goba diela tše dingwe gomme di tlošwago ka mokgwa wa go sefšwa.

Turbidity – the cloudy appearance of water caused by the presence of suspended and colloidal matter.

Meetse ka sepepego sa leru leo le hlolwago ke goba gona ga dilwana tša go lekelela le go thatafala ka meetsing.

Virus – the smallest form of micro organisms capable of causing disease.

Mogare - diphedi tše nnyane kudu tša go se bonwe ka leihlo tšeo di kgonago go hlola malwetši.

Water quality – the chemical, physical and biological characteristics of water on which the fitness of the water is based for a specific use, such as drinking water for humans.

Bomakgonthe bja meetse - mokgwa woo meetse a tswakilwego, a bopegilego le ka moo a hlolegilego ka wona, woo go ka dumelwago gore meetse ao a ka šomišwa ke batho go nwa.

## GLOSSARY 7

## TRANSLATION: English – Venda

Abstraction – the withdrawal of water from natural or other water sources.  
U bvisa madi kha tshiga tsha mupo.

Aesthetically – relating to concepts of beauty and purity.  
U vhambedza vhudi na lunako.

Agglomeration – to form or be formed into a mass or cluster.  
U vhumbara nga zwigwada – kana u vhumba zwigwada.

Aggression – pH unstable water resulting in the cement content in fibre cement or concrete pipes, or concrete structures being dissolved.  
U sa lingana ha madi zwine zwa ita kha cemende zwine zwa ita uri tshifhato tsha concrete tshiwe.

Algae – microscopic plants that contain chlorophyll and live floating or suspended in water.  
Miri ino mela madini i sina midzi kana matari, i kona u vhanala zwavhudi nga microscopi.

Alkali – various soluble salts, principally sodium, potassium, magnesium and calcium that have the property of combining with acids to form neutral salts.  
Mino yo fhambanaho, sa tsumbo, sodiamu, potassium, magnesium na calcium ine ya kona u tangana na acid u vhumba acid ya vhukati (neutral acid).

Alkalinity – the capacity of water to neutralize acids. Alkalinity is a measure of how much acid can be added to a liquid without causing a big change in pH.  
Mannda a madi a no kona u dimula acid. Alkalinity ndi tshikalo tshikalaho vhunzhi ha acid i shelwaho kha iudi isa shandukisi pH.

Backwash – the process of reversing the flow of water back through the filter media to remove entrapped solids.  
Mushumo wa u vhuisele madi movahu nga filter media u bvisa dzi tshika dzo omaho.

Bacteria – microscopic living organisms usually consisting of a single cell.  
Zwipuka kana zwimela zwi tshilano, zwine zwa vha na cell nthihi, zwi vhoalaho nga microscopi.

Bentonite – soft porous rock comprising mainly of clay mineral particles, with the property to expand in water as much as 30 times its own dry volume.  
Tombo lo vhumbiwaho nga vumba line la kona u kukumuwa 30 times musu 10 nukala.

Calibration – a procedure which checks or adjusts an instrument's accuracy by comparison.  
Maitele a u lavhelesa tshi shumiswa kana instrument zwa vhudi nga u tshi vhambedza.

Chemical dosing – administering of chemicals, in this case to remove organisms and for disinfection.  
U langa dzi chemicals, u itela u bvisa dzi organisms.

Coagulant – a substance added to destabilise colloids that will cause particles to form flocs.

Contaminant – any physical, chemical, biological or radiological substance or matter that has an adverse effect on air, water or soil.  
Zwithu zwine zwa thithisa muya mufhe, madi kana mavu. Zwingavha zwa mupo, dzi chemicals kana zwitwaho nga vhatu kana zwipuka.

Collide – to come together with an impact.  
U tangana kana u da ha zwithu hu ne havha nga influence kana thuthuwedzo.

Colloids – very small, finely divided solids (particles that do not dissolve) that remain dispersed in a liquid for a long time due to their small size and electrical charge.

Dzi particles thukhu dzine dzi si noke, dzine dza sala dzi tshi vhonala kha ludi tshifhinga tshilapfu.

Corrosion – chemical reaction between water and metal components resulting in dissolution (rusting) of the metal (or steel pipes).

U tangana ha madi na tsimbi zwine zwa vhanga u rosa ha tsimbi.

Corrosive – the corrosiveness of water is defined by the water's pH, alkalinity, hardness, temperature, total dissolved solids, dissolved oxygen concentration, and the Langelier Index.

Detention time – the time during which an amount of water is retained in a tank at a given rate of flow.

Tshifhinga tshine madi a vhewa kha thannga.

Dewater (sludge) – to dry sludge so that it can be handled and disposed off.

U omisa matope u itela uri a kone u bviselwa nnda.

Disinfection – a process to kill most microorganisms in water including all pathogenic (disease causing) bacteria.

Maitela a u vhulaya (ha) zwikho khonono zwa madini zwi vhonehaho nga microscopi, zwine zwa vhanga zwitshili (bacteria).

Dissolved (solids) – a measure of the amount of various inorganic salts dissolved in water. A high dissolved solid concentration in water can lead to a salty taste and/or corrosion of pipes.

Tshikalo tsha vhunzi ha mino yo fhambanaho nokaho madini.

Dosage – the quantity of chemicals administered in a certain period.

Vhunzhi ha dzi chemicala dzo langwaho kha tshifhinga tsho kalwaho.

Electrical boards – electrical panels containing the switch gear for the various equipment.

Bodo ya electric ine yavha na switch dza zwi shumiswa zwo fhambananaho.

Elevated tank – a storage tank for water, which is installed at a certain level above ground to provide pressure, for example to a water network.

Tan nga ya u vhulunga madi yo vhwaho fhethu hu re ntha nithela uri huvhe na mutsiko (pressure).

Filtration – a process for removing particulate matter from water by passage through porous filter media (sand, pebbles, coal).

U bvisa zwithu zwino nga muthavha madini nga u shumisa porous filter.

Flocculation – the binding together of fine particles in water by gentle mixing after the addition of coagulant chemicals to form larger flocs.

U tanganyisa kana u vhumba tshithu tshihulwane nga u tanganyisa dzi chemicals nga ngomu madini.

Flocs – clumps of bacteria and particulate impurities that have come together and formed a cluster.

Dzi bacteria dzine dza tshikafhadza madi, dzo vhubaho zwi gwada.

Hydraulical mixing – utilising the hydraulic energy of water flowing over or through static devices for mixing.

U shumisa mannda a madi u thanganyisa zwithu.

Infrastructure – engineering services such as water supply facilities, sewerage, sewage disposal etc.

Zwi shumiswa sa tsumbo, mabunga a shumisaho madi.

Langelier Index – an index reflecting the equilibrium pH of water in relation to calcium and alkalinity. Mutevhe wa zwithu (nomboro) u sumbedzaho u lingana ha pH ya madi i tshi vhambedzwa na calcium kana alkalinity.

Mechanical mixing – the induction of energy into liquid for mixing by means of an external source such as a motor driven propeller.

U bveledza mannda kha madi u itela u tanganyisa, nga u shumisa tshi shumiswa tshino langwaho nga motor e.g. motor driven propeller (mbombo).

Media (filter media) – porous filter material normally comprising of graded sand, pebbles and coal. Filter yo thanganaho na mutavha kana malasha o vhwaho nga dzi graidi.

Monitoring – measuring concentrations of substances to determine the effectiveness of the water purification processes.

U kala vhunzhi ha dzi substance u itela u swikela ndivho ya u kuna kisa madi.

Organisms – any form of animal or plant life.

Mbonalo inwe na inwe ya vhwashilo ha zwipuka kana zwimela (miri).

Particles – a tiny portion, for example, of sand.

Tshipida tshituku tuku, sa tshumbo, mutavha.

Pathogenic – organisms, including bacteria and viruses, capable of causing diseases.

Zwitshili zwine zwa kona u vhangwa malwadze.

Pathogens – micro organisms that can cause disease in other organisms, humans, animals and plants. Pathogens include bacteria, viruses, and parasites, and are often found in sewage.

Dzi organism dzine dza kona u vhangwa malwadze kha dzinwe organism.

pH – the intensity of the alkalinity or acidity condition of a substance. The pH may range from 0 to 14, where 0 is most acid, and 14 most alkaline, and a pH of 7 is neutral.

Pollution – generally the presence of matter that produces undesired environmental effects.

U vha hone ha zwithu kana tshithu tshine tsha i ta uri mupo u sivhe wa vhudi.

Polymers – a chemical formed by combining monomers and used with other chemical coagulants to aid in binding small suspended particles to larger chemical flocs for their removal from water.

Substance kana chemical yo vhumbiwaho nga u tanganyisa dzi monomers.

Potable (water) – water that is safe and satisfactory for drinking and cooking.

Madi o kunaho, o lugelaho u nwiwa na u shumiswa kha u bika.

Precipitation – pH unstable water resulting in calcium or iron minerals being deposited on the walls of pipes, which could result in blockages.

Madi ane a vhangwa nga calcium kana iron, a rothaho kha dzimbondo dza dzi pipe, ane a nga ita uri pipe dzi valee kana u block.

Propeller – a rotating component in a pump designed to pump or lift water.

Tshithu tshi manaho kha bombo, tsho itelwaho u bomba madi.

Pump station – structure housing pumps, which are generally used to pump water to higher levels.

Tshifhato tsha bommba, tsho itelwaho u bommba madi kana u kokodza madi a tshiya ntha.

Quality – the value of usefulness of water, determined by the combined effects of its physical attributes and its chemical constituents.

Vhudi ha madi vhu vhone nga u tangana ha madi na zwithu zwa mupo (tshika) kana dzi chemicals.

Reservoir – any natural or artificial basin for collecting and holding a supply of water.  
Damu la mupu kana lo fhatwaho li faraho madi a tshiya vhathuni.

Residual (chlorine) – the amount of free and/or available chlorine remaining in water after a specific contact time.  
Tshivhalo tsha chlorine ire madini nga murahu ha tshinga tsho vhwahao.

Sedimentation – process in which solid particles settle out or sink from the water being treated.  
Maitele ane zwithu zwo omaho, zwo dzhenaho madini zwa bviswa ngao.

Sink – the settling of particles where they can accumulate and be removed.  
Maitele a zwithu zwine zwannga dzhena madini zwa kuvhangana lune zwa nga bwise iwa nnda.

Stabilisation – adjusting the pH of water in order to minimise the effects of corrosion, aggression or precipitation.  
U dzudzanya pH ya madi u itela u thivhela uri a sa bvude.

Storage – the collection or accumulation, for example, of water.  
U kuvhanganya madi.

Suspended (solids) – solids that either float on the surface or are suspended in water or other liquids, and which are largely removable by filtering.  
Zwithu (kana lunwe iudi) zwine zwa elela nthha ha madi.

Turbidity – the cloudy appearance of water caused by the presence of suspended and colloidal matter.  
Mbonalo ya madi a tshinga gole, zwitshi vhangwa nga zwithu kana iudi (oil) zwi elelaho nthha ha madi.

Virus – the smallest form of micro organisms capable of causing disease.  
Tshi tsjili tshitukutuku tshikonaho u vhanga vhulwadze.

Water quality – the chemical, physical and biological characteristics of water on which the fitness of the water is based for a specific use, such as drinking water for humans.  
Vhudi ha madi ho se dzava dzi chemicals, zwithu zwa mupo zwine ngomu madini, zwine zwa ita uri madi a vhe o lugelwa u shumiswa kana unwiwa na a vhathu.



Abstraction – the withdrawal of water from natural or other water sources.  
Kuka mati yahuma exihlobyeni

Aesthetically – relating to concepts of beauty and purity  
Kufananisa kamarito yasaseka niyo tenga.

Agglomeration – to form or be formed into a mass or cluster.  
Kuhlangana entlaweni wo karhi / kumbe e ka hlengeletano yo karhi.

Aggression – pH unstable water resulting in the cement content in fibre cement or concrete, pipes, or concrete structures being dissolved.  
Mati lawa ya fambaka endzeni ka muako wa semende kumbe tiphayiphi.

Algae – microscopic plants that contain chlorophyll and live floating or suspended in water  
Swimilani leswi swimileke swarinhlaza endzeni ka mati, swi tlhela swi papamala.

Alkali – various soluble salts, principally sodium, potassium, magnesium and calcium that have the property of combining with acids to form a neutral salts.  
I mimunyu yinwana, yo fana na sodiyamu, potesiyamu, magnesiyamu na calsiyamu leswingana nga na swan'wa nchumu kuhlangana nati acids.

Alkalinity – the capacity of water to neutralize acids. Alkalinity is a measure of how much acid can be added to a liquid without causing a big change in pH.  
Talo wa mati ku kondza wu ntsonga acid. Alkalinity yi pimiwa ka acid leyi ngeteriwa eka swihalaki kambe ku nga vini ku cinca ka pH.

Backwash – the process of reversing the flow of water back through the filter media to remove entrapped solids.  
Ku sefiwa ka mati, ku mehusiwa leswi nga halakiki.

Bacteria – microscopic living organisms usually consisting of a single cell.  
Swimilani kumbe switsongsongana leswi hanyaka.

Bentonite - soft porous rock comprising mainly of clay mineral particles, with the property to expand in water as much as 30 times its own volume.  
Maribye lamo oloya ma hlangenekeneni swivumbiwa yahlamuka / yahambana yiku kukumuka endzeni ka mati kiringana ka 30 loku katolovelwa wona wo oma.

Calibration – a procedure, which checks or adjusts an instrument's accuracy by comparison.  
I ndlela yo langutisisa kumbe ku ringanisa swi tirhisiwa hi vukheta hi ku fananisa.

Chemical dosing – administering of chemicals, in this case to remove organisms and for disinfection.  
Matirhiselo ta ti khemikhali, ku susa switsotswana na ku sirhelela ma vabyi.

Coagulant – a substance added to destabilize colloids that will cause particles to form flocs.

Contaminant – any physical, chemical, biological or radiological substance or matter that has an adverse effect on air, water or soil.  
Rihanyo, matengelo, mahlaya ya ya ngani koka eka moya, mati kume misava.

Collide – to come together with an impact.  
Ku hlangana yi maendlelo.

**Colloids** – very small, finely divided solids (particles that do not dissolve) that remain dispersed in a liquid for a long time due to their small size and electrical charge.  
Swintsongo no vonikela, swo ka swinga n’woki, nakona switsama swihalakile hivumati hinkari wo leha.

**Corrosion** – chemical reaction between water and metal components resulting in dissolution (rusting) of the metal (or steel pipes).  
Ku hundzuluka exikarhi ka mati na nsibhi loko swi hlanganile ku kondza loko swi rhosa (xikombiso, ku rhosa ka tinsimbi tatiphayiphi ta mati.

**Corrosive** – the corrosiveness of water is defined by the water’s pH, alkalinity, hardness, temperature, total dissolved solids, dissolved oxygen concentration, and the Langelier Index.  
Matengiselo ya mati swi endliwa hi maxelo, matiyelo ku’nwokisiwa kamimunyu, hi tumbuluko.

**Detention time** – the time during which an amount of water is retained in a tank at a given rate of flow.  
karhi lowu mpimo wa mati lowu vaka endzeni ka thangi kuya yimpimo wamakhulukelo.

**Dewater(sludge)** – to dry sludge so that it can be handled and disposed off.  
Kususa ridadaka leswaku rita tekeriwa goza ku ricukumeta kule.

**Disinfection** – a process to kill most micro-organisms in water including all pathogenic (disease causing) bacteria.  
Ndlela yo dlaya switsotswana ematini hinkwaswo leswi vangaka mavabyi.

**Dissolved (solids)** – a measure of the amount of various inorganic salts dissolved in water. A high dissolved solid concentration in water can lead to a salty taste and /or corrosion of pipes.  
Mimunyu yotata ya n’woka ematini nakona kun’woka ka munyu hi ndlela ya xiyimo xalehenhla ya vanga rhosi etiphayiphini.

**Dosage** – the quantity of chemicals administered in a certain period.  
Ndzingano wa tikhemikhali leti pimanisiwaka hinkari wo karhi.

**Electrical boards** – electrical panels containing the switch gear for the various equipment.  
hlangano wa ma magezi laha kukumekaka gerhe-nkulu yo fambisa ha yona.

**Elevated tank** – a storage tank for water, which is installed at a certain height above ground to provide pressure for example to a water network.  
Kuhlayiswa ka mati endzeni ka thangi leri vekiweke ehlenhla ka misava kunyikela ntikelo. Xikombiso hlangano wamati.

**Filtration** – a process for removing particles matter from water by passage through porous filter media (sand, pebbles, coal).  
Ndlela yo humesela ehandle ntsuri ematini hi ndlela yo sefa.

**Flocculation** – the binding together of fine particles in water by gentle mixing after the addition of coagulants chemicals to form large flocks.  
Ku hlanganisa ntshuri, hikiva ku mikisiwa hivukheta endzaku kaku engeteriwa kamimirhi kuendlela ku tenga loku kulu.

**Flocs** – clumps of bacteria and particulate impurities that have come together and formed a cluster.  
Xikhomo xa switsongatsongana ni ntshuri na switengiso leswi hlanganeke swi endla hlangano wo ka rhi.

**Hydraulic mixing** – utilizing the hydraulic energy of water flowing over or through static devices for mixing.  
Kutirhisiwa ka swihalaki swa matimba ematini swi papamala.

Infrastructure – engineering services such as water supply facilities, sewerage, sewage disposal, Etc.

Vamitirho ya le matini na vo lunghisa masoreji.

Langelier Index – an index reflection the equilibrium pH of water in relation to calcium and alkalinity. I landzeleriso lowu kombisaka maringaniselo ya madzungelo ya mati hi kukombisiwa hi calcium na Alkalinity.

Mechanical mixing – the induction of energy into liquid for mixing by means of an external source such as a motor driven propeller.

Media (filter media) – porous filter material normally comprising of graded sand, pebbles and coal.

Monitoring – measuring concentrations of substances to determine the effectiveness of the water purification process.

Ku pimiwa ka ntalo wa swilo ku engeteriwa kaku tenga ka mati.

Organisms – any form of animal or plant life.

I xinwana na xin'wana lexi nga xiharhi kumbe ximilana leshi hanyaka.

Particles – a tiny portion, for example, of sand.

xiphemu lexitsongo, xikombiso; sandi.

Pathogenic – organisms, including bacteria and viruses, capable of causing disease.

Swimilana na switsongwatsongwana, swihumbana leswi vangaka mavabyi.

Pathogens – micro organisms that can cause disease in other organisms, humans, animals and plants. Pathogens include bacteria, viruses, and parasites, and are often found in sewage.

Sswimilanana leswi tsingo leswi vangaka mababyi aka leswi hanyaka vanhu, swihari, switsongwatsongwana, swihumbana.

pH – the intensity of the alkalinity or acidity condition of a substance. The pH may range from 0 to 14, where 0 is most acid, and 14 is most alkaline, and a pH of 7 is neutral.

Pollution – generally the presence of matter that produces undesired environmental effects.

Ku kumeka ka swilo leswi vangaka thyaka endhawini.

Polymers – a chemical formed by combining monomers and used with other chemical coagulants to aid in binding small-suspended particles to large chemical flocs for their removal from water.

Portable (water) – water that is safe and satisfactory for drinking and cooking.

Mati lawa ya te ngeke ku fikela kunwa no sweka.

Precipitation – pH unstable water resulting in calcium or iron minerals being deposited on the walls of pipes, which could result in blockages.

Propeller – a rotating component in a pump designed to pump or lift water.

Xilo levi rhendzelekaka endzeni ku popo ya mati ko papa niku tlakusiwa ka mati.

Pump station – structure housing pumps, which are generally used to pump water to higher levels.

Mmoako wo popa mati lowu pompaka mati kuya eka xiyimo ya le henhla.

Quality – the value of usefulness of water, determined effects of its physical attributes and its chemical constituents.

Koka wa kitirhisa ka mati. Wu hambanyisiwa hi matalelo ya matimba yamirhi.

Reservoir - any natural or artificial basin for collecting and holding a supply of water.  
xibye xa ntumbuluko kumbe lexi endliweke ku torhiswa ku khoma matimba ya mati.

Residual (chlorine) – the amount of free and/or available chlorine remaining in water after a specific contact time.

Talo wa munyu/ kumbe ku dzunga loku kumekaka ematini.

Sedimentation – process in which solid particles settle out or sink from the water being treated.  
Ndlela leyi swilavi dzikaka ha ha yona swi lulamisiwa.

Sink – the settling of particles where they can accumulate and be removed.  
Ku hlayisiwa ka ritshurhi, laha rihlengeletanaka naku susiwa kona.

Stabilisation – adjusting the pH of water in order to minimize the effects of corrosion, aggression or precipitation.

Ku lulamisa madzungelo ya mati ku kota ku hunguta ku dlayiwa ka swimilana.

Storage – the collection or accumulation, for example, of water.

Ku hlengeletywa / ku hlayisa xikombiso mati.

Suspended(solids) – solids that either float on the surface or are suspended in water or other liquids, and which are largely removable by filtration.

Leswi ngahalikiki leswi papamalaka ehenhla ka mati kumbe swihalaki leswinga sefiwaka swi hela.

Turbidity – the cloudy appearance of water caused by the presence of suspended and colloidal matter.  
Xivumbelo xamapapa ya mati hikokwalaho ka mati ya thyaka.

Virus – the smallest form of micro organisms capable of causing disease.

Switsongatsongwana leswi vangaka mavabyi.

Water quality – the chemical, physical and biological characteristics of water on which the fitness of the water is based for a specific use, such as drinking water for humans.

Matengelo, rihanyu, vuhlayiseki lebyi hlawulekisaka mati ku kombisa konka wamati kuya hiku hlawula matirhiselo ya mati kufana na kun'wiwa ka mati.

Abstraction – the withdrawal of water from natural or other water sources.

Onttrekking – die onttrekking van water uit natuurlike of ander waterbronne.

Aesthetically – relating to concepts of beauty and purity.

Esteties – hou verband met konsepte van skoonheid en suiwerheid.

Agglomeration – to form or be formed into a mass or cluster.

Opeenhoping/versameling – om 'n massa of groep te vorm.

Aggression – pH unstable water resulting in the cement content in fibre cement or concrete pipes, or concrete structures being dissolved.

Aggressiwiteit – pH-onstabiele water wat aanleiding gee tot die oplossing van die sementinhoud in veselversterkte of betonpype, of betonstrukture.

Algae – microscopic plants that contain chlorophyll and live floating or suspended in water.

Alge – mikroskopiese plante wat chlorofil bevat en wat op die water dryf of in suspensie is.

Alkali – various soluble salts, principally sodium, potassium, magnesium and calcium that have the property of combining with acids to form neutral salts.

Alkalie – verskeie oplosbare soute, hoofsaaklik afkomstig van natrium, kalium, magnesium en kalsium, wat die eienskap het om met sure te verbind om 'n neutrale sout te vorm.

Alkalinity – the capacity of water to neutralize acids. Alkalinity is a measure of how much acid can be added to a liquid without causing a big change in pH.

Alkaliniteit – die vermoë van water om suur te neutraliseer. Alkaliniteit is 'n maatstaf van hoeveel suur by 'n vloeistof gevoeg kan word sonder 'n groot verandering in pH.

Backwash – the process of reversing the flow of water back through the filter media to remove entrapped solids.

Terugwas – die terugpomp van water in 'n teenoorgestelde rigting deur die filtermedia om sodoende die media skoon te was van partikels en stowwe wat vasgevang was.

Bacteria – microscopic living organisms usually consisting of a single cell.

Bakterieë – lewendige mikroskopiese organismes wat uit 'n enkelsel bestaan.

Bentonite – soft porous rock comprising mainly of clay mineral particles, with the property to expand in water as much as 30 times its own dry volume.

Bentoniet – sagte poreuse rots, bestaande uit hoofsaaklik kleiagtige minerale met die vermoë om tot 30 maal sy eie droë volume in water uit te swel.

Calibration – a procedure which checks or adjusts an instrument's accuracy by comparison.

Kalibrasie – 'n prosedure om 'n instrument se akkuraatheid met 'n vasgestelde standaard te kontroleer.

Chemical dosing – administering of chemicals, in this case to remove organisms and for disinfection.

Chemiese dosering – die dosering van chemikalieë om onder andere organismes te verwyder en die water te ontsmet.

Coagulant – a substance added to destabilise colloids that will cause particles to form flocs.

Flokkulasiemiddel – 'n middel wat toegevoeg word om kolloïedes te destabiliseer sodat fyn deeltjies aan mekaar vasheg om vlokke te vorm.

Contaminant – any physical, chemical, biological or radiological substance or matter that has an adverse effect on air, water or soil.

Kontaminant / besmetter – enige fisiese, chemiese, biologiese of radiologiese stof wat 'n ongunstige invloed het op lug, water en grond.

Collide – to come together with an impact.

Bots – om met impak bymekaar te kom.

Colloids – very small, finely divided solids (particles that do not dissolve) that remain dispersed in a liquid for a long time due to their small size and electrical charge.

Kolloïedes – baie klein onoplosbare soliede deeltjies wat lank in 'n vloeistof bly as gevolg van onder andere, die elektriese lading wat hulle dra.

Corrosion – chemical reaction between water and metal components resulting in dissolution (rusting) of the metal (or steel pipes).

Verroesting – 'n chemiese reaksie tussen water en metaalkomponente wat die ontbinding van die metaal tot gevolg het.

Corrosive – the corrosiveness of water is defined by the water's pH, alkalinity, hardness, temperature, total dissolved solids, dissolved oxygen concentration, and the Langelier Index.

Korrosief, wegvretend – die korrosiewe eienskap van water is afhanklik van die water se alkaliniteit, hardheid, temperatuur, swewende stowwe, opgeloste suurstofkonsentrasie, en die Langelier Indeks.

Detention time – the time during which an amount of water is retained in a tank at a given rate of flow.

Retensietyd – die tyd wat 'n hoeveelheid vloeistof in 'n tenk bly as dit teen 'n sekere tempo deur die tenk vloei.

Dewater (sludge) – to dry sludge so that it can be handled and disposed off.

Ontwater (slyk) – om slyk uit te droog sodat dit hanteerbaar is.

Disinfection – a process to kill most microorganisms in water including all pathogenic (disease causing) bacteria.

Ontsmetting – 'n proses om mikroörganismes en patogene bakterieë wat in water voorkom te vernietig.

Dissolved (solids) – a measure of the amount of various inorganic salts dissolved in water. A high dissolved solid concentration in water can lead to a salty taste and/or corrosion of pipes.

Opgeloste stowwe – 'n maatstaf van die hoeveelheid opgeloste anorganiese soute in die water. 'n Hoë konsentrasie opgeloste stowwe kan aanleiding gee tot 'n soutrige smaak en/of die korrosie van pype.

Dosage – the quantity of chemicals administered in a certain period.

Dosis – die hoeveelheid chemikalieë wat 'n sekere tydperk doseer word.

Electrical boards – electrical panels containing the switch gear for the various equipment.

Elektriese verspreidingsborde – elektriese panele waarin die skakeltuig vir verskillende toerusting geïnstalleer is.

Elevated tank – a storage tank for water, which is installed at a certain level above ground to provide pressure, for example to a water network.

Druktoring – 'n stoortenk wat op 'n sekere hoogte bo grondvlak geïnstalleer word om 'n sekere druk aan byvoorbeeld 'n waternetwerk te gee.



Filtration – a process for removing particulate matter from water by passage through porous filter media (sand, pebbles, coal).

Filtrasie – 'n proses waardeur partikels van water geskei word deur dreinerings deur poreuse filtermedia (sand, spoelklippies, steenkool).

Flocculation – the binding together of fine particles in water by gentle mixing after the addition of coagulant chemicals to form larger flocs.

Flokkulasie – die vorming van groter deeltjies (vlokke) deur die samebinding van klein deeltjies na die byvoeging van 'n vlokmiddel en stadige roering van die water.

Flocs – clumps of bacteria and particulate impurities that have come together and formed a cluster.

Vlokke – bakterieë en ander deeltjies wat saampak.

Hydraulic mixing – utilising the hydraulic energy of water flowing over or through static devices for mixing.

Hidrouliese vermenging – die gebruik van die hidrouliese energie van water wat oor of deur statiese toestelle vloei om water te vermeng.

Infrastructure – engineering services such as water supply facilities, sewerage, sewage disposal etc.

Infrastruktuur – ingenieursdienste soos watervoorsieningsfasiliteite, rioolhantering ens.

Langelier Index – an index reflecting the equilibrium pH of water in relation to calcium and alkalinity.

Langelier Indeks – 'n indeks wat 'n gebalanseerde pH van water in verhouding tot kalsium en alkaliniteit aandui.

Mechanical mixing – the induction of energy into liquid for mixing by means of an external source such as a motor driven propeller.

Meganiese vermenging – die aanwending van toerusting om water te vermeng, soos byvoorbeeld 'n elektries-aangedrewe skroef.

Media (filter media) – porous filter material normally comprising of graded sand, pebbles and coal.

Filtermateriaal – poreuse filtermateriaal wat normaalweg bestaan uit gegradeerde sand, spoelklippies en steenkool.

Monitoring – measuring concentrations of substances to determine the effectiveness of the water purification processes.

Monitering – die meet van konsentrasies van bestanddele om die doeltreffendheid van die waterbehandelingsprosesse te bepaal.

Organisms – any form of animal or plant life.

Organismes – enige vorm van dier- of plantlewe.

Particles – a tiny portion, for example, of sand.

Partikels/deeltjies – klein deeltjies van byvoorbeeld sand.

Pathogenic – organisms, including bacteria and viruses, capable of causing diseases.

Patogenies – organismes soos bakterieë en virusse wat in staat is om siektes in byvoorbeeld mense te kan veroorsaak.

Pathogens – micro organisms that can cause disease in other organisms, humans, animals and plants. Pathogens include bacteria, viruses, and parasites, and are often found in sewage.

Patogene – mikroörganismes wat siektes in ander organismes, mense, diere of plante kan veroorsaak. Dit kan bakterieë, virusse of parasiete wees, en kom dikwels in riool voor.

pH – the intensity of the alkalinity or acidity condition of a substance. The pH may range from 0 to 14, where 0 is most acid, and 14 most alkaline, and a pH of 7 is neutral.

pH – die maatstaf waarvolgens 'n vloeistof as suur of alkalies geklassifiseer word. Die pH kan tussen 0 en 14 varieer, waar 0 die ergste suur en 14 die ergste alkalies sal wees. 'n pH van 7 is neutraal.

Pollution – generally the presence of matter that produces undesired environmental effects.

Besoedeling – normaalweg die voorkoms van stowwe wat 'n nadelige effek op die omgewing het.

Polymers – a chemical formed by combining monomers and used with other chemical coagulants to aid in binding small suspended particles to larger chemical flocs for their removal from water.

Polimere – 'n chemikalie wat gevorm word deur samevoeging van monomere en wat saam met koagulante gebruik word om swewende stowwe saam te bind om groter vlokke te vorm.

Potable (water) – water that is safe and satisfactory for drinking and cooking.

Drinkbare (water) – water wat veilig is vir drink en huishoudelike gebruik.

Precipitation – pH unstable water resulting in calcium or iron minerals being deposited on the walls of pipes, which could result in blockages.

Neerslag – pH onstabiele water wat veroorsaak dat kalsium of metaal minerale op die wand van pype neerslaan, wat tot verstoppings aanleiding kan gee.

Propeller – a rotating component in a pump designed to pump or lift water.

Skroef – die roterende komponent in 'n pomp wat veroorsaak dat 'n vloeistof na 'n hoër vlak gepomp kan word.

Pump station – structure housing pumps, which are generally used to pump water to higher levels.

Pompstasie – struktuur waarin pompe geïnstalleer word om water na hoërliggende punte te pomp.

Quality – the value of usefulness of water, determined by the combined effects of its physical attributes and its chemical constituents.

Gehalte – die bruikbaarheid van water wat bepaal word deur die gesamentlike invloed van die fisiese en chemiese samestelling van die water.

Reservoir – any natural or artificial basin for collecting and holding a supply of water.

Stoordam, opgaardam – enige natuurlike of kunsmatige struktuur om water te stoor.

Residual (chlorine) – the amount of free and/or available chlorine remaining in water after a specific contact time.

Oorblywende (chloor) – die hoeveelheid chloor wat na 'n sekere kontakperiode nog in die water beskikbaar is.

Sedimentation – process in which solid particles settle out or sink from the water being treated.

Besinking – proses waartydens die soliede deeltjies wat in die water wat behandel word voorkom, sink.

Sink – the settling of particles where they can accumulate and be removed.

Sink, uitsak – die uitsakking van deeltjies na 'n punt vanwaar hulle verwyder kan word.

Stabilisation – adjusting the pH of water in order to minimise the effects of corrosion, aggression or precipitation.

Stabilisasie – die aanpassing van die pH van water om die invloed van korrosie, aggressiwiteit en die neerslag van byvoorbeeld kalsium te verminder.

Storage – the collection or accumulation, for example, of water.

Stoor – die opgaar van byvoorbeeld water.

Suspended (solids) – solids that either float on the surface or are suspended in water or other liquids, and which are largely removable by filtering.

Swewende stowwe – stowwe wat of op die oppervlakte dryf, of in suspensie is, en wat deur filtrasie verwyder kan word.

Turbidity – the cloudy appearance of water caused by the presence of suspended and colloidal matter.

Turbiditeit (troebelheid) – die wolkerige voorkoms van water wat veroorsaak word deur swewende of kolloïdale deeltjies.

Virus – the smallest form of micro-organisms capable of causing disease.

Virus – 'n klein vorm van 'n mikroörganisme wat in staat is om siekte te veroorsaak.

Water quality – the chemical, physical and biological characteristics of water on which the fitness of the water is based for a specific use, such as drinking water for humans.

Watergehalte – die chemiese, fisiese en biologiese eienskappe van water, wat bepaal of die water geskik sal wees vir 'n spesifieke doel, byvoorbeeld vir menslike gebruik.

ABSTRACTION



CHEMICAL DOSING



FLOCCULATION



SEDIMENTATION



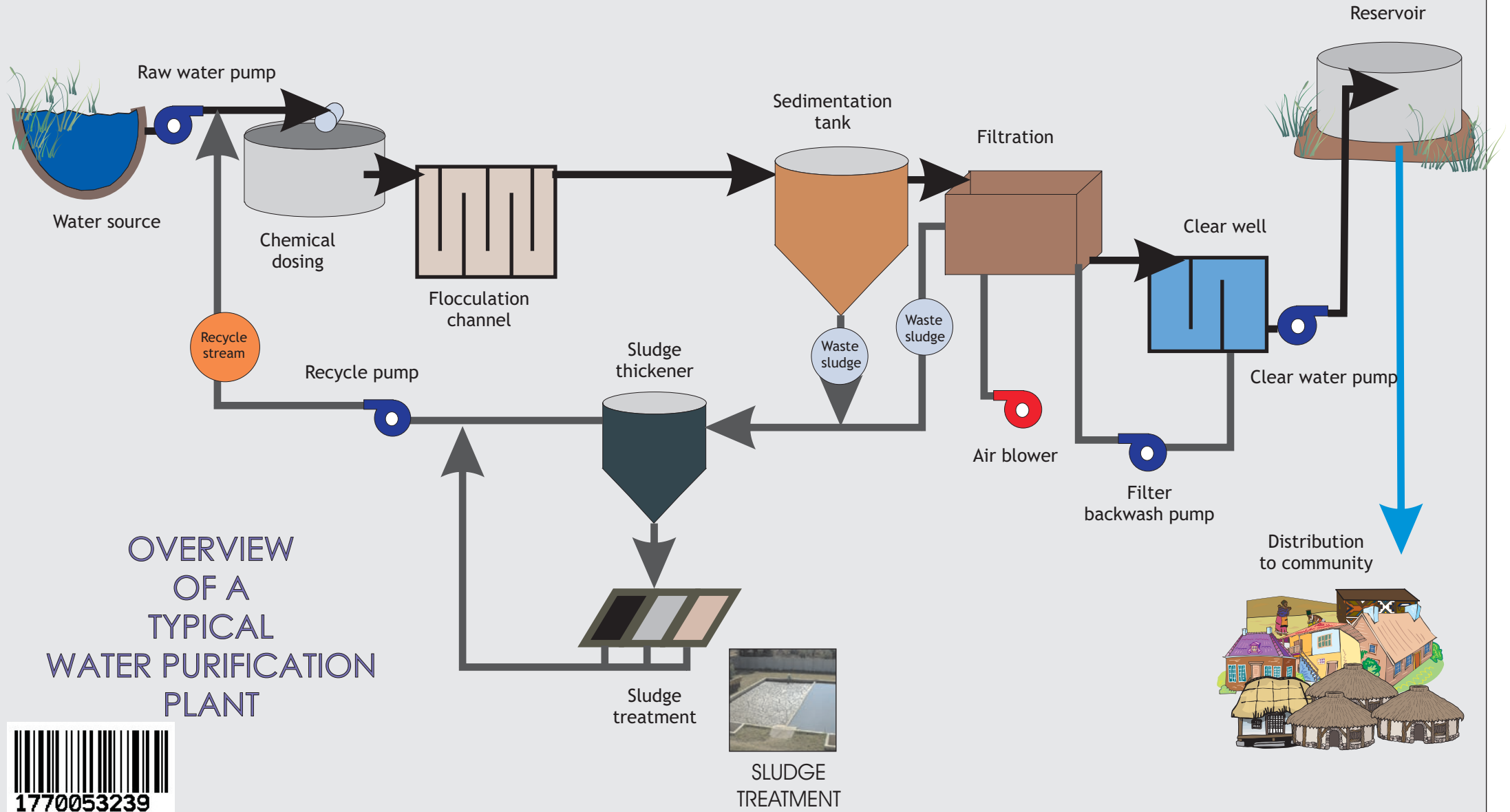
FILTRATION



DISINFECTION



STORAGE



# OVERVIEW OF A TYPICAL WATER PURIFICATION PLANT



SLUDGE TREATMENT



Distribution to community