



Improving Safety, Reliability & Productivity Using Complex Process Modelling & Plant Automation

INEOS
Electrochemical Solutions



CloroSur
2022

COSTA DO SAUÍPE



Introduction – Felipe Santos

- Senior Lead Process Engineer at INEOS Electrochemical Solutions, with 16 years of experience in the Chlor-Alkali industry and its downstream processes
- Born in Salvador, Brazil !
- Extensive knowledge of both Process Design, Plant Operations, and all three chlor-alkali technology processes
- Experienced in plant troubleshooting, debottlenecking, process simulation, risk assessments and the full lifecycle of capital projects from conceptual design to plant commissioning, working across South America and Europe



INEOS Electrochemical Solutions



INEOS Ranked 4th - Global chemical companies, 194 sites in 29 countries



BICHLOR™ Electrolysers - very low energy consumption, class leading output and the largest effective working area



Automation built on 120 years of cell room **operating experience**

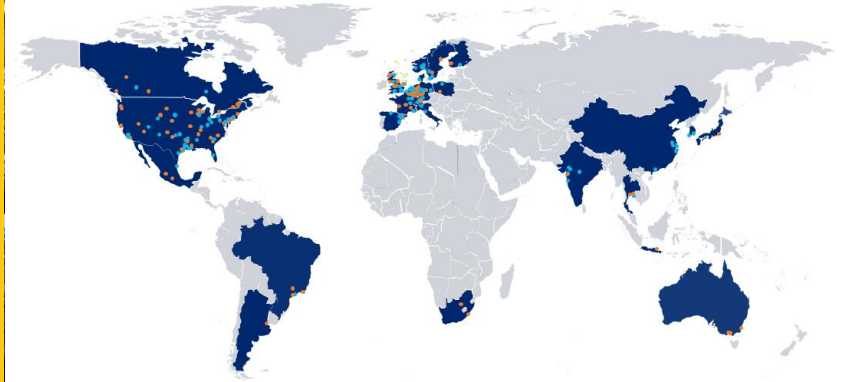


Global Asset Care & Technical Service program



Electrolyser installations in **over 35 countries**

Energy efficient electrolyser technologies for the lowest cost per tonne of product





Automation & Process Control

INEOS Electrochemical Solutions



Benefits of an Automated Plant



Manpower: Fewer field and DCS operators
Easier to operate

Performance: Tighter operating envelope

Productivity: Quicker Transitions
Fewer unplanned shutdowns

Safety: Reduced cell room occupancy
Improved communication

Robustness: Fewer excursions

Automation supports
Maximum uptime and lifetime
LOWEST COST PER TONNE
& **HIGHEST PRODUCTION RATE**

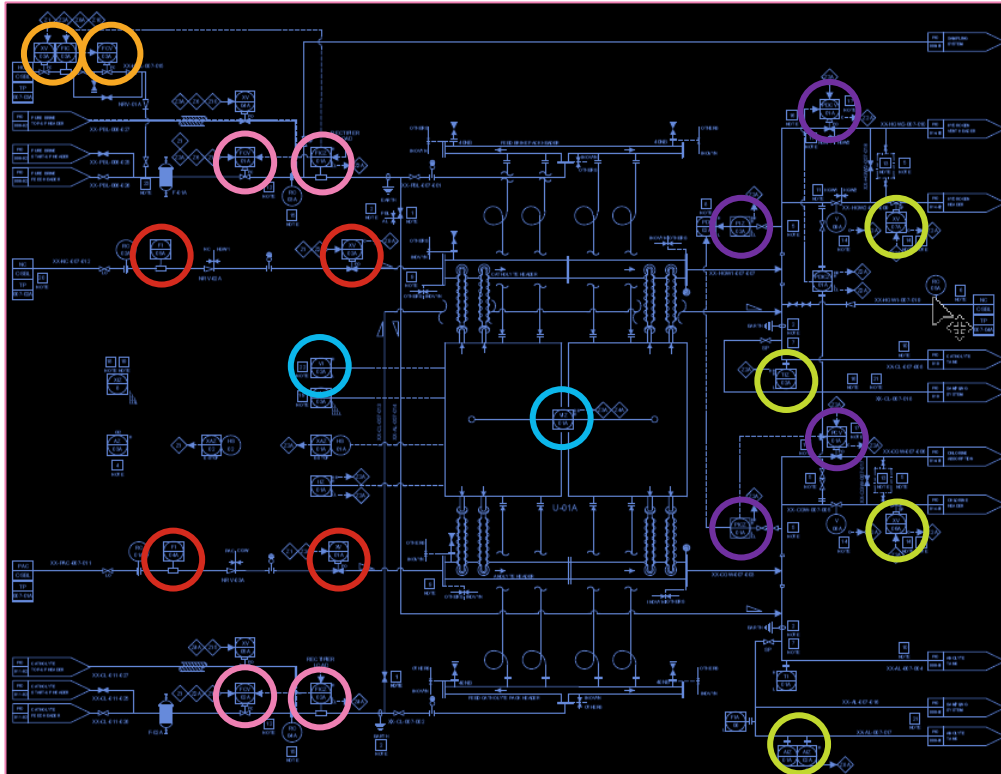
Automation for Chlor Alkali



Chlor Alkali Automation System

- Chlor Alkali cell (chlorine & hydrogen) pressure
- Chlorine gas room (chlorine cell room)
- Chlorine gas room (chlorine cell room) cooling
- Chlorine gas room (chlorine cell room) control
- Downstream hydrogen & chlorine automation

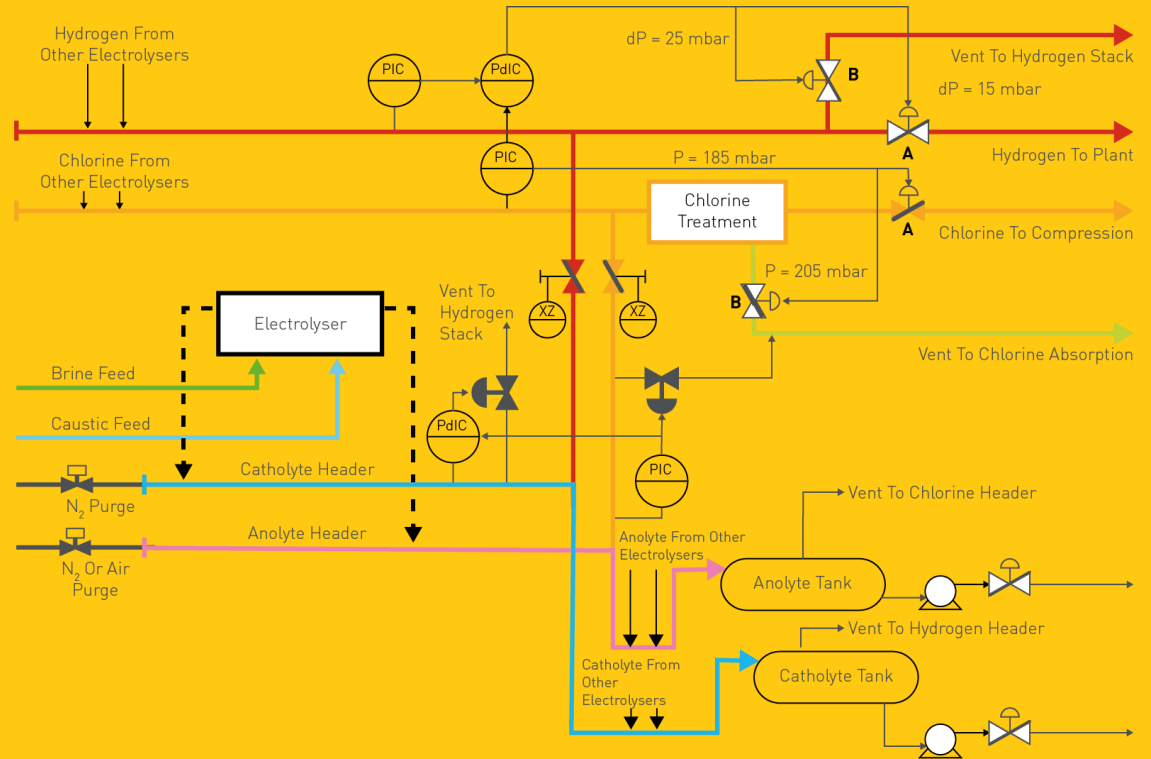
Foundational to Plant Design



- Brine and caustic feeds
- Brine acidification
- Voltage Monitoring System
- Purge control
- Trips
- Pressure control

Pressure Control

- Essential to success
- Ease of start-up and shutdown
- Predictable, reliable, consistent and successful – Best Practice
- Common goals
 - Optimisation of existing design
 - Minimise unnecessary venting
 - Minimise frequency of trips and the severity of the impact
 - Reduce risk



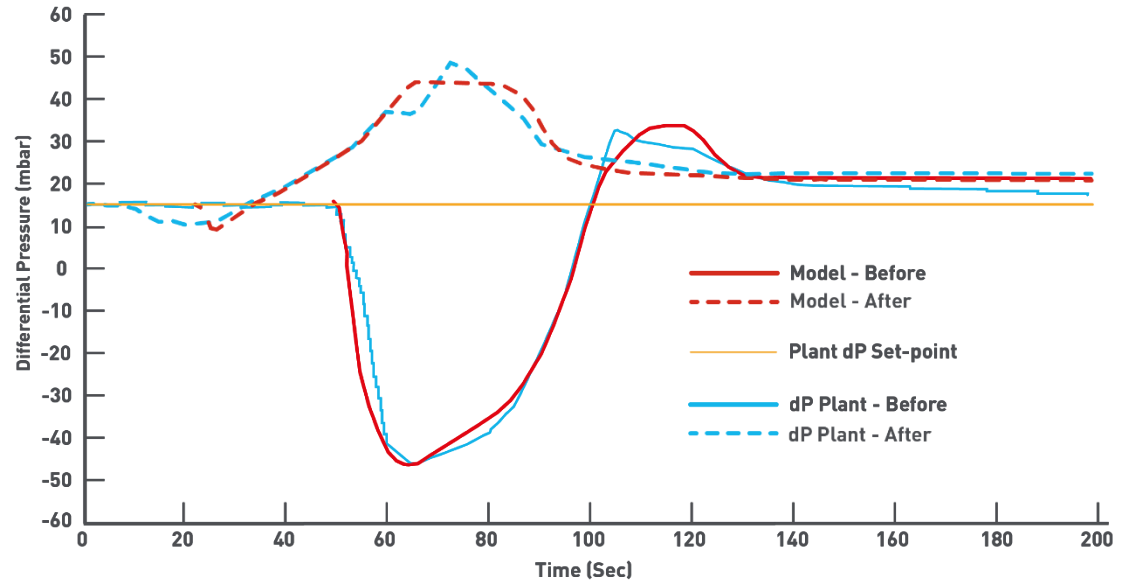
Dynamic Pressure Modelling

Example Before

- Model validated with real plant data
- Large negative differential pressure
- Need for improvement identified

Example After

- Model stroke times adjusted
- Improvement predicted
- Changes implemented on site
- Results confirmed
- Ease of update with plant changes



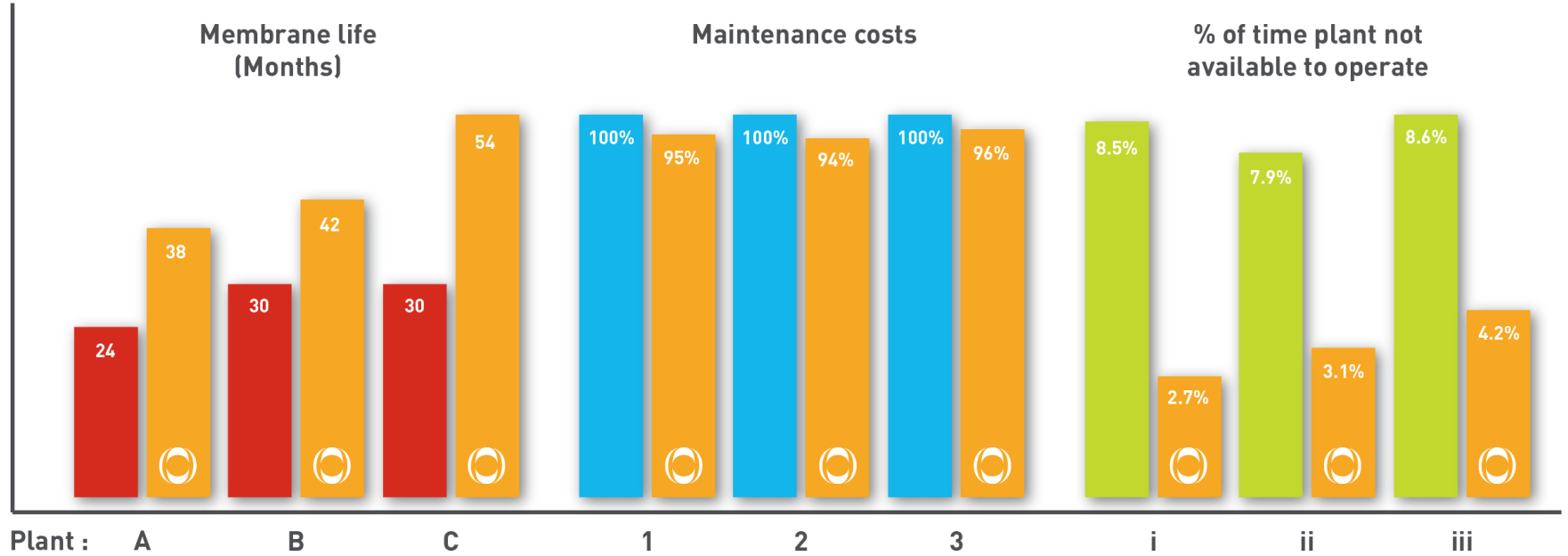
Tangible Savings for Operators

Typical Key Metrics

- Better workforce utilization (25 – 30% reduction)
- Plant Start Ups
 - Average duration (50 – 60% reduction)
 - Number of trips (75 – 80% reduction)
- Production
 - Plant trips (70 – 90% reduction)
 - Plant availability (4 – 8% increase)
 - Off spec product (50 – 75% reduction)



Tangible Savings for Operators



After intervention



Key Takeaways

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Key Takeaways

Automation coupled with complex modelling improves productivity, safety, environmental, product quality, and manpower utilization, for the **lowest cost per tonne** and **highest plant throughput**

Safety and environmental performance

- Employee safety
- Fewer unplanned events and plant upset conditions

Productivity

- Higher quality product – eliminate off-specification material due to inconsistent start and stop routines
- Tighter operating envelopes enable higher production rates and reduced waste
- Improved plant availability, reliability and reduced maintenance through consistent operation
- Reduced costs due to more efficient usage of power and chemicals
- Focus on predictive versus reactionary tasks

Automation is standard on INEOS cell rooms, is retrofittable, and can also be used on other electrolyzers.

Thank You

We welcome questions

Meet with INEOS at the **Table Top Expo**,

or discover more at:

www.ineos.com/electrochemical

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