EXtract retractable probe housings in the sugar industry

How a field crop becomes the finest white sugar

Before a sugar beet becomes a lump of sugar for coffee or fine crystal sugar for cake, a wide variety of different process steps are necessary. Often, the pH value must be precisely determined or set. But this is not only true for sugar production. In virtually every process step, by-products are obtained which are processed accordingly and are then used later, for example as fertiliser or feed.

At almost all pH measuring points in sugar production, but especially at those with high process engineering requirements (e.g. temperature, medium, etc.), it is possible to use retractable probe housings profitably. As a result, regular cleaning and maintenance of the installed pH sensors in the current process is possible, which is noticeable not only by a stable measurement signal, but also by an extended life cycle of the sensors used. In the sugar industry in particular, failures of installations and measurement technology during an ongoing campaign are a major nuisance. Depending on the process step, the following influencing factors are considered as special challenges: media-related formation of deposits, viscous and fibrous media, abrasive fluids with residues of sand and soil, and use of corrosive media. However, robust and maintenance-friendly EXtract retractable probe housings help the system operator to operate the pH measuring points with low interference and process reliability.

In principle, the production of sugar from sugar beet can be divided into 5 steps:

- Washing of delivered beets
- Carving of beets and production of raw juice
- Cleaning of the raw juice for obtaining thin juice
- Thickening of the thin juice into thick juice
- Crystallisation, centrifugation and drying

Furthermore, the processing and utilisation of the residual materials produced are carried out in the respective process steps. Thus, for example, the beet marrow remaining after the sugar has been removed from the beet is used as dry pulp or pellets for feeding cattle and pigs.

The molasses obtained at the end of the sugar production (viscous syrup with a proportional residual sugar) are used, among other things, in the production of yeast or bioethanol. The carbolime formed from the lime milk used in the process is applied to agricultural areas again as soil fertiliser. Waste water is mostly recycled and used, for example, for beet washing.

But back to the main process and thus to the actual sugar production. The five production steps already mentioned are therefore explained in more detail below:

Washing the delivered beets
The delivered beets are freed from adhering soil and sand by means of water. Stones and residues of damaged beets are also washed out. The cleaned beets are then processed either immediately or after short intermediate storage.

Carving the beets and obtaining the raw juice
In a cutting machine, the beets are comminuted by rotating knives into thin beet chips. These are then heated together with water to about 70°C. Due to this high temperature, the cell walls of the chips become permeable, as a result of which the sugar can be dissolved out by means of countercurrent methods in so-called extraction towers. This produces the so-called raw juice.

Cleaning the raw juice to obtain thin juice
In addition to the actual sugar, the raw juice also contains other ingredients which are largely separated off during the juice cleaning. This is done with the aid of lime milk and carbonic acid. The so-called non-sugars are deposited in this process step. During the process, the pH value of the medium is changed again and again. What remains is a clear, pale yellow liquid – the thin juice.

Thickening the thin juice into thick juice
In a multi-stage evaporation process, water is removed from the thin juice until a viscous syrup with a dry substance content of about 70% is formed. This "thickening" creates the golden brown thick juice.

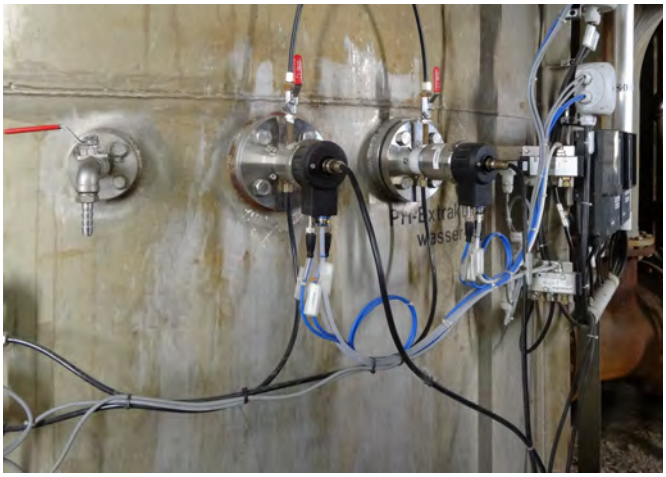
Crystallisation, centrifugation and drying
The thick juice obtained is now further concentrated by gentle boiling. In this case, an underpressure prevails in the process in order to prevent caramelisation and thus discoloration of the sugar. From a certain ratio of water to sugar, crystallisation begins. When the crystals have reached a defined size, the cooking mass is drained off for cooling and further crystallisation. This "crystal slurry" is kept in motion constantly by agitators. The sugar crystals continue to grow during this time.

Finally, the separation of the sugar crystals from the viscous syrup takes place by means of centrifuges. The cleaning of crystals with water steam produces white sugar. This is then dried and stored in silos for further processing. For example, by dissolving the crystallised white sugar, then filtering it and crystallising it again, a particularly pure and high-quality sugar, the refined sugar, is produced.

Which retractable probe housings can be used where?
EXtract retractable probe housings can be used in almost all the manufacturing steps described. Particular attention must be paid to the respective requirements for temperature, media resistance, process medium and immersion length.

The pneumatically actuated armature EXtract 810 and the manually actuated armature EXtract 810M have proven themselves in the sugar industry. Depending on the process medium, either tap water or condensate present in the process can be used to clean the pH sensors used via the rinsing chamber of the retractable probe housing. The main advantage of the EXtract series of fittings is the low wear of the sealing O-rings due to a short travel path of the armature of only 36 mm. With its integrated PTFE scraper, the EXtract 810 in particular offers an even greater resistance in processes with increased requirements.

If individual armatures are to be automated, it is possible to equip the EXtract 810 with inductive limit switches, as an alternative to the pneumatic feedback units. The automatic control unit EXmatic 470 can also be used, which enables appropriate feedback to a superior control system if required, as well as independently controlling the complete cleaning process and the retractable probe housing.



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