DEVELOPMENT ON CATALYTIC DEACTIVATION STUDY IN COMMERCIAL RFCC CATALYSTS

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ADNOC REFINING

AGENDA

- RFCC UNIT AT RUWAIS
- RFCC CATALYST
- COMMON CATALYST DEACTIVATION PROTOCOLS
- BASIS OF THE NEW APPROACH.
- SUMMARY

ADNOC REFINING RFCC UNIT

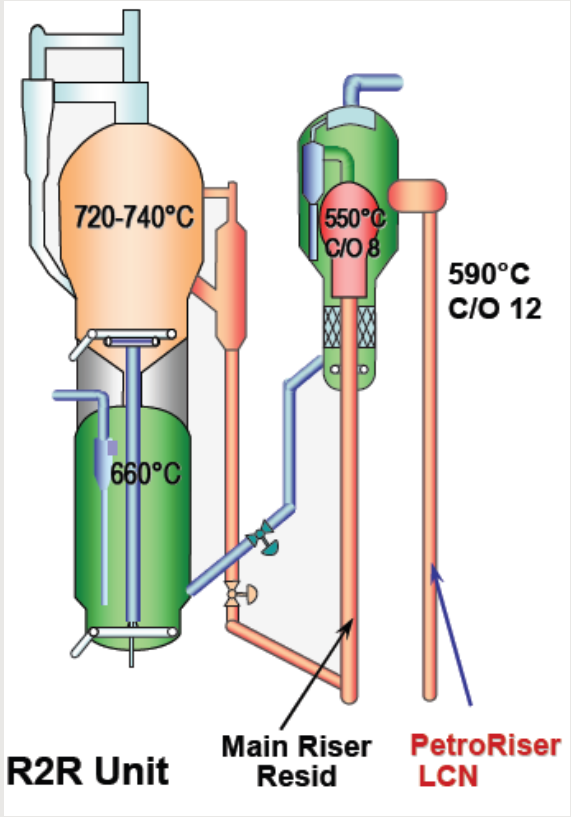
- Ruwais refinery, Abu Dhabi
- Resid to propylene technology, R2R technology
- 127,000 BPSD
- PetroRiser recycling LCN
- Atmospheric Residue,

  API=21,

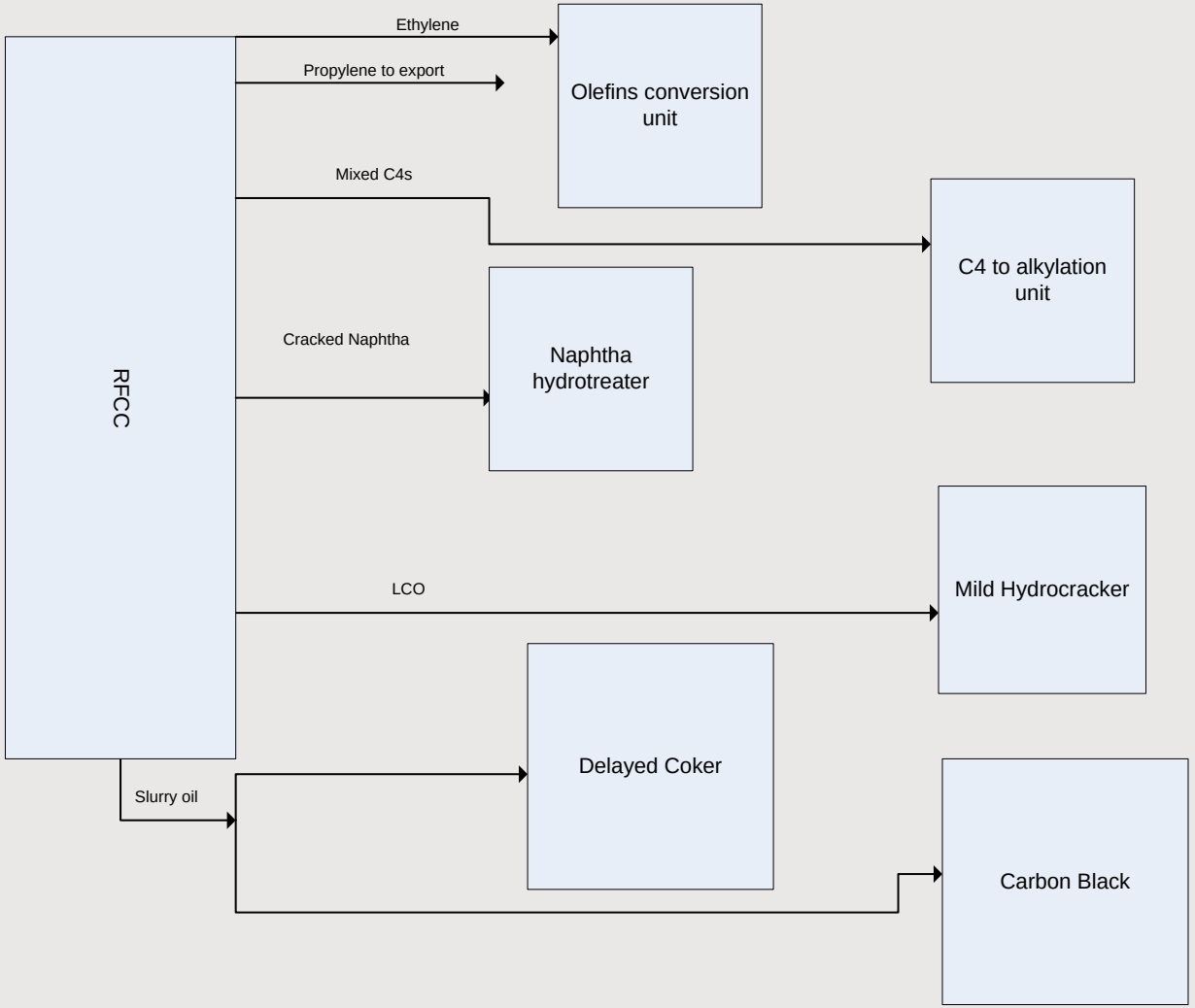
  CCR=4.7 %, S = 1.7 wt%

  Nickel:7 ppmw

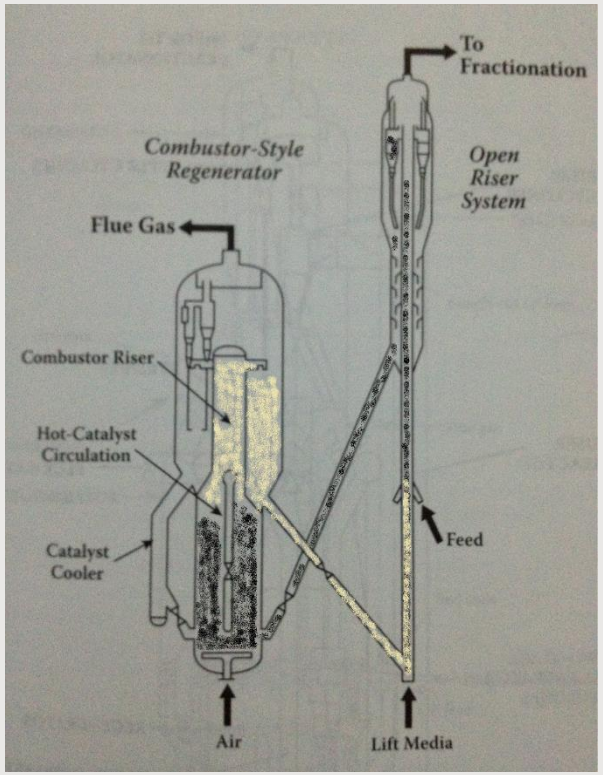
  Vanadium:11 ppmw

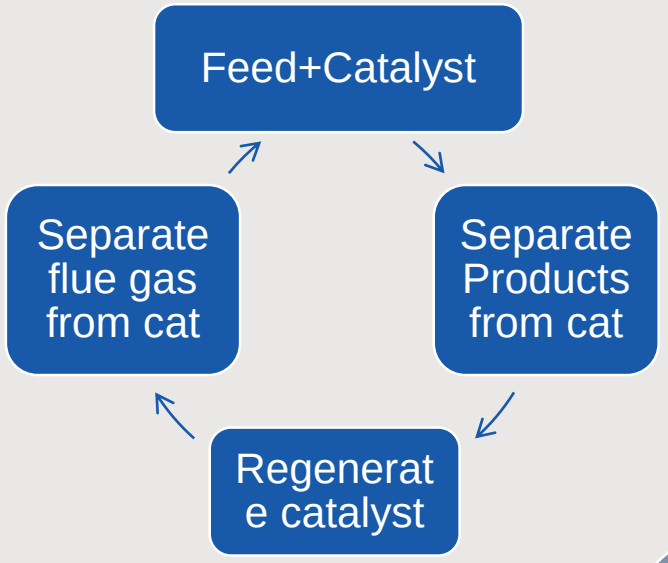


RUWAIS REFINERY RFCC DOWNSTREAM UNITS

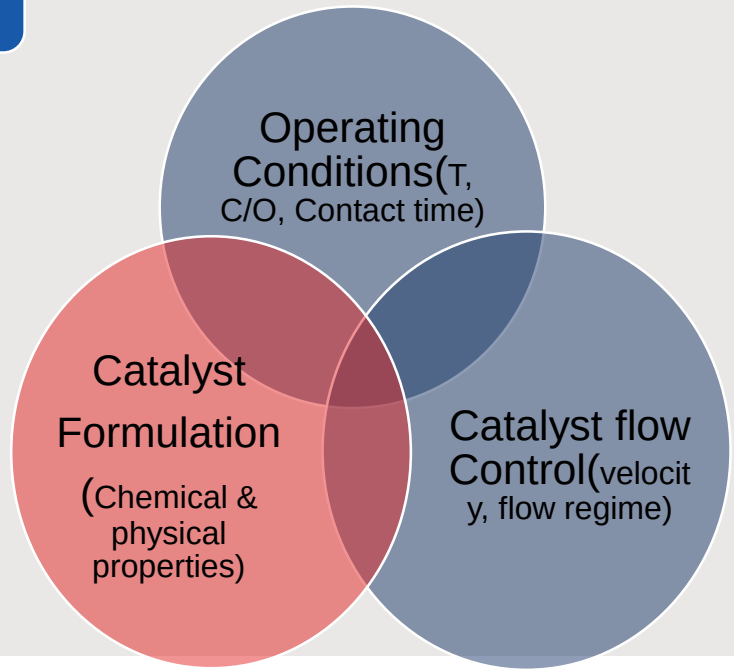


RFCC OPERATION

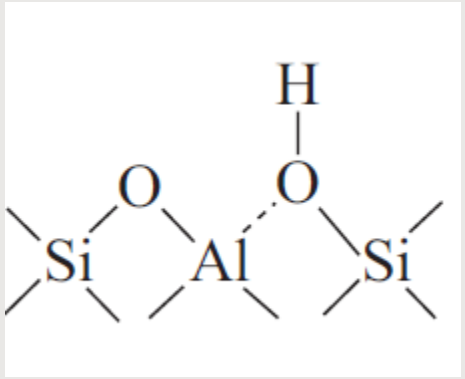


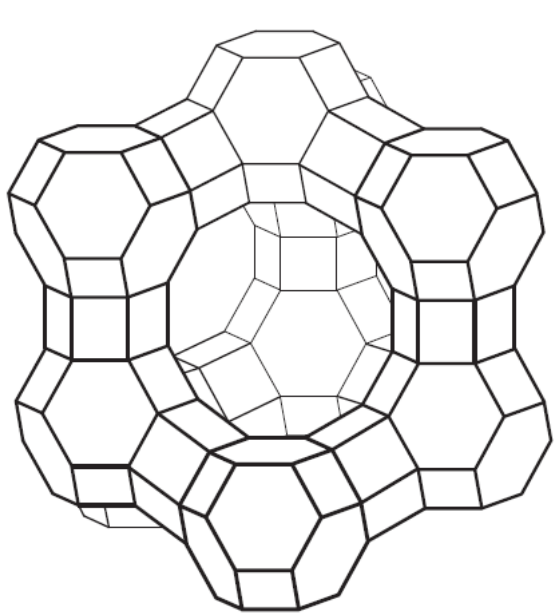


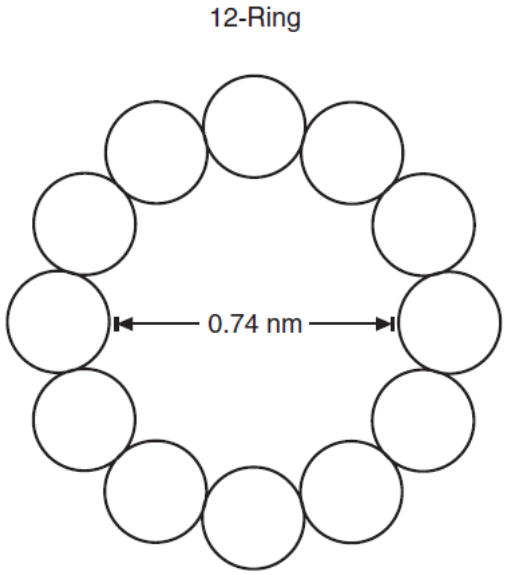
To Achieve max target of Product



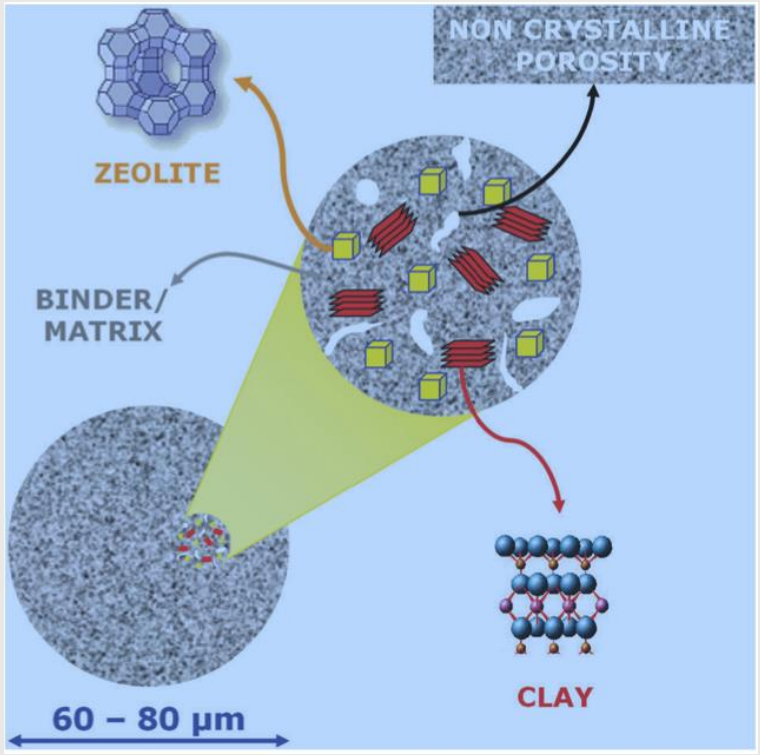
RFCC CATALYST

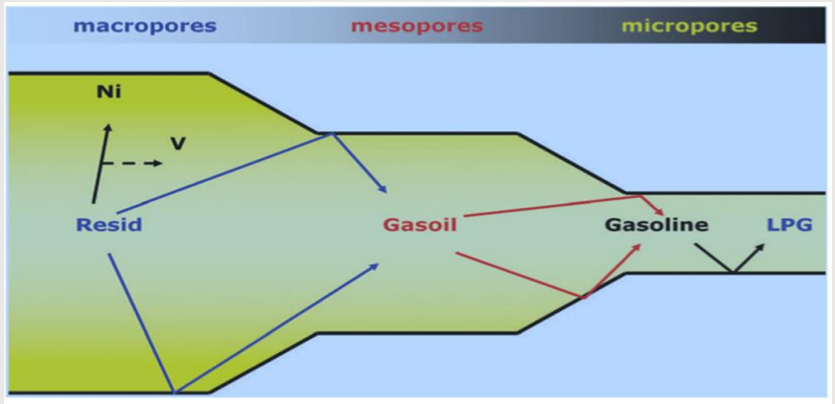






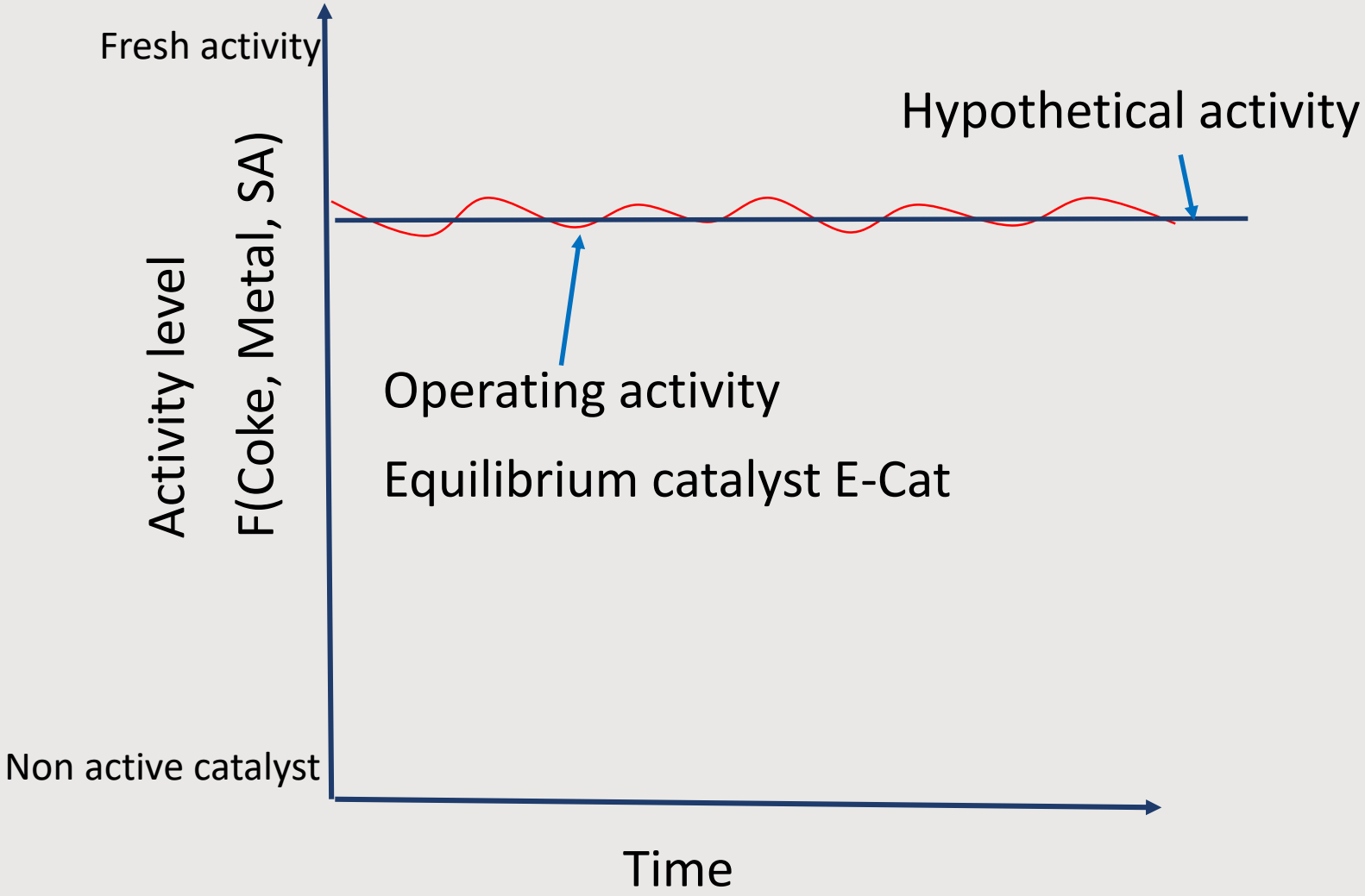
Hagen, J. (2015). *Industrial catalysis : A practical approach*



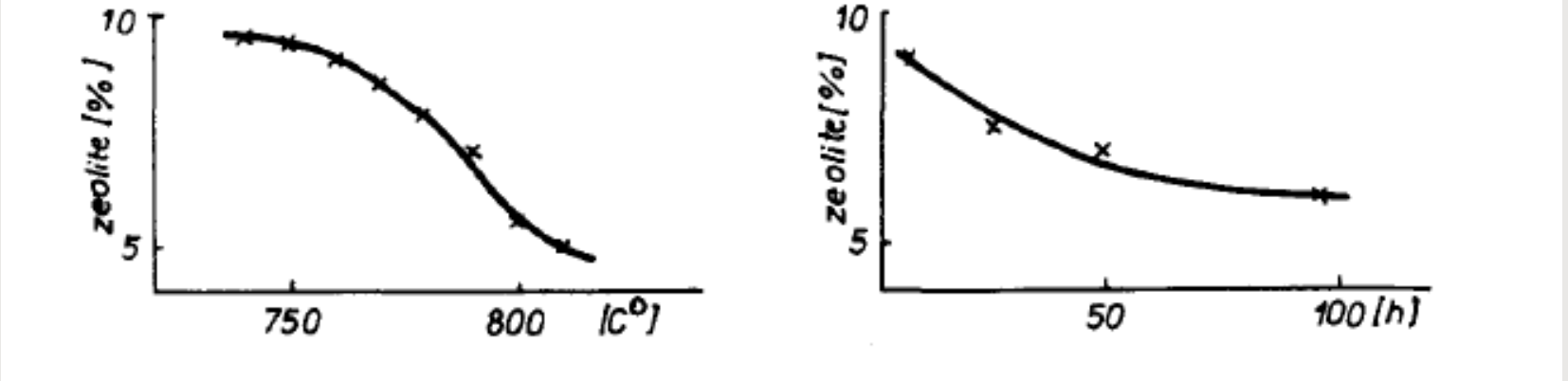


Hierarchical pore structure in a RFCC catalyst

ACTIVITY OF RFCC CATALYST



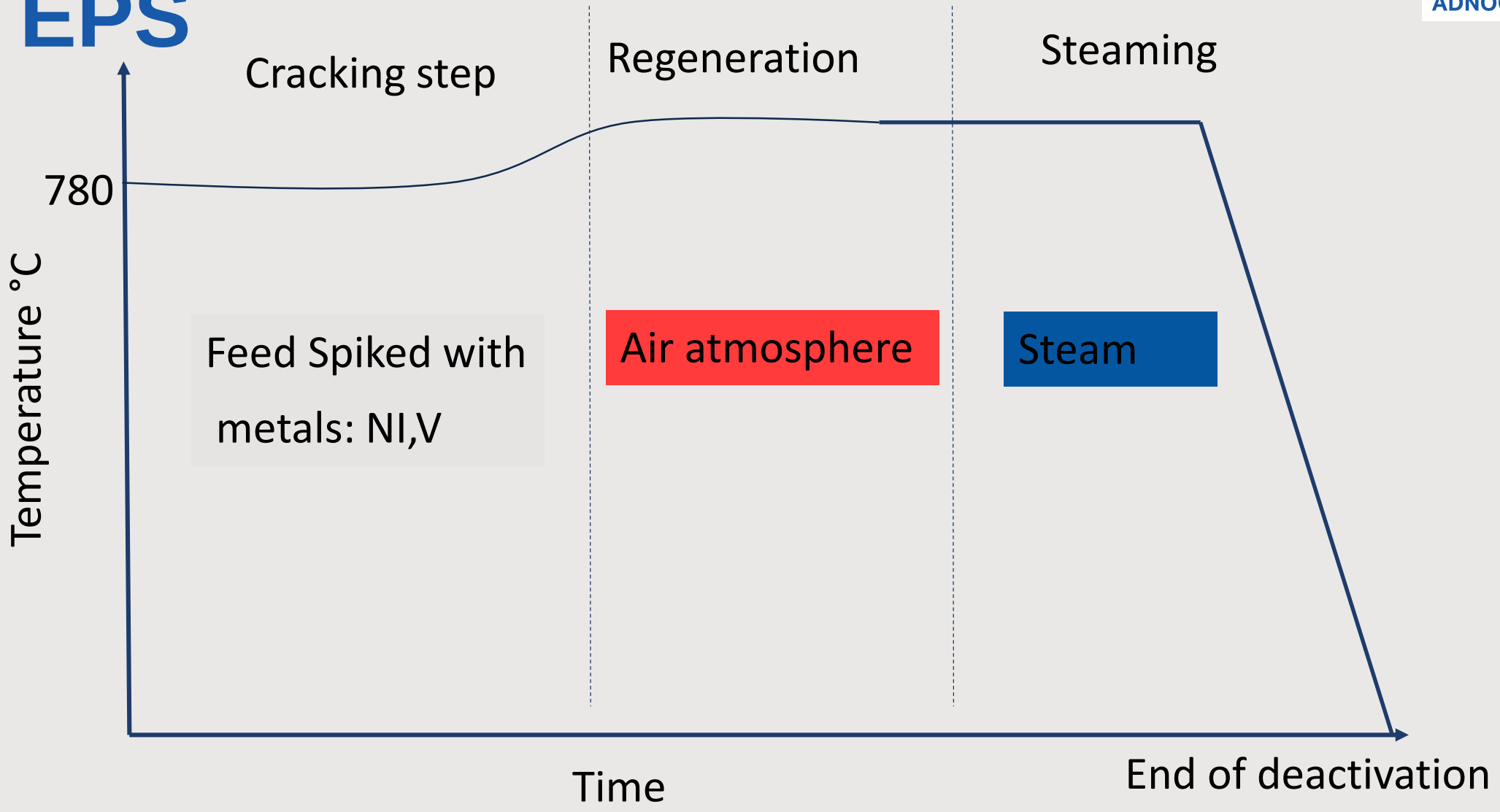
TEMPERATURE VS TIME



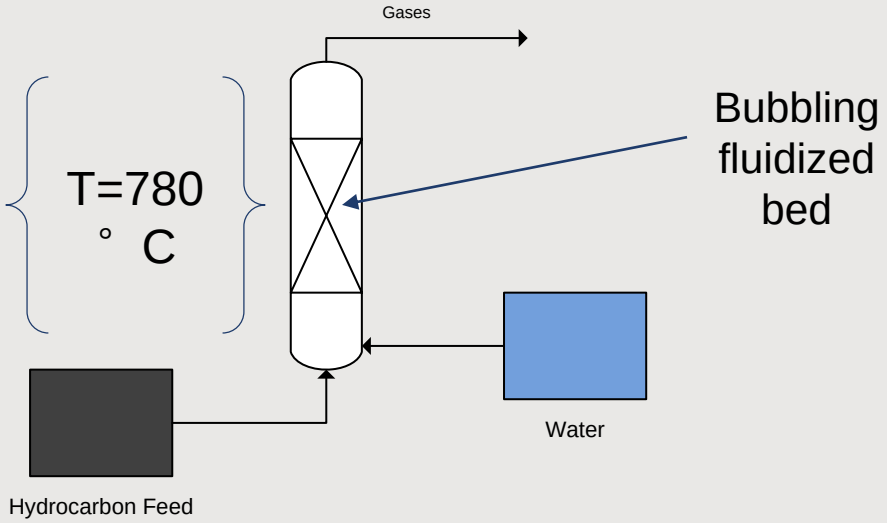
It is commonly practiced to increase the deactivation temperature to simulate the aging effect.

B Darjaz. "Studies in Surface Science and Catalysis." *Elsevier* 24 (1985)

DEACTIVATION STEPS



DEACTIVATION EQUIPMENT



Findings:

At certain level of concentration catalyst can not take up the metals.

Clusters form at the inlet of the reactor.

DEACTIVATION

Standard Protocol

Base catalyst Metallation at 780 ° C and steaming at 800° C for 6 hours

+

Olefins Additives Steaming at 800 ° C for 20 hours

→

Deactivated catalyst for testing kinetics

Modified Protocol

Base catalyst Metallation at 650° C and steaming at 800° C for 6 hours

+

Olefins Additives Steaming at 800 ° C for 20 hours

←

Deactivated catalyst for testing kinetics

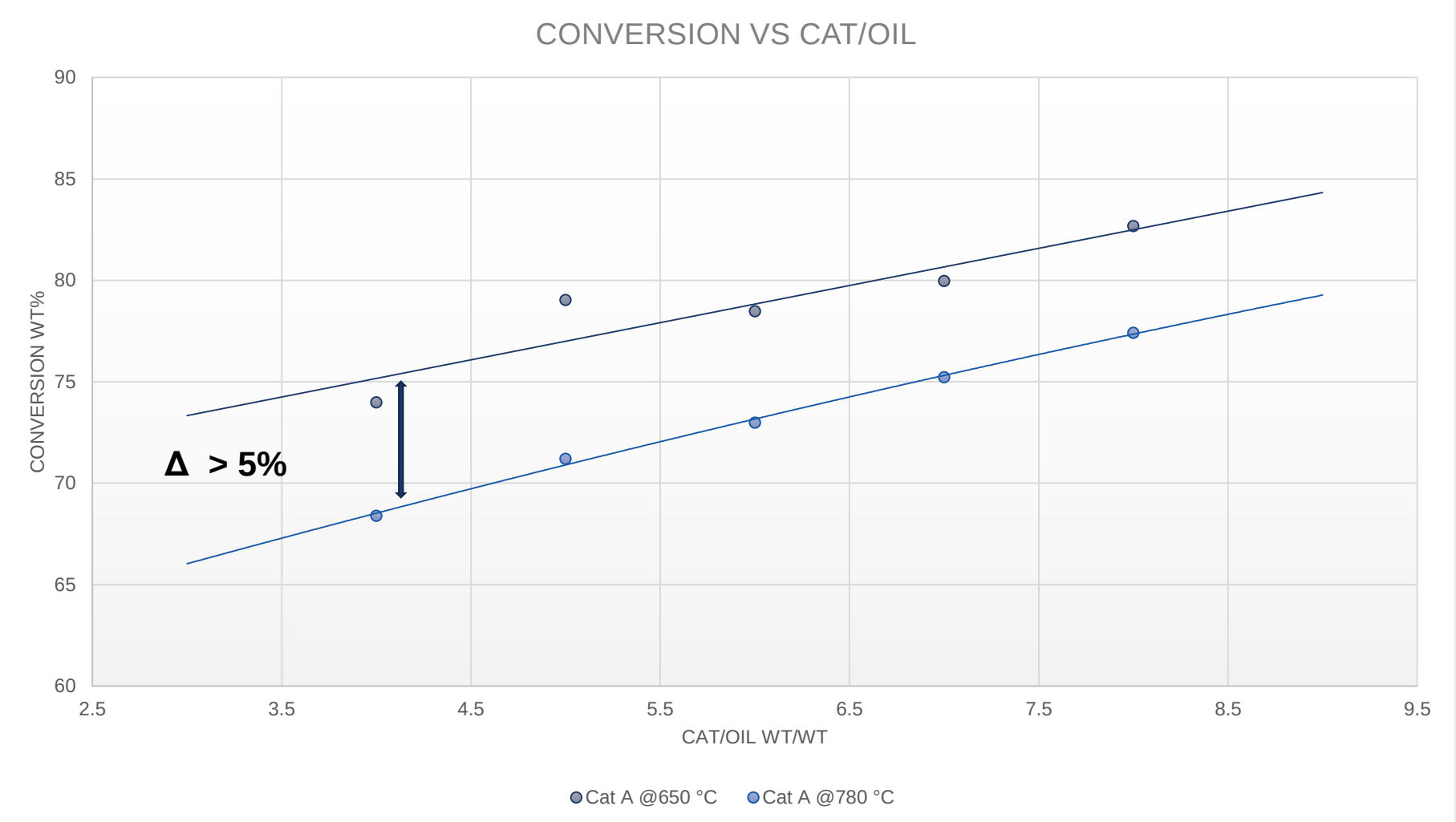
EVALUATION OF CATALYST

Evaluation Unit
Advanced Cracking Evaluation

Evaluation Conditions

Catalyst Bed	Fixed fluidized Bed
Reaction Temp	550 ° C
Cat/Oil	4-9
WHSV	8
Contact time	< 3 seconds

TEMPERATURE EFFECT



SUMMARY

- Effect of cracking temperature is dominant in deactivating the catalyst.
- Wet metallation at low temperatures will give Lower deactivation effect. On the contrary increasing temperature too high will agglomerate metals.
- It is found that cracking at low temperatures better simulate metal distribution of E-Cat.

THANK YOU