

# Overcoming the Detrimental Effects of Inorganic Salts in Crude Oil

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## Overview

Crude oil extracted from hydrocarbon reservoirs contain inorganic salts that are detrimental to the oil refining process. Salt content can be measured with the Standard Test Method for Salts in Crude Oil (ASTM D3230) and must undergo desalting before the crude oil can enter distillation.

## K23060 Salt in Crude Analyzer

The Koehler K23060 Salt in Crude Analyzer is able to determine the salt content within crude oil. It does so by measuring the conductivity of a crude oil solution in a polar solvent when subjected to an alternating electrical current. Salinity is obtained by comparing the resulting conductance to a calibration curve of known salt mixtures.



## ASTM D3230

To prepare a sample solution for the procedure stated in ASTM D3230, add 15 mL of xylene and 10 mL of crude oil to a 100 mL graduated, glass-stopper cylinder. Make up to 50 mL with xylene and shake the cylinder for 60 s. Dilute the mixture to 100 mL with mixed alcohol solvent and shake for 30 s. Let the solution rest for 5 minutes before transferring to a dry test beaker for testing.

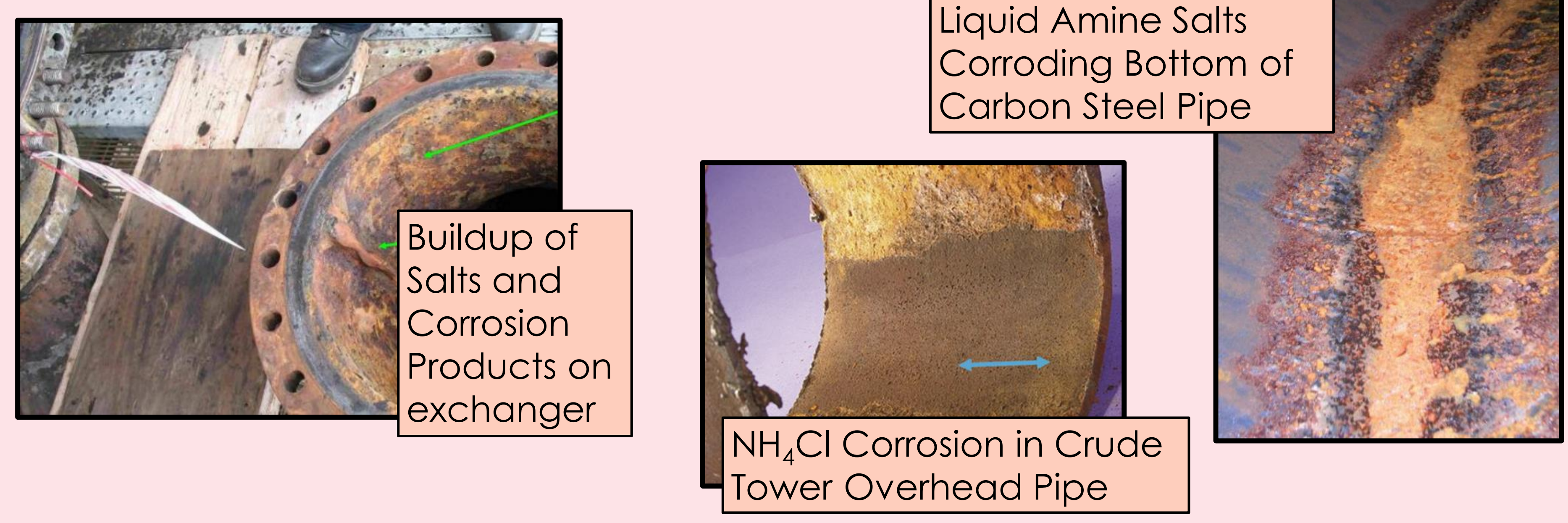


## Acknowledgements

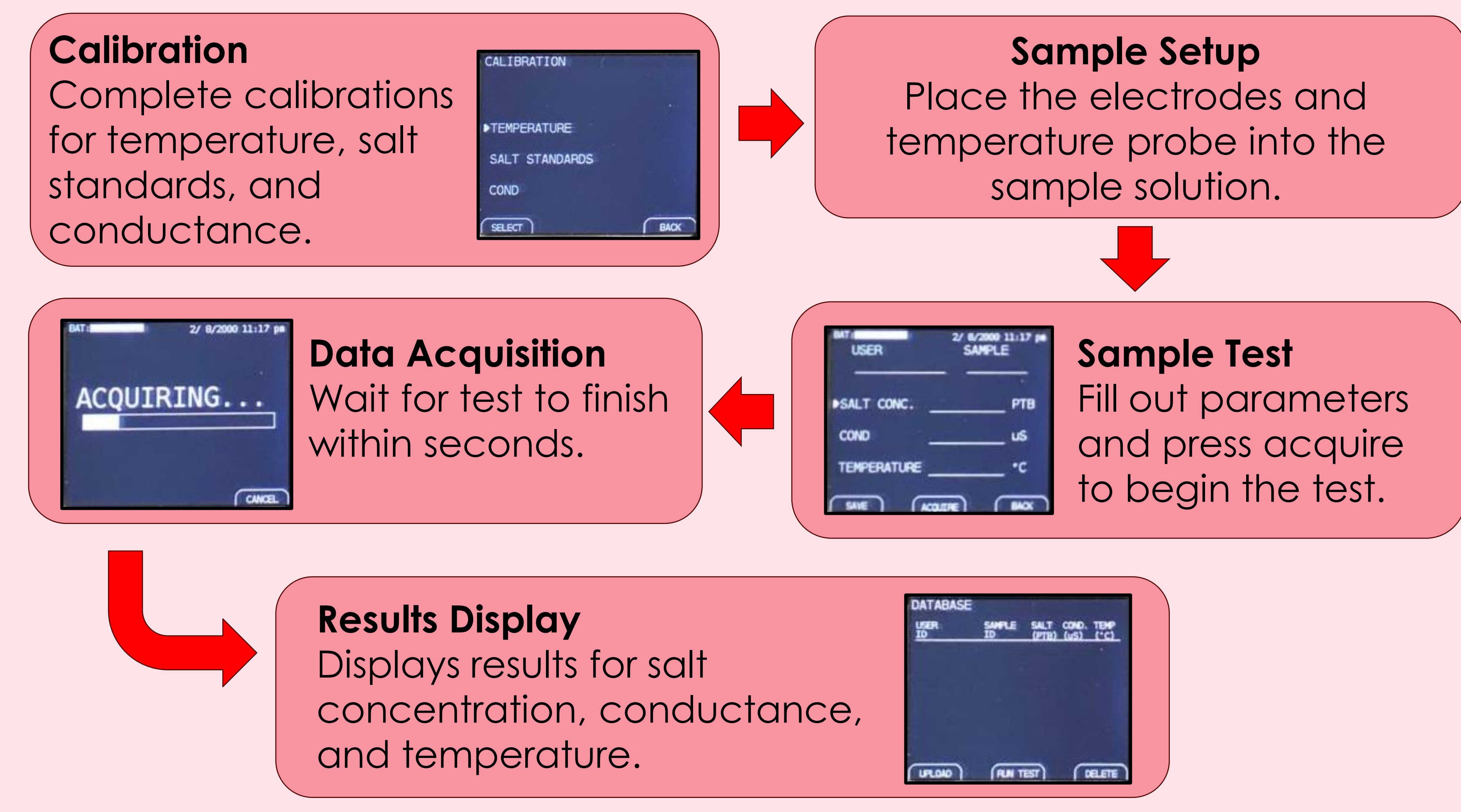
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## Problem

The existence of dissolved or suspended salts in crude oil can give rise to significant complications during the petroleum refinery process such as fouling and scaling in pipelines and heat exchangers, as well as catalyst poisoning. The presence of chloride salts in downstream processes can cause corrosion to refinery pipelines and equipment due to the formation of hydrochloric acid. Neutralizers, such as ammonia and organic amines are utilized in chloride control but can lead to under deposit corrosion in overhead systems from  $NH_4Cl$  or amine-HCl formation.



## How The K23060 Works



## References

**ASTM D3230-10** "Standard Test Method for Salts in Crude Oil (Electrometric Method)," ASTM International.

**Amit Patel** "Corrosion Potential – Refinery Overhead Systems," *OLI Simulation Conference*, ConocoPhillips Company, 16-18 Nov. 2010.

**Mahajanam, Sudhakar, et al.** "Underdeposit Corrosion in Crude Tower Overheads," *Materials Performance Magazine*, 31 Jan. 2019.

**Modcon** "Salt Content Monitoring," Modcon Systems LTD.

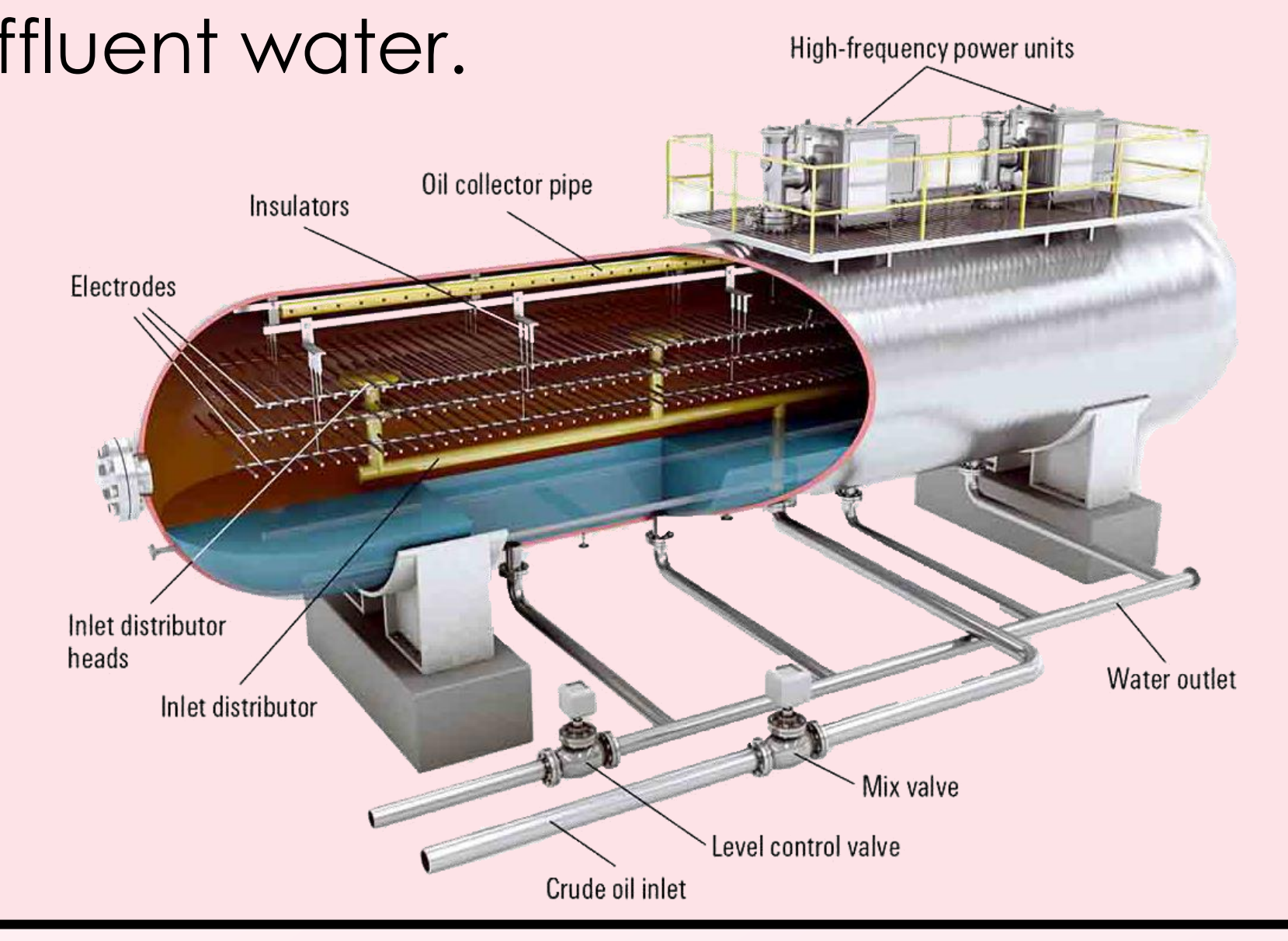
## Data

Sample solutions of crude oil in a mixed alcohol solvent at fixed salt concentrations were tested for their salt content with the Koehler K23060 unit after temperature, conductance, and salt calibration.

Sample Concentration (PTB)	Koehler K23060 (PTB)
0	0
1	1.18
3	3.01
5	5.05
10	10.76
16	16.23
21	21.24
26	26.54
31	31.64

## Desalting Process

If the salt content of a crude oil exceeds the desired salt concentration, it is crucial to desalt the solution. The desalting process involves preheated crude being mixed with fresh water before entering the desalter, where electrostatic fields separate the mixture into desalted crude and effluent water.



## Conclusion

The wide range of problems caused by excess salt content in crude oil necessitates the measurement and removal of inorganic salts to meet industry standards. The Koehler K23060 Salt in Crude Analyzer can determine salt concentration in a crude oil sample, in accordance with ASTM D3230, in a quick and reliable manner to prevent complications with equipment or yield during the refinery process.