

Optimising CDU desalter processing with interface control

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Agenda



- 1 Introduction**
- 2 CDU challenges**
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**Giving your operations perspective to deliver
invaluable insights that enable process
optimisation and reduce risk**

Desalting process challenges

Flexibility - inability to diversify crude feedstock

Unit efficiency - environmental compliance and emissions reduction

Corrosion - fouling and damage to overheads and downstream equipment

Control - unplanned trips and shutdowns, increased costs and lower operating margins

Chemical usage - impurity removal and emulsion or chemical control

Knock on effects - impact on distillation and FCC yields

A solutions based approach to your needs



Using our products and services to increase customer value

- Holistic view of processor operating challenges
- Using our proven services and technology
- Deploying the appropriate solution
- Ongoing service and support



First principles

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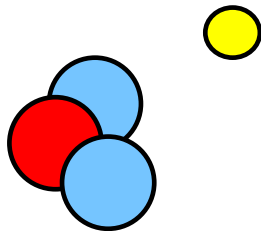
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What is ionizing radiation?

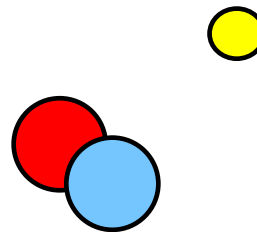
Matter consist of tiny particles which are atoms

Atoms with the same number of protons and different number of neutrons are isotopes

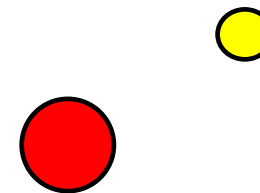
Many isotopes are unstable, they become stable through changes in the nucleus, known as radioactive decay



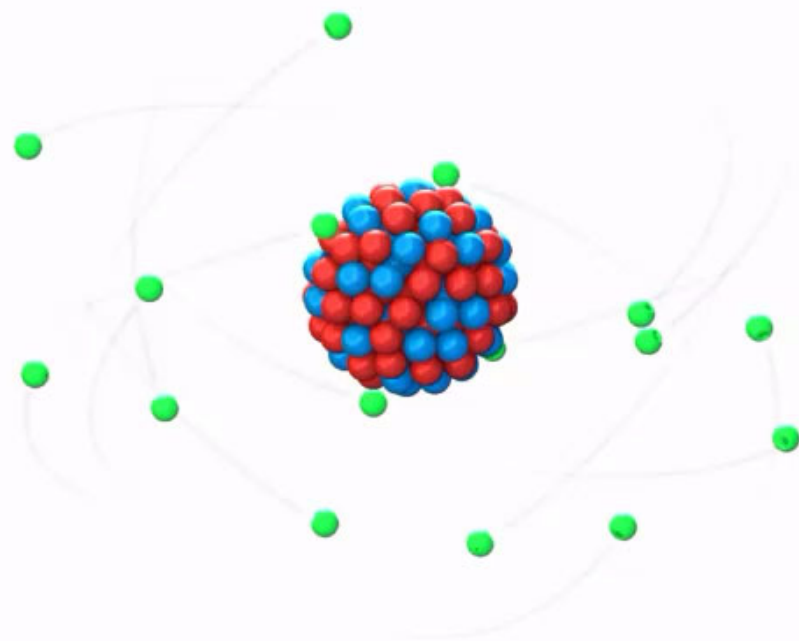
Hydrogen (H-3)
[Tritium]
Radioactive



Hydrogen (H-2)
[Deuterium]
Stable



Hydrogen (H-1)
Stable





Profiler™

Reliable multi-phase
control, in real-time

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Profiler™



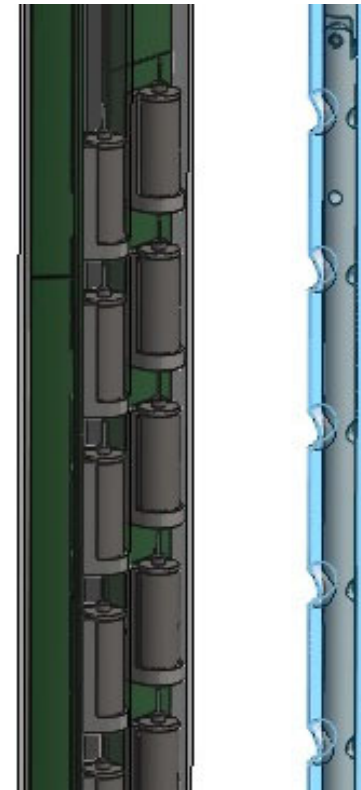
High resolution Geiger-Müller

- Combined bulk level, multi-interface and density instrument
- Industry leading high resolution measurement
- Real-time operator data
- Wide range of operating temperatures
- Analogue and digital outputs
- Low maintenance
- Bespoke design solution to suit exact need

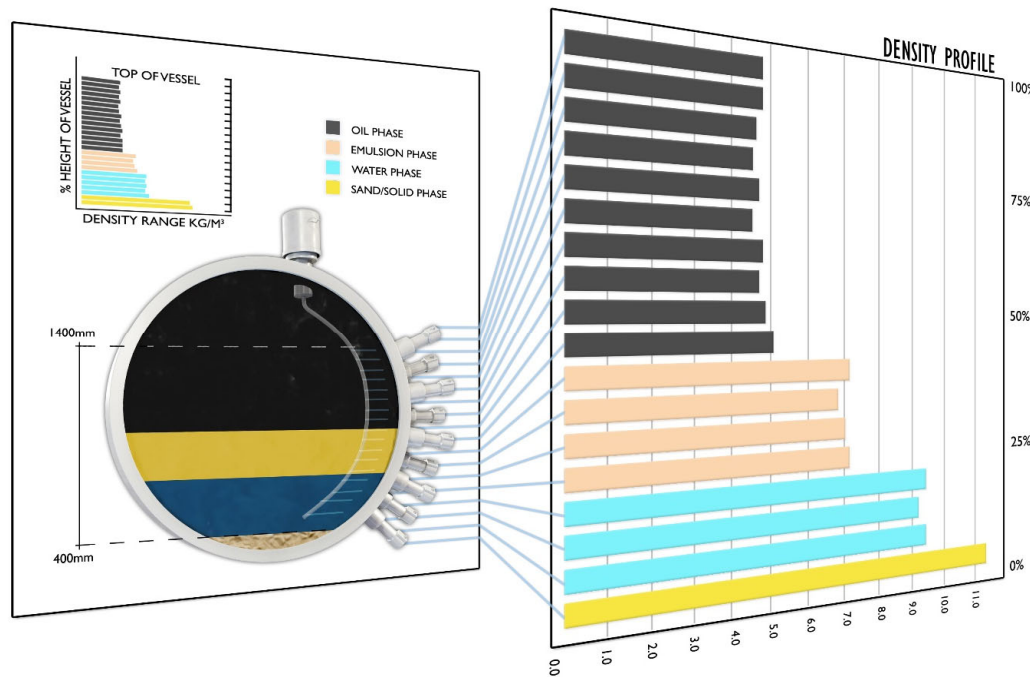
Bespoke design

Completely customisable

- Designed in accordance to process and vessel conditions
- Range of resolutions available
- Density accuracy to suit application
- Multiple control architectures available, including SIL2



Conventional “profiling” method

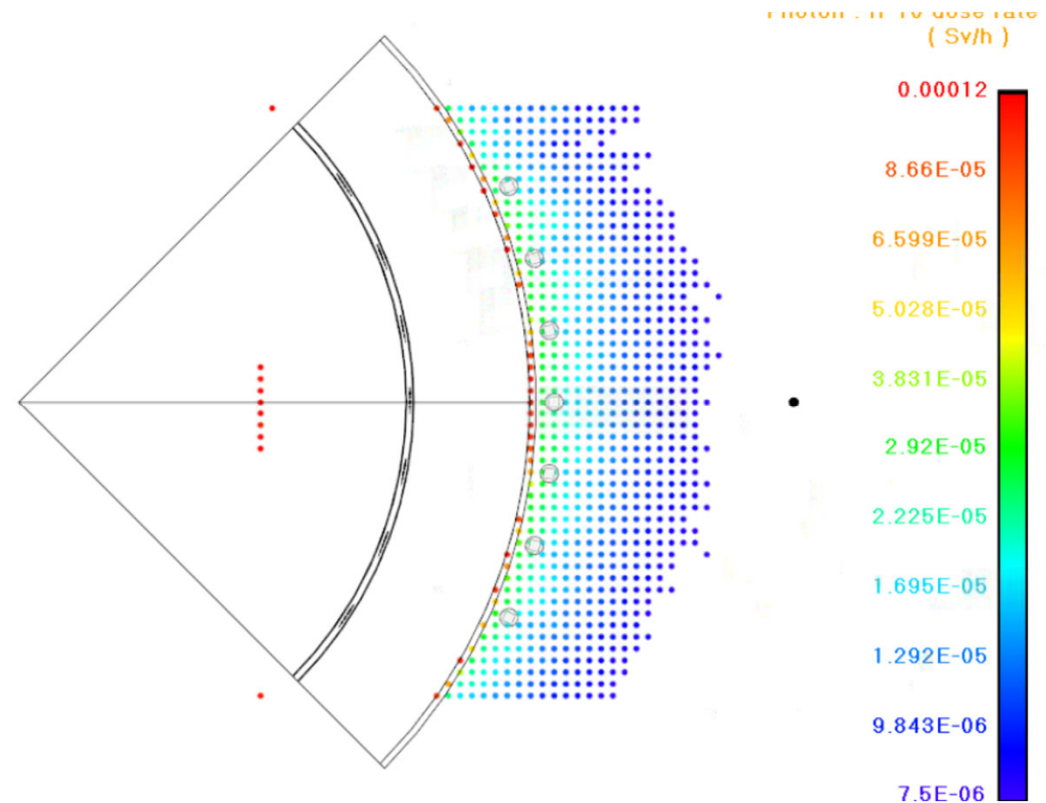


- Installation costs are high as there are external mounting structures
- Detector spacing typically 6 inches; low resolution
- Single detector failure affects entire system
- Collimation adds weight
- Effected by radiography

Radiation safety and operation - external detectors

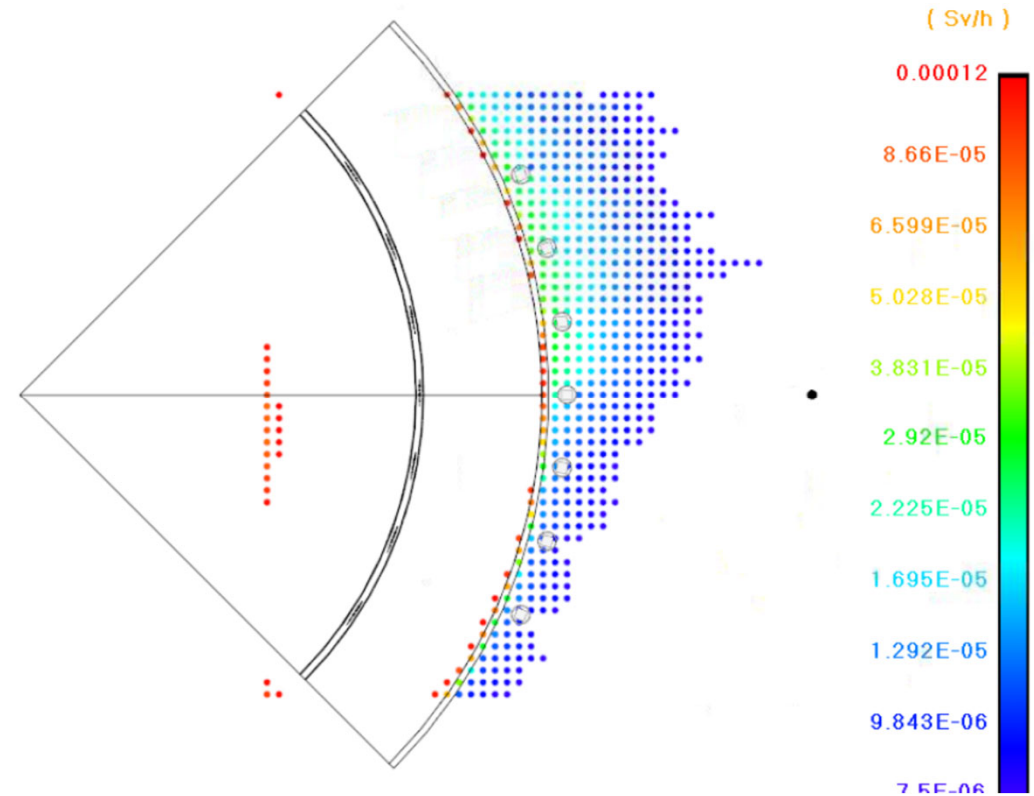
Oil

For the external system to work correctly, there must be a dose rate in oil, sufficient so that the interfaces can be differentiated between when the measured density changes.



Interface

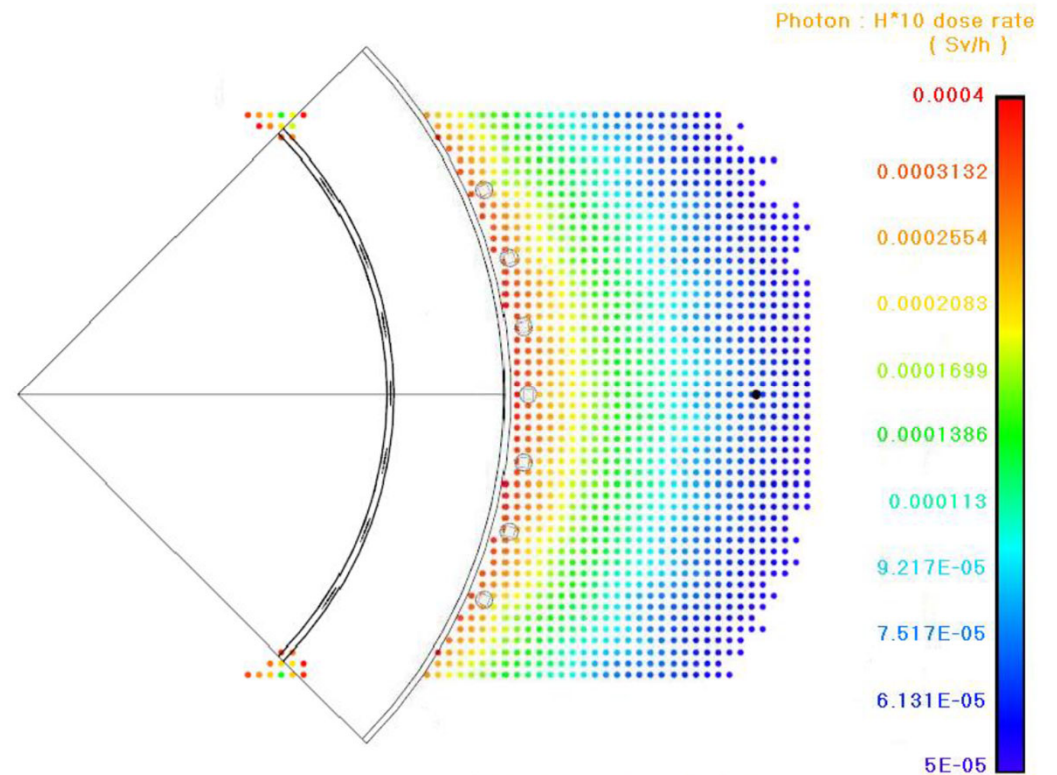
When we introduce an interface, we can see water attenuates more of the radiation as it is denser than oil ($\approx 1000\text{kg/m}^3$ vs $\approx 800\text{kg/m}^3$). The detectors measure this difference and give an output.



However...

Air

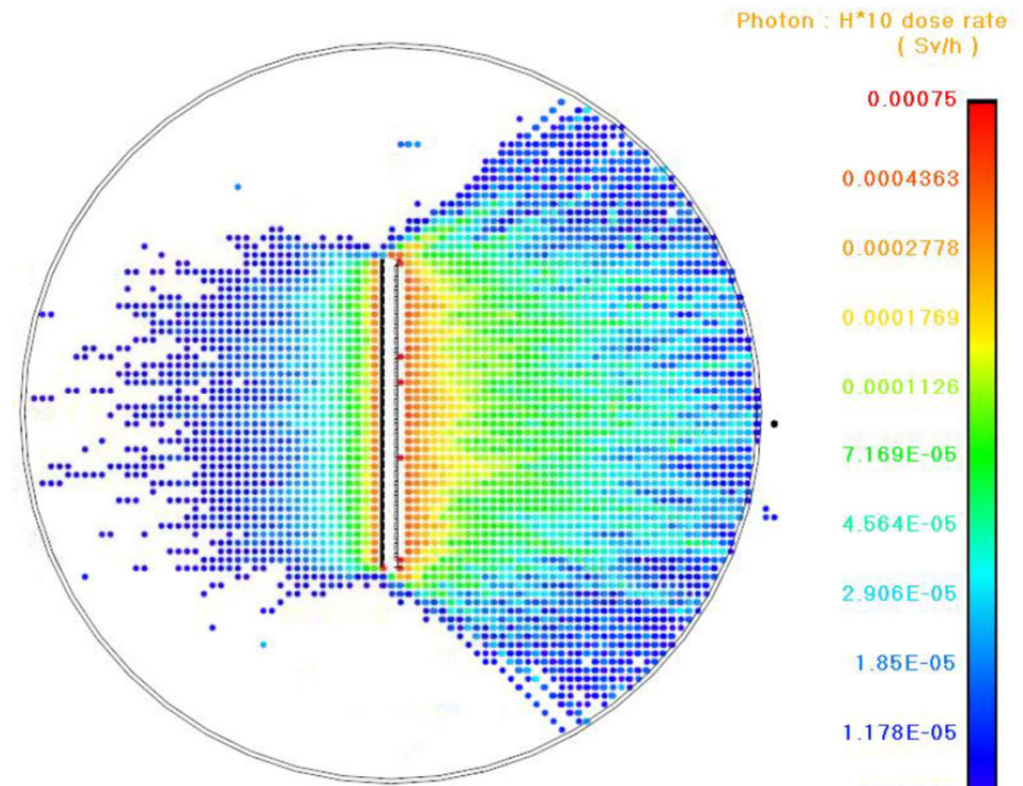
When air is introduced into the measurement range, the dose rates can exceed 400 μ Sv/hr on the wall and 60 μ Sv/hr at 1m (+155%) higher than allowable (7.5 μ Sv/hr@30cm)



Radiation safety and operation - Profiler™

Air

As the Profiler™ measures level and interface internally over a short path length (source-detector), it has no dose external to the vessel regardless of process conditions or measurement range.



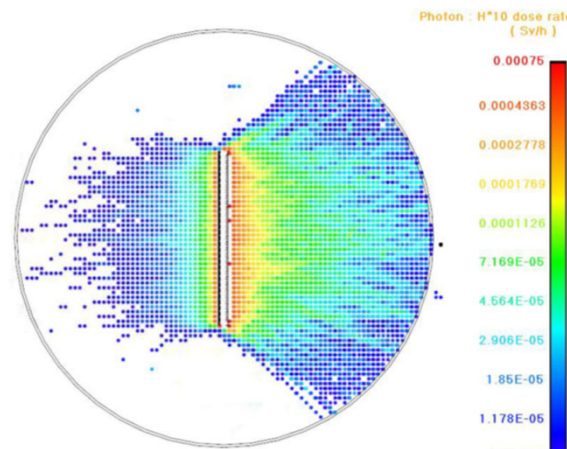
Profiler™ safety comparison

Internal sources and internal detectors

When we look at using low energy gamma (Profiler™) vs higher energy for external detector systems, we see Profiler™ results in no additional dose the surface of the vessel. For the external system to work correctly, there must be a dose rate in oil so that the interfaces can be differentiated between.

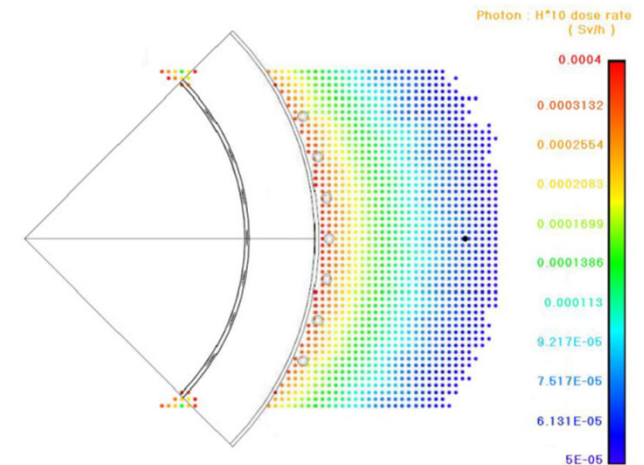
It is also important to note that the external detector system cannot perform with respect to high accuracy when the vessels are not flooded. This requires reducing the activity of the sources that would normally be in air as to avoid high dose rates externally and if the interface level increases, the activity is not high enough to differentiate between oil and water.

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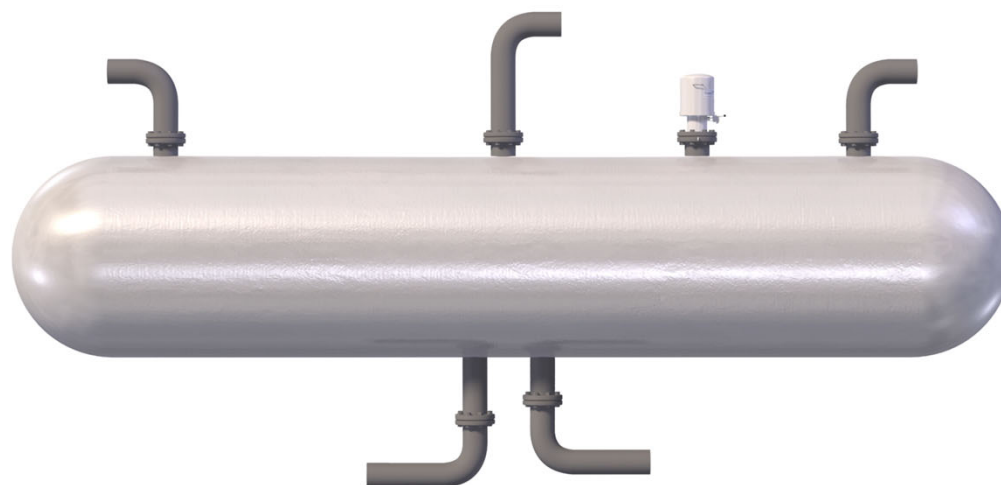
Profiler™

When air is introduced into the measurement range, the dose rates can exceed 400μSv/hr on the wall and 60μSv/hr at 1m (+155%) higher than legally allowable (7.5 μSv/hr@1m)



External

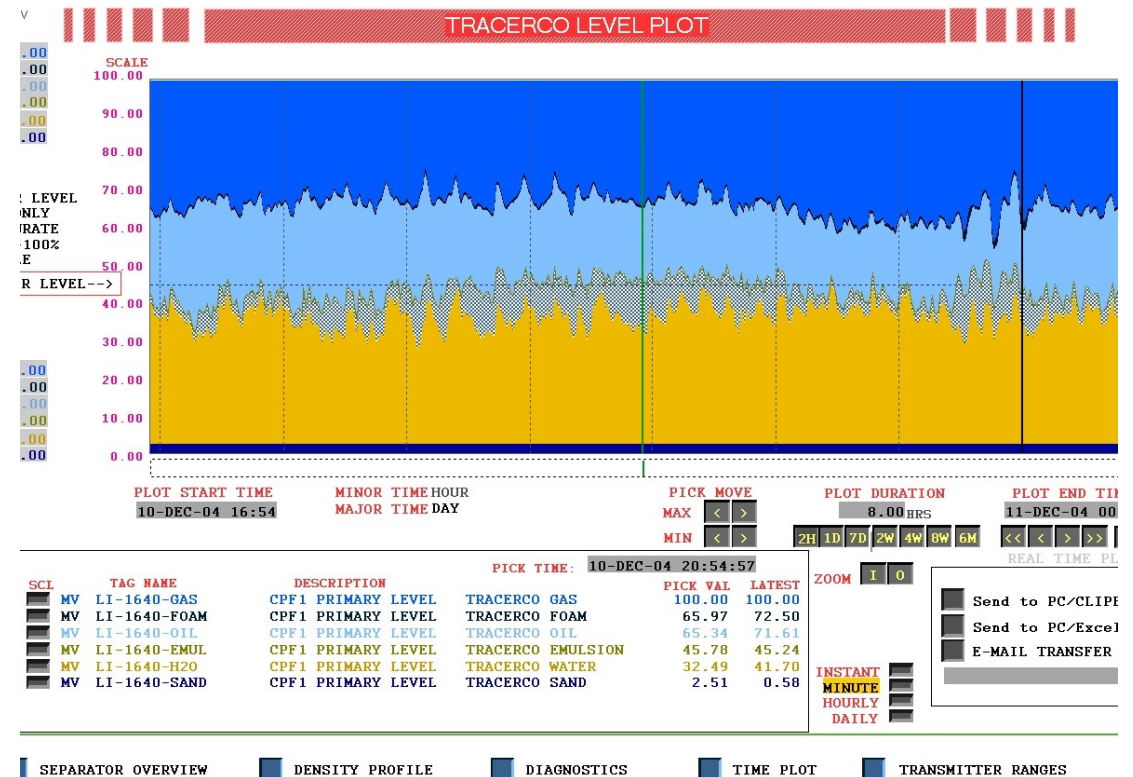
Radiography resilient





Operator visualisation

- Control from one central location with accurate overview of plant
- Real-time alarms enable quicker reaction in the event of anomalies
- Real-time and historical density and level data is recorded to offer enhanced diagnostics
- Effective management and operation of instrument and plant
- Reduced installation cost





Process review

A client focused, solutions
based approach

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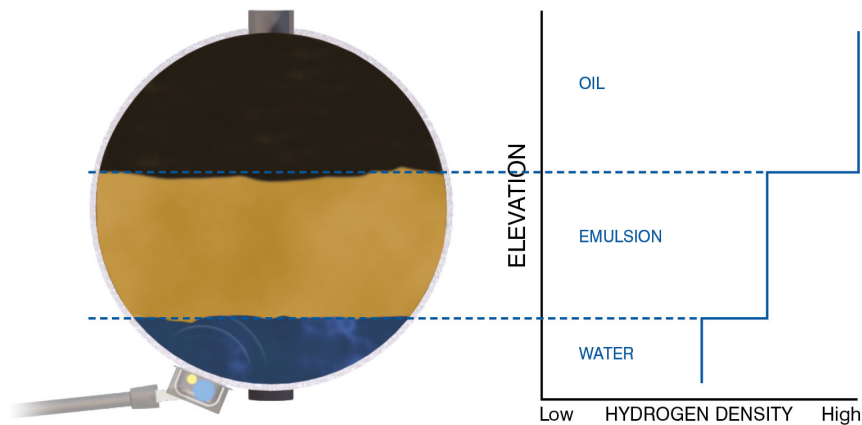
Onsite, on demand scanning services

- Level, interface and emulsion measurement in vessels
- Deposit/vapour profile in pipelines
- Foam heights in tower downcomers
- Liquid levels in tower distributors, chimney trays and draw sumps
- Levels in reboilers/heat exchangers

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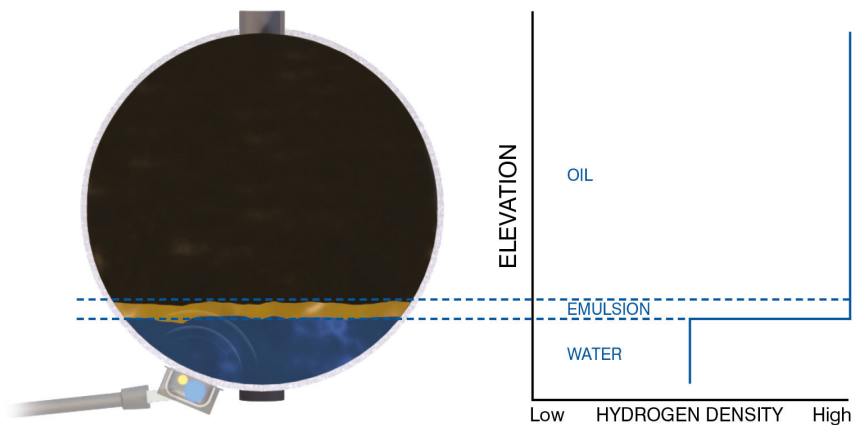


Actual operation



- The malfunctioning level transmitters led to carryover of emulsion and chlorides in the oil stream to the distillation columns, in turn corroding overheads due to increased chlorides
- There was also carry under of oil in water affecting wash water purity and environmental non-conformances

Optimal operation



- Clean, defined interface
- Within operating parameters
- Visualisation of emulsion for control

Preliminary findings

Control

Poor level control
from existing RF
probes

Carry-over

Carry-over of
emulsion (H_2O ,
NaCl) in the oil
stream to the
distillation
columns

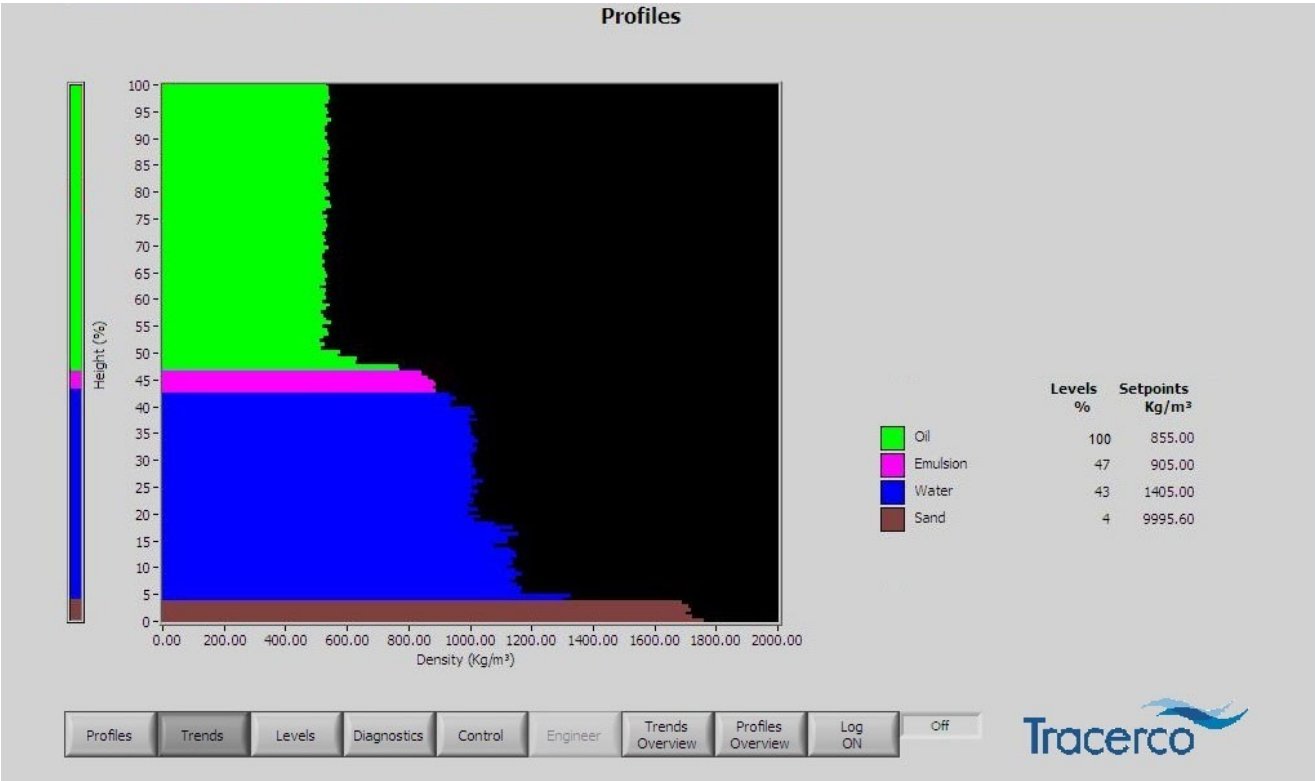
Carry-under

Carry-under of oil
in water affecting
wash water purity
and environmental
nonconformances

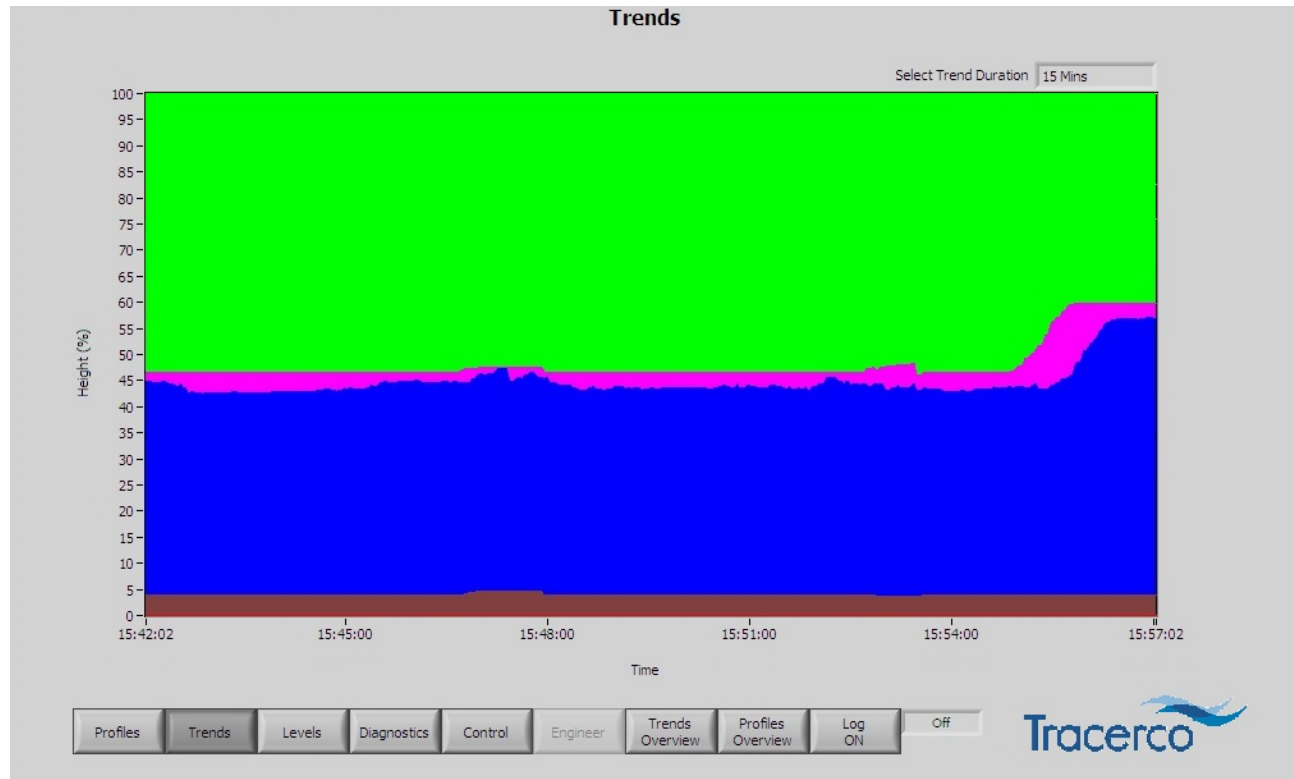
Corrosion

Corroding
overheads due to
increased
chlorides

Real time monitoring and control



Historical trending



Summary

Enhanced understanding
of process

Reduced corrosion

Reduced demand on
distillation pre-heat

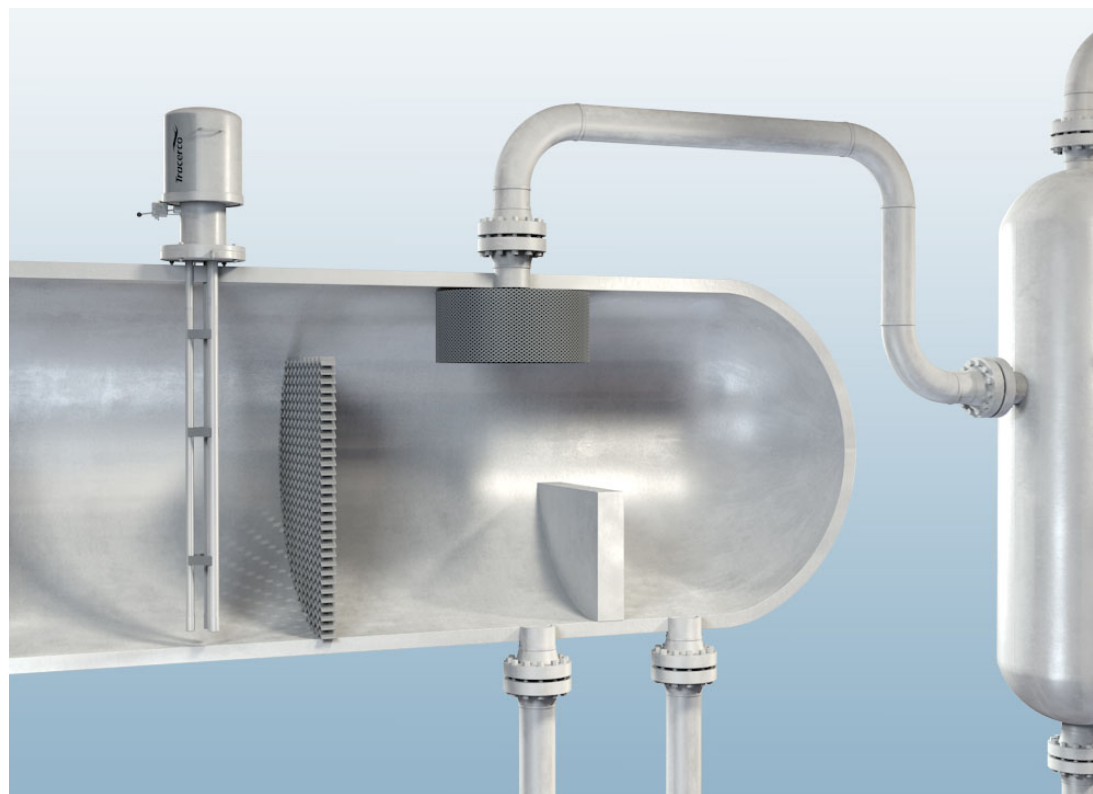
Improved SRE

Reduction in BS&W

Reduction in chemical
dosing

Typical applications

- HF/SF Alkylolation
- Separators
- Production traps
- Slug catchers
- Desalters
- Dehydrators
- Coalescers
- Settling tanks
- Wash tanks
- Primary separation cells
- Subsea storage tanks



Questions and answers

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