

AKXA **TECH** PVT. LTD.

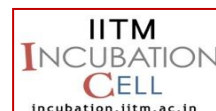
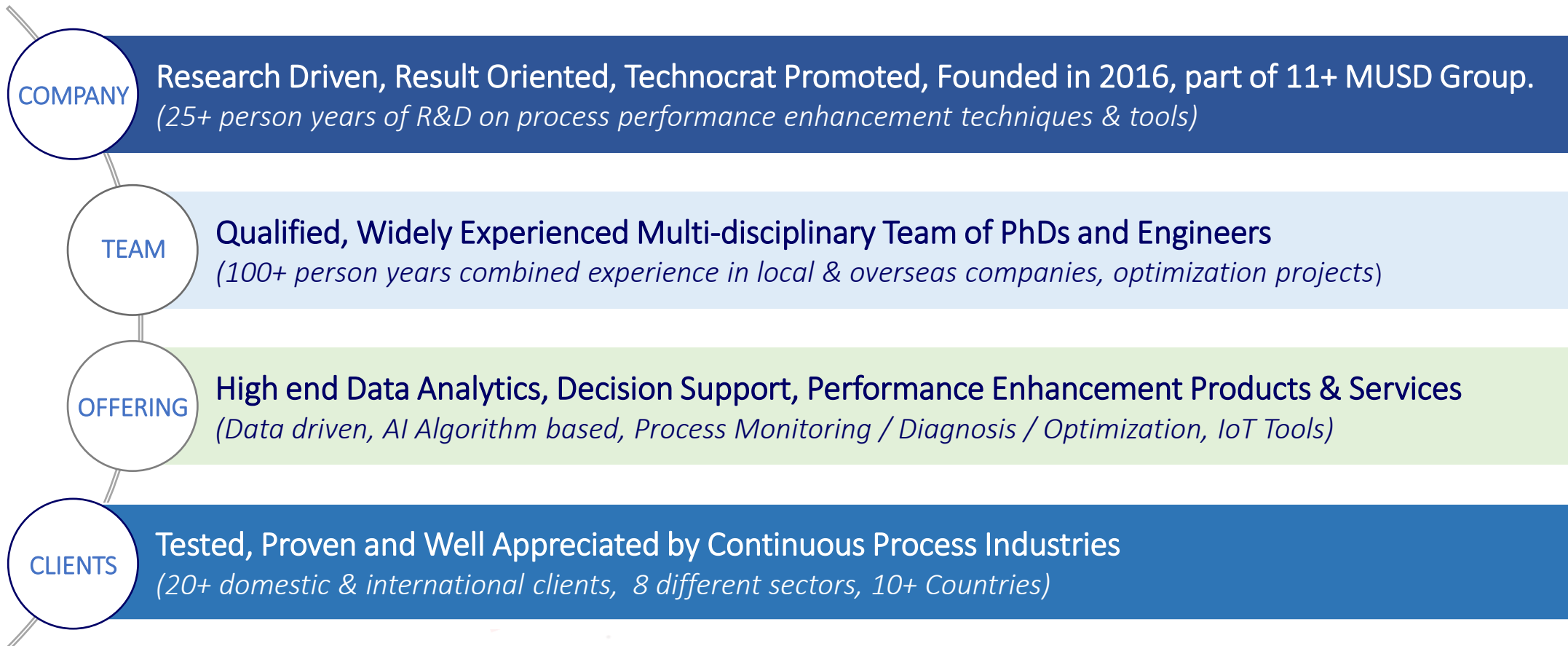
*AI / ML Based Analytics for Chlor Alkali Plants
with successfully executed Case Studies*

Research Driven

Building Sustainable Solutions

Adopted by Global Clients

About AKXA



*Recognized as
Innovative Product*

*Approved by Govt
(DIPP 2649)*

*Collaboration with
IIT Madras*

*Promoted by
(35+ yrs of Engg. Service)*

Our Core Competency & Skillsets



PROCESS DATA ANALYTICS

- ❖ multi-space
- ❖ multi-time scale
- ❖ multi-physics
- ❖ multi-format
- ❖ multi-layer

MULTI-DOMAIN EXPERTISE

- ❖ Process
- ❖ Operations
- ❖ Utilities
- ❖ Automation
- ❖ Optimisation

DEVELOPMENT CAPABILITY

- ❖ Algorithms
- ❖ Smart Controller
- ❖ IoT tools
- ❖ Customized Apps
- ❖ Hardware Products

MULTI-SKILLED TEAM

- ❖ Process diagnosis
- ❖ Data Science
- ❖ Modelling
- ❖ Simulation
- ❖ Project Management

❖ *Design, develop and build new algorithms, IoT based Products (software applications + hardware) to solve Industry challenges for various sectors*

Industries/Process Plants – Services Offered

Services and Automated Decision Support Tools for
Productivity Optimisation, Energy Efficiency Enhancement and Quality Consistency

**CEMENT, MINERAL &
METAL PROCESSING**



**CHEMICALS, FERTILIZER
& PHARMA**



**PULP PROCESSING &
PAPER / BOARDS**



**GLASS &
CERAMICS**



**POWER PLANTS
CAPTIVE / CO-GEN**



**ANY CONTINUOUS
PROCESS PLANT**



Projects across multiple assets, industries, countries

15+
Analytics & IoT products

500+
Assets Investigated

~10%
Energy Savings Achieved

12+
Countries



Confederation of Indian Industry



1) Digitization of paper-based (manual tracking) activities

- *Ex : Log Books, Maintenance check list, Lab reports, Customer Complaints, Contract Workforce Management, etc*

2) Smart Data Acquisition systems for Legacy, Old plants with low digital foot-prints

- *Ex : read data from PLCs, SCADA screens, HMIs, Trend Image based data capturing*

3) AI / ML based analytics for Process monitoring and diagnosis

- *Ex: process fluctuation assessment, controller performance assessment, alarm event management*

4) Algorithm based equipment health monitoring

- *Ex: digital audits, abnormality checks, signal processing for failure prediction, valve stiction detection*

5) Image processing based online monitoring, fault detection

- *Ex: hot/cold rolled steel surface defects, auto analysis of billet samples, in process samples.*

6) AR/VR for improved process efficiency, safety and environmental assessment

- *Ex: cc tv camera based PPE detection, furnace refractory health check, stack monitoring etc*

Products and Service Offerings – AI / ML Based



Harnessing Data >> **Extracting Knowledge** >> **Creating Value**




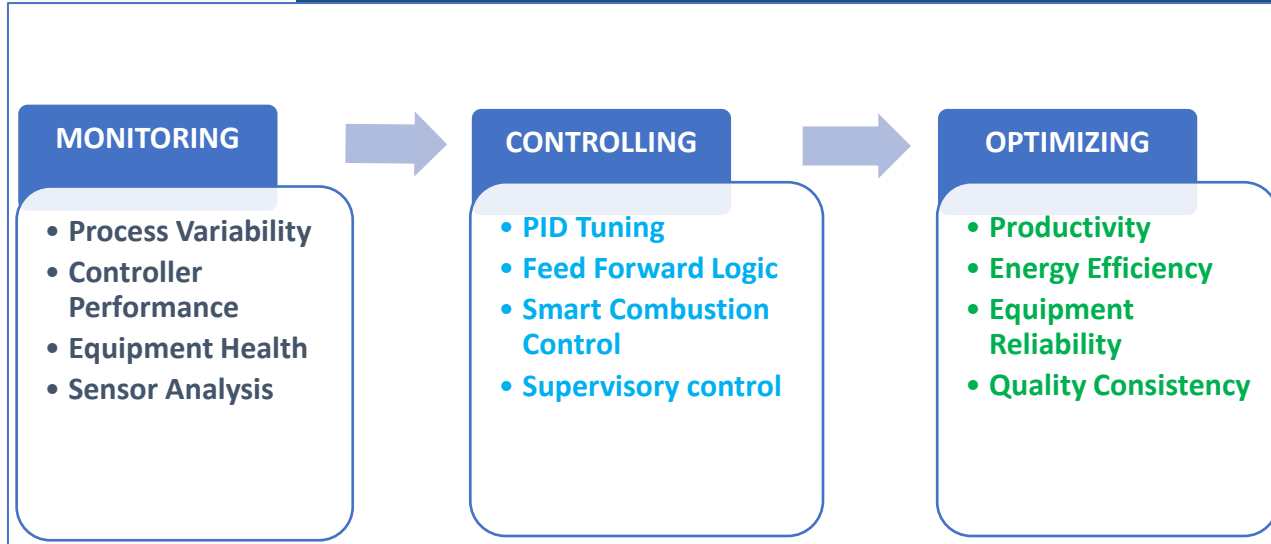
PRODUCTS AND SERVICES

- Process Monitoring
- Process Control
- Process Optimisation



SUSTAINABLE SOLUTIONS

- Productivity improvement
- Quality consistency
- Equipment reliability

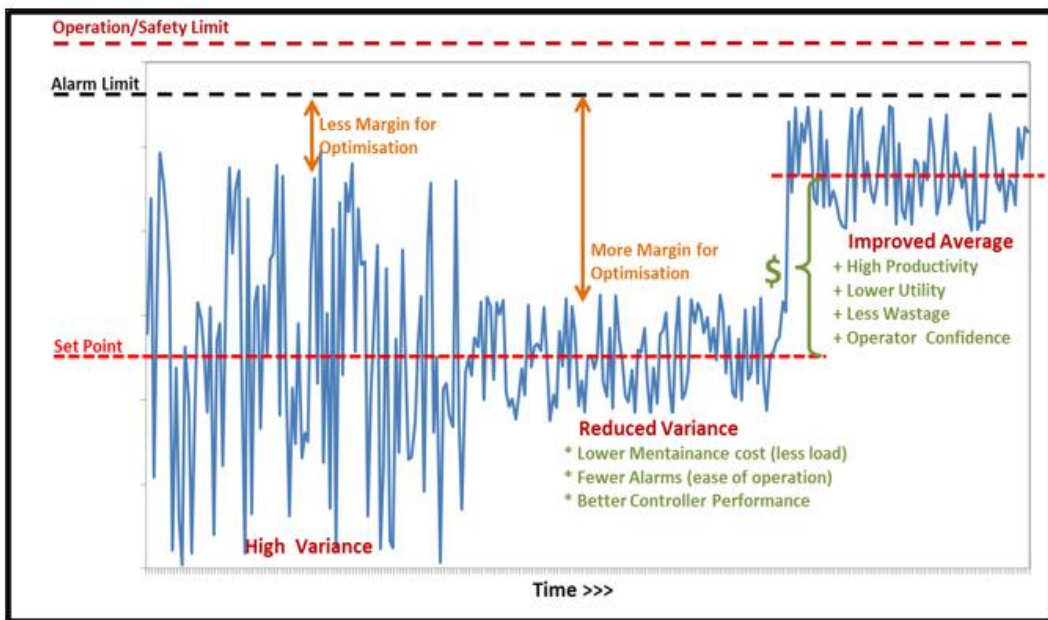


INDUSTRY FOCUS

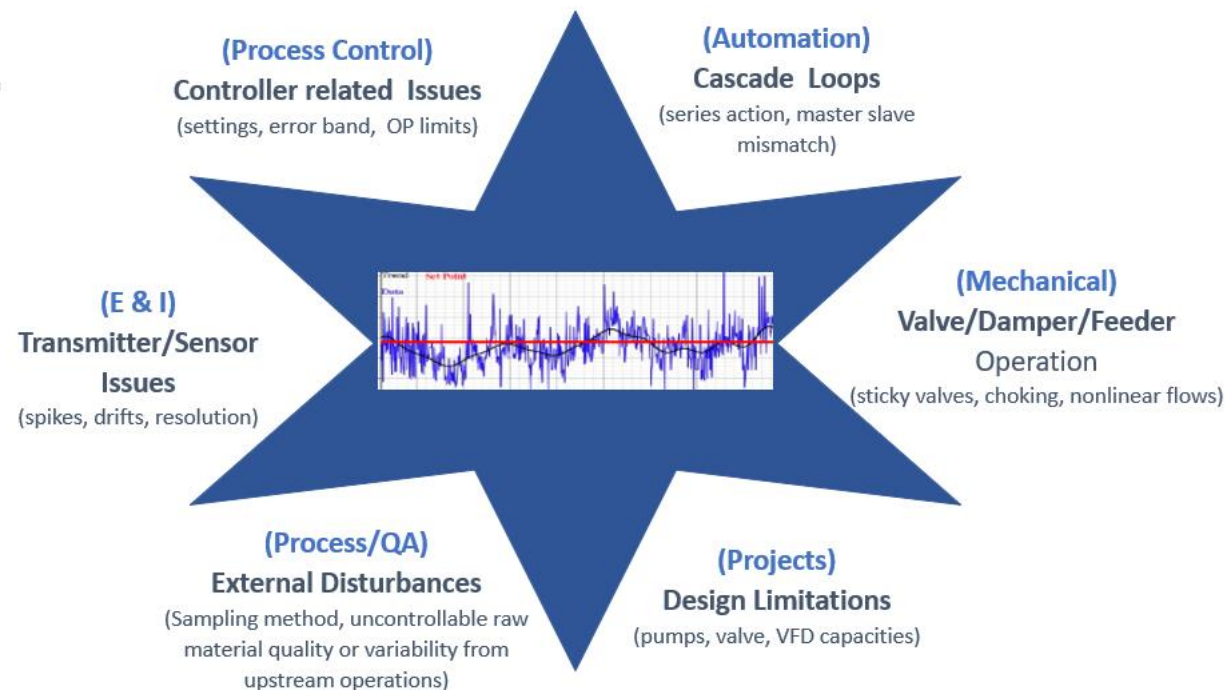
- Continuous process plants
- Process utility equipment
- Data analytics + IoT solutions

Key Focus Areas – On Process Fluctuations

REDUCE fluctuations >> CREATE margins >> OPTIMIZE processes

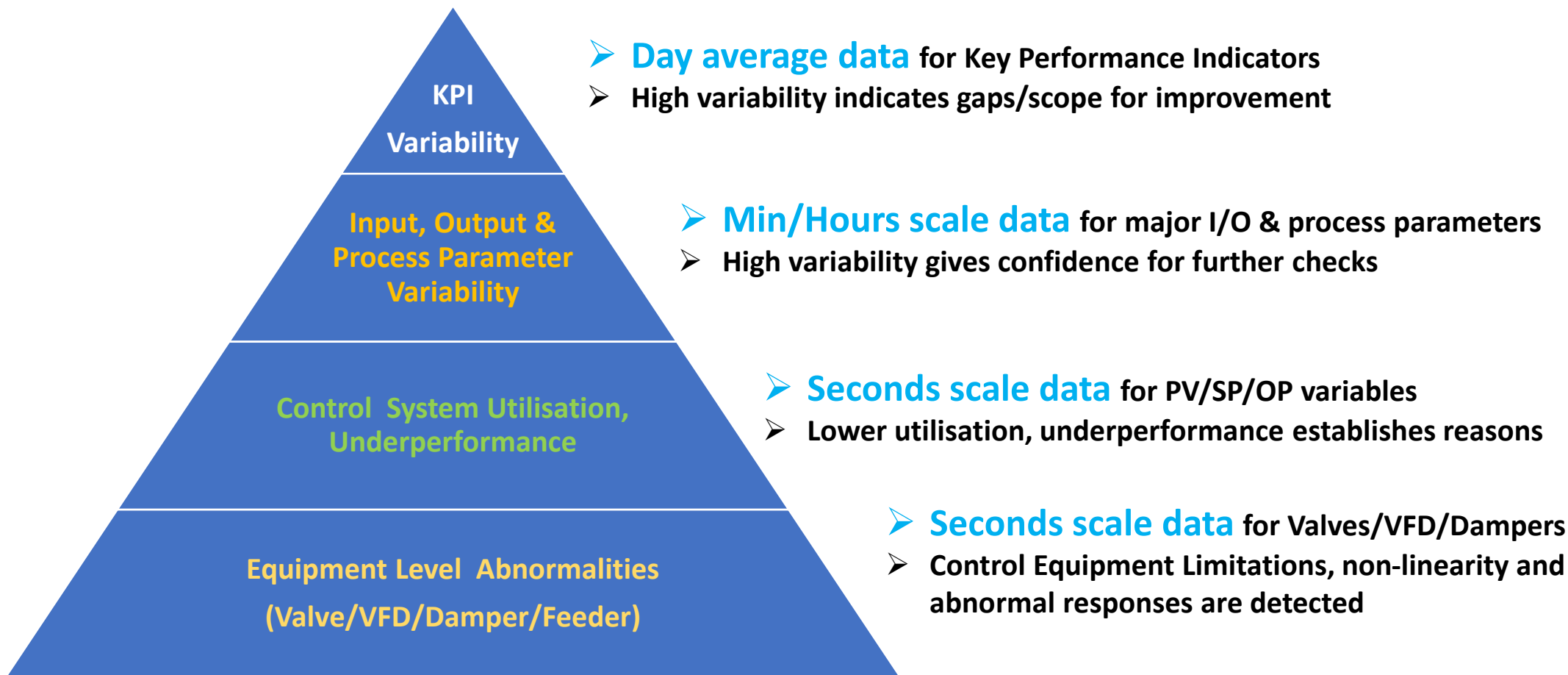


Process Plant Fluctuations – Sources we analyze



Solution Approach

:: FLUCTUATION AUDIT / ASSESSMENT APPROACH ::



ALL CONTINUOUS
PROCESS

OEM
AGNOSTIC

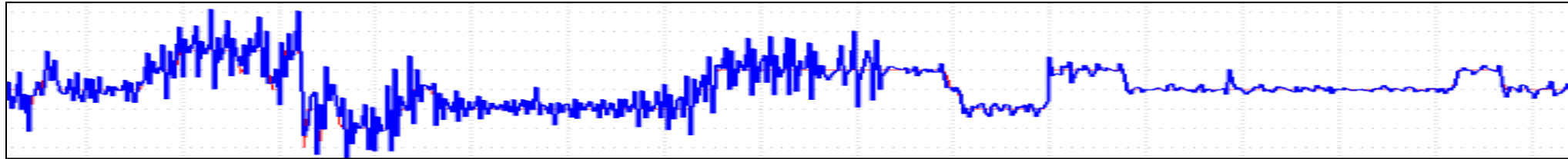
DIFFERENT TIME
and SPACE SCALES

STANDARDISED
APPROACH

MULTIVARIATE
ANALYSIS

1) OPTIMakx[®]+deltAKX[®] Algorithm Based Process Monitoring & Optimization Tool

(For REAL TIME MONITORING for PROCESS FLUCTUATIONS)



WHEN

Assess

WHY

Diagnose

WHERE

Prioritise

HOW

Optimise

- ✓ Suite of AI/ML and very complex Statistical, Signal processing Algorithms. *(IP developed by AKXA at IITs)*
- ✓ Open Source IT platform, Web Based Application for IoT and Industry 4.0 needs.
- ✓ Automatic data acquisition, assessment, diagnosis and decision support for continuous improvement.
- ✓ Multi-plant, Multi-process, Multi-user configuration for remote monitoring / benchmarking.

➤ **100+** installations in India and **25+** installations in Europe and US in the past couple of years

➤ **20+** different scientific/statistical measures for performance benchmarking

➤ **15+** different root causes diagnosed for abnormal operation/high fluctuations

➤ **500+** variables simultaneously tagged, tracked, issues diagnosed, compared

CORPORATE Features: Workflow Annotation, Auto Reporting, Escalation, Super Admin features

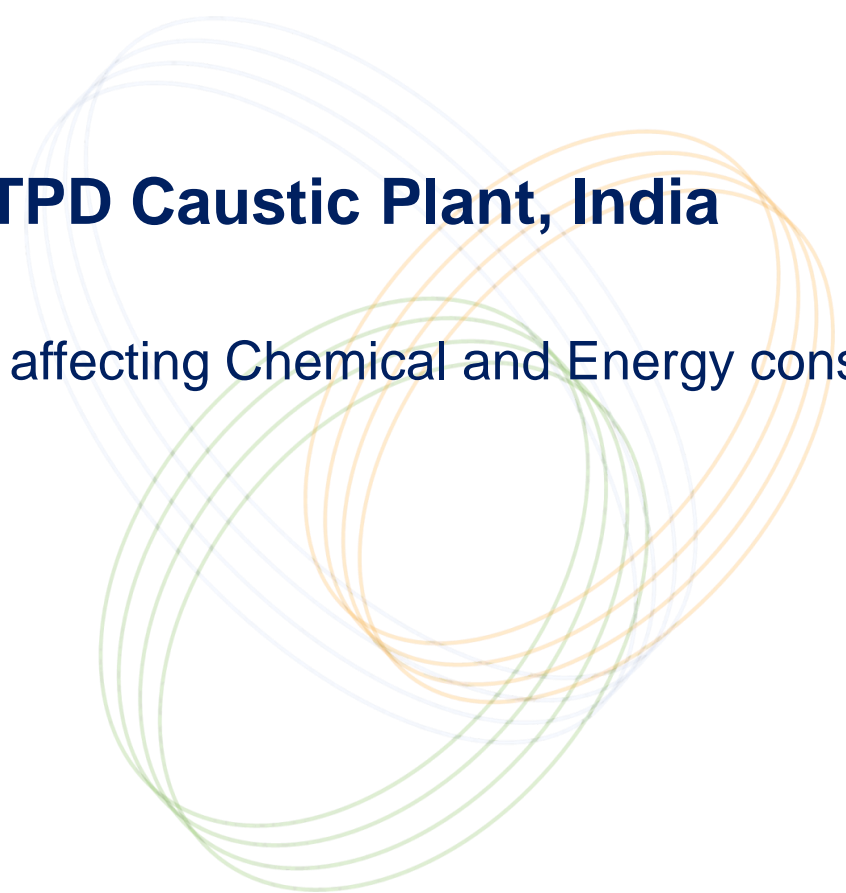
IMPACT OF OPTIMakx[®] + deltAKX[®] INTERVENTION (no CAPEX required)



SECTOR/AREA	CASE ESTABLISHED	IMPACT
Gas Mixing Station	Auto Utilisation increased to 100% and COG, BFG and MG Pressure variation reduced by more than 30%	1% reduction in Flaring Gas 74,000 MJ/day , ~ USD 53,000/Yr
POWER Plants /BOILER	1% Reduction in Heat Rate ~ Fuel consumed/Unit Power	Fuel Saving Co-Gen Plant lower CO2 emission
Oxygen/Nitrogen Plants	4% increase in Purity + Lower Utility consumption	USD 2,00,000 /Yr Savings : for 20 TPD gas plant
Compressors /VFD	15% lower Electricity + Lower Pressure Variation	~ USD 20,000 /Yr for Typical 1000 CFM compressor
Process Plant CONTROLS	25% Reduction in Process Variability and Response Time	5 to 10% Energy Saving @ Pay Back Period < ONE YEAR

Case Study-1 : Optimization activity @ 1100 TPD Caustic Plant, India

Target : To Reduce variations in Key process parameters affecting Chemical and Energy consumption

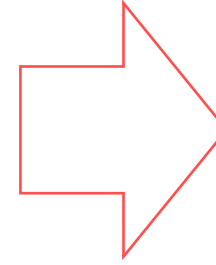


Optimization activity @ 1100 TPD Caustic Plant, India



Problem Summary :

- ✓ Data from 22 PID loops collected over 48 hours highlighted significant performance issues and instability.



VALVE STICTION ISSUE IDENTIFIED BY THE AKXA's "OPTIMakx Tool" accordingly Plant team has taken corrective action to change the positioner for Caustic dosing valve (Brine Solution pH Controlling cascade loop)



Impact on Downstream Operations:

- ✓ Fluctuations impaired process stability, increasing chemical consumption and affecting dosing efficiency.

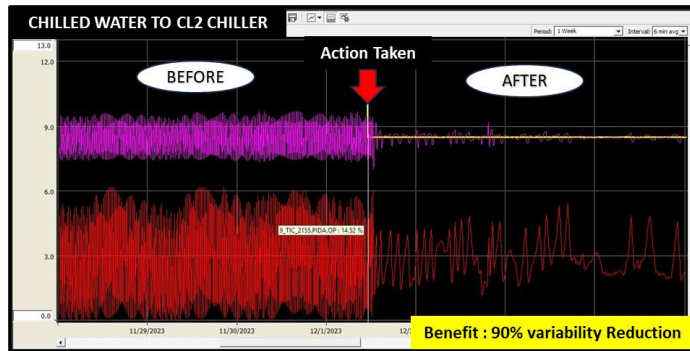
Solution : Root Cause Identification" and "Model Development and Integration :

- ✓ Using OPIMakx, valve stiction was identified and corrected, optimizing low-performing loops and enhancing control.

Results and Benefits

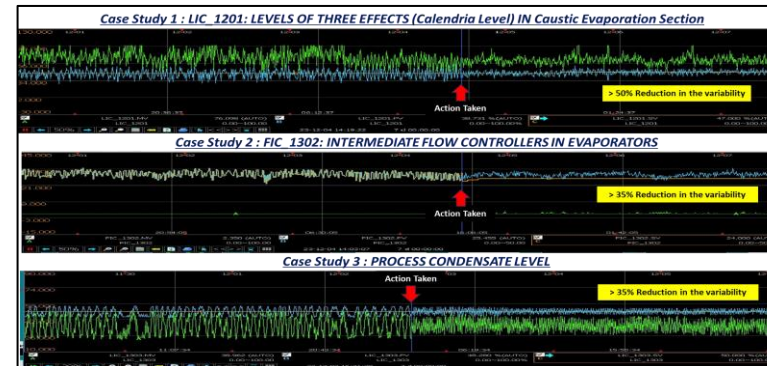
Improvements in Stability

- ✓ Fluctuations reduced by 61%, with 48% of loops now performing well—a 33% improvement overall.



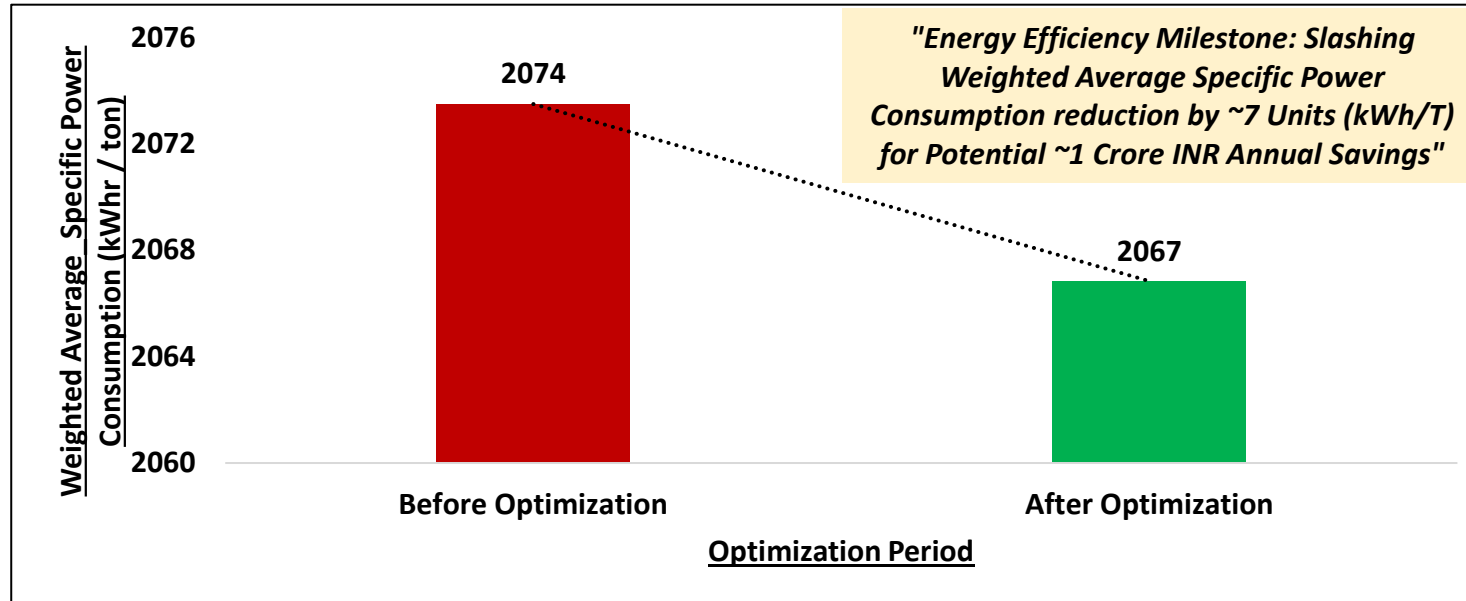
Economic Benefits

- ✓ Reduced NaOH and SMBS consumption led to cost savings while ensuring efficient process control

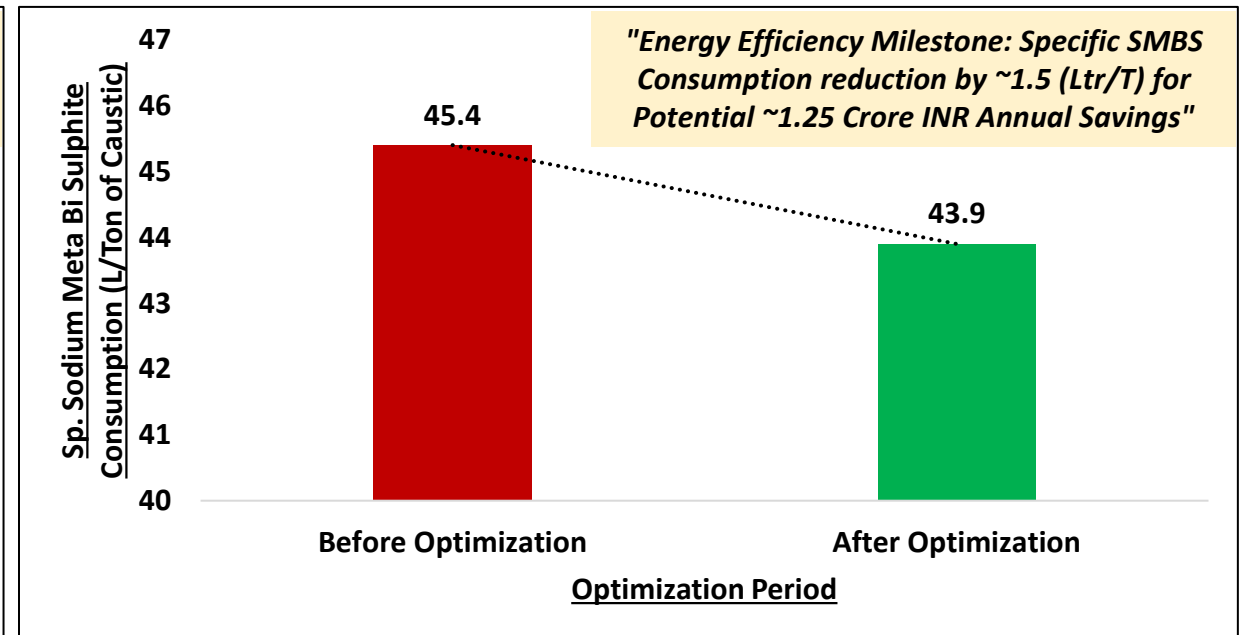
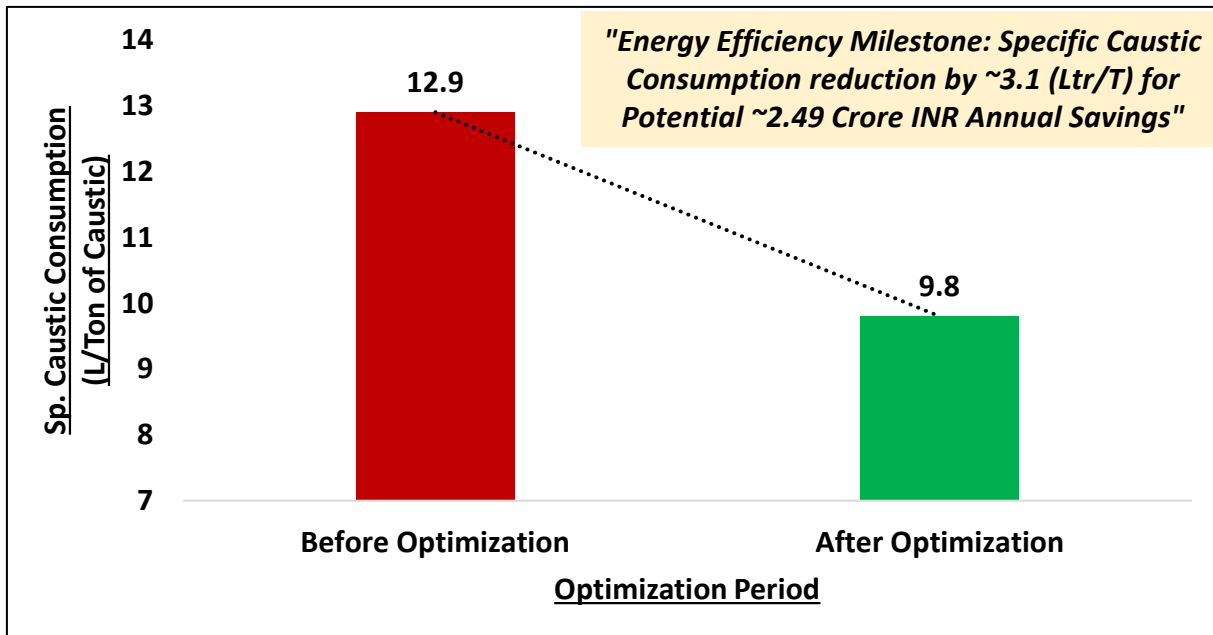


Total Annual Savings through OTO : Rs. 4.72 Crores or ~0.56 Million USD

Optimization in Cell house & CCU Section and it's KPI Impact

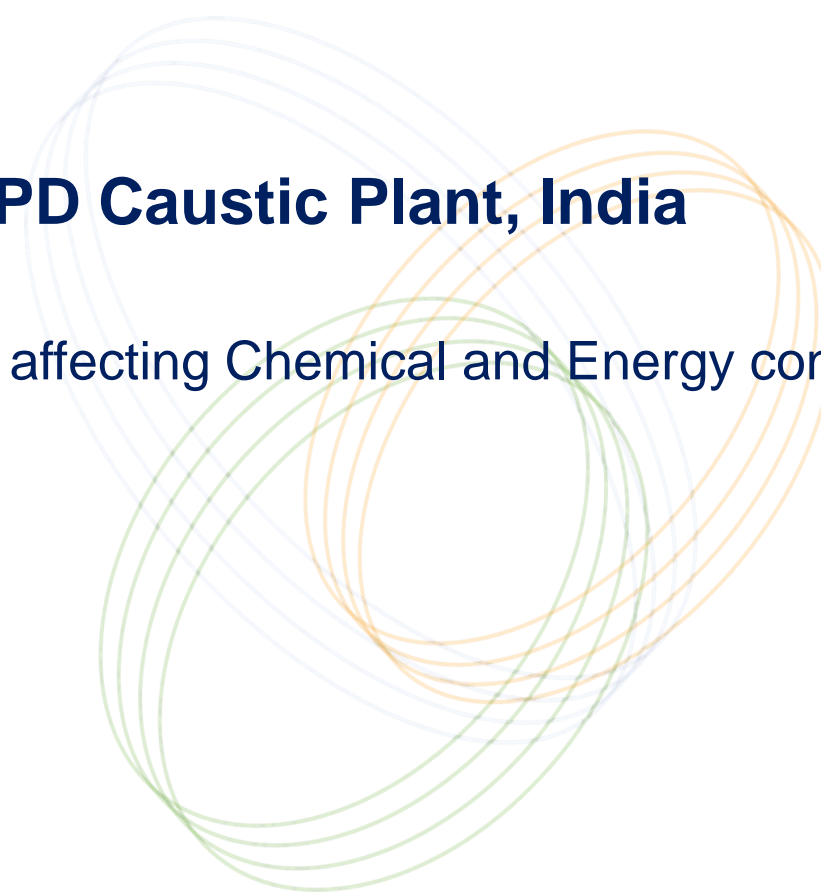


**Total Annual Savings through OTO:
Rs. 4.72 Crores or
~0.56 Million USD**



Case Study-2 : Optimization activity @ 550 TPD Caustic Plant, India

Target : To Reduce variations in Key process parameters affecting Chemical and Energy consumption

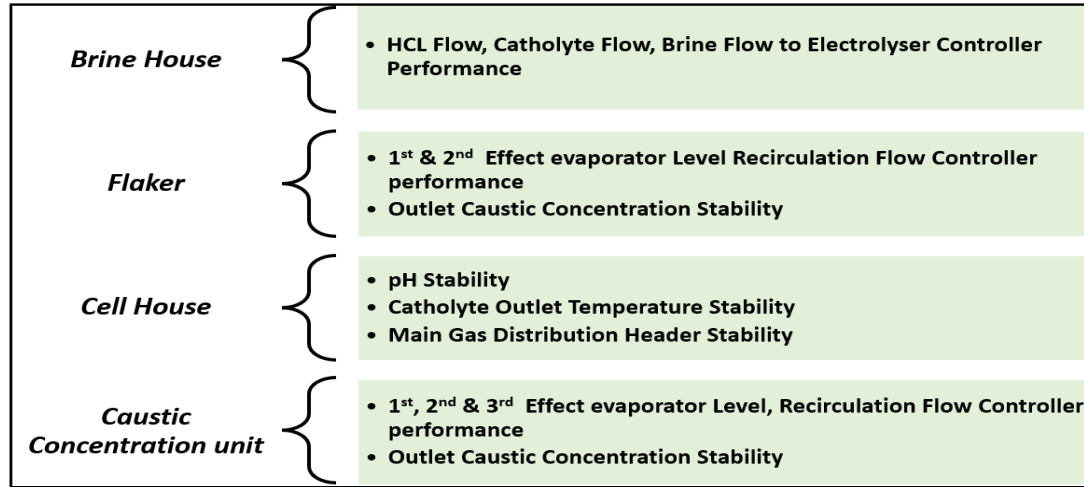


UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION



Confederation of Indian Industry
Business and Beyond
125 Years: 1895-2020

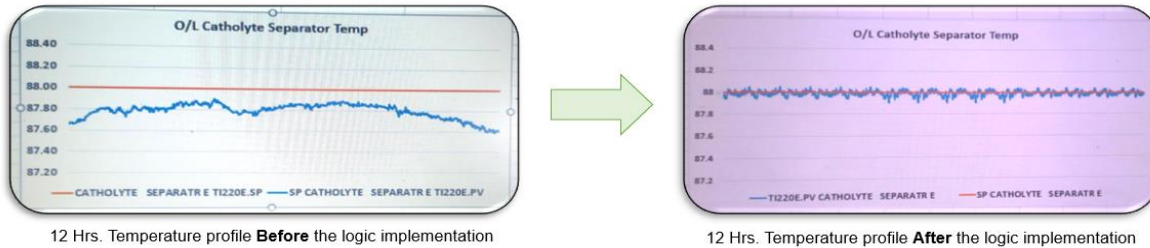
Focus Area



- Stabilizing flow, level, and temperature loops in the Flaker unit significantly reducing steam and hydrogen consumption.
- Maintaining stable header distribution pressure is crucial for membrane health and overall process stability.

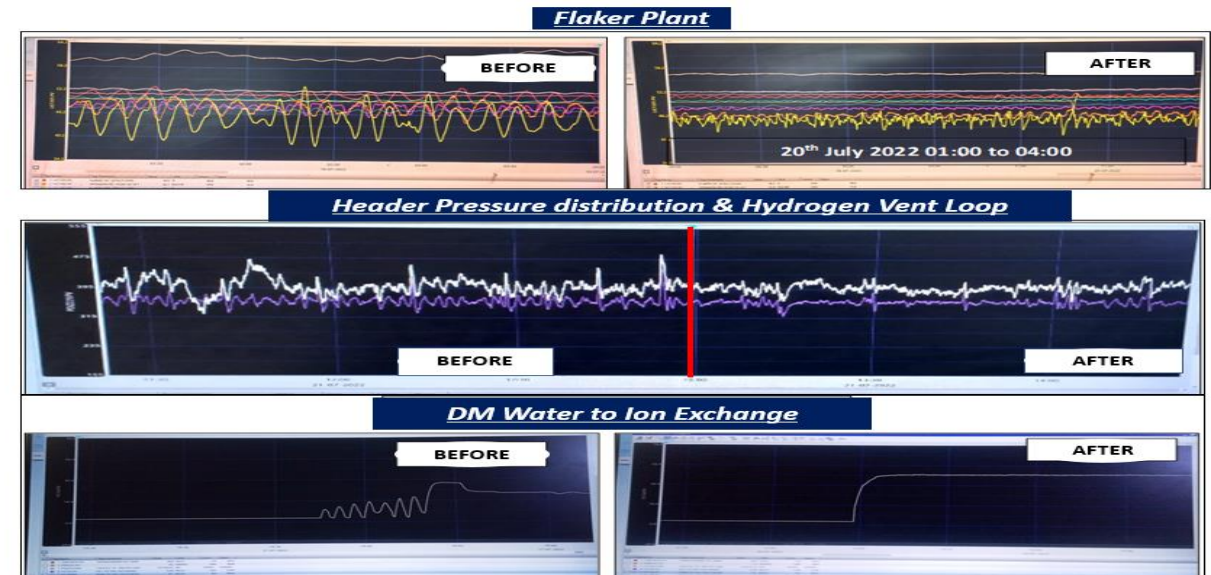
These measures enhance equipment reliability and efficiency.

Control loops Optimization Outcome



Cell House	Units	Before Logic Implementation	After Logic Implementation
O/L Catholyte Temperature (Error%)	%	0.26%	0.12%
Average O/L Catholyte Temperature	°C	87.75	88.00

- In Manual Operation, it is very difficult to maintain the outlet temperature by inlet Caustic Temperature because of Variation in Brine Temperature, I/L Catholyte temperature & Load.
- Logic is designed to maintain the outlet Temperature to a given Set Point. Brine Temperature + Process lag, is also considered in the Logic so that up to 1.0 - 1.5 MW Load Variation is getting handled seamlessly by the Logic.



Total Annual Savings through OTO: 0.84 Crore INR or ~0.1 Million USD

Optimization in Cell house, CCU Section & Flaker Unit and it's KPI Impact



Cell House	Units	Before Logic Implementation	After Logic Implementation
% AACE, O/L Catholyte Temperature	%	0.26	0.12
Average O/L Catholyte Temperature	°C	87.79	88.02
Average Electrolyser Voltage (Combined effect of logic + fluctuation mitigation)	V	471.0	470.4
Power Per Ton Caustic	Units Per Ton	2105.6	2102.6
Power Per Day	Units Per Day	1052798.8	1051347.7

Net Power Saving : 1451 Units Per Day

Flaker Section	Units	Pre Optimization	Post Optimization
Average Production	TPD	217.39	217.65
Average Steam Consumption / Day	MT	227.89	213.98
Steam Consumption Per Ton of Caustic (Unit Per Ton)	Kg/Ton	1048.26	983.13

Net Saving in Steam Consumption : ~15 Tons Per Day

**Total Annual Savings through OTO:
0.84 Crore INR or
~0.1 Million USD**

+ Additional Benefit of reduction in hydrogen vent losses

Case Study-3 : Optimization activity: @ 15,000 TPA Epichlorohydrin Plant in Thailand.

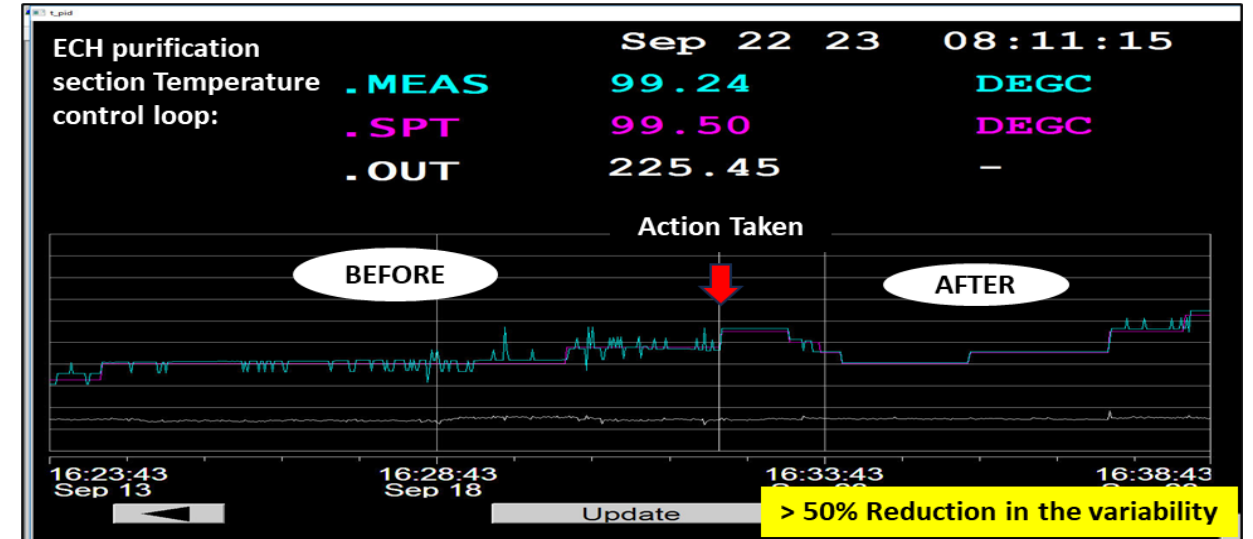
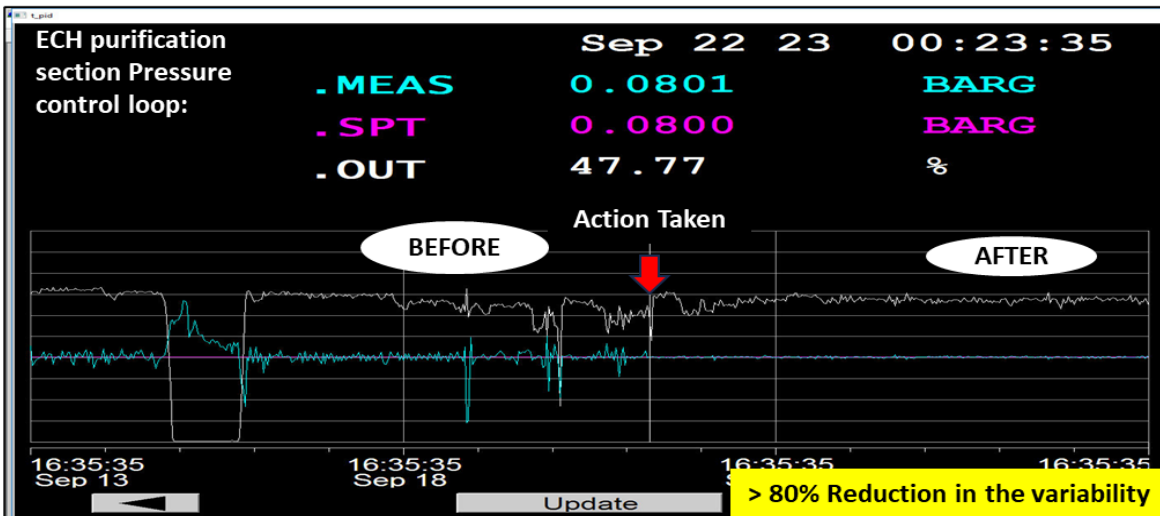
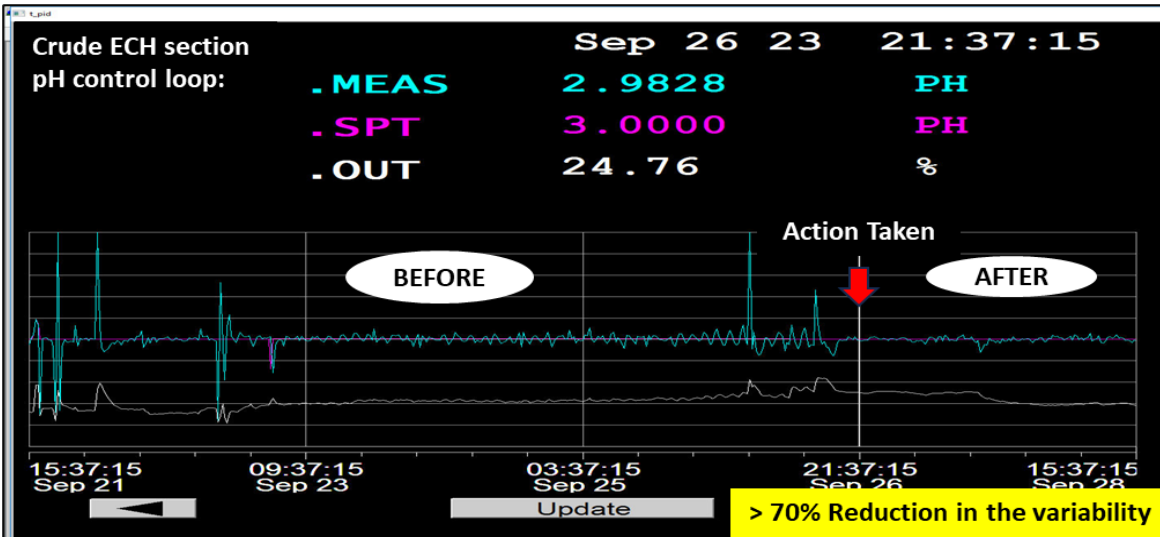
Target : To Reduce variations in Key process parameters affecting Quality and Energy consumption



Focus Area

A total of 90 control loops across various sections have been optimized for enhanced operational stability.

- a) 15 loops optimized to improve pure ECH consistency
- b) 19 loops stabilized key columns in auto-cascade.
- c) 12 loops optimized for stabilizing pH control, etc
- d) 8 loops were optimized for HCl absorption.
- e) 17 loops were optimized focusing on reactor and flow controls, and an additional 19 loops were optimized in the other sections.

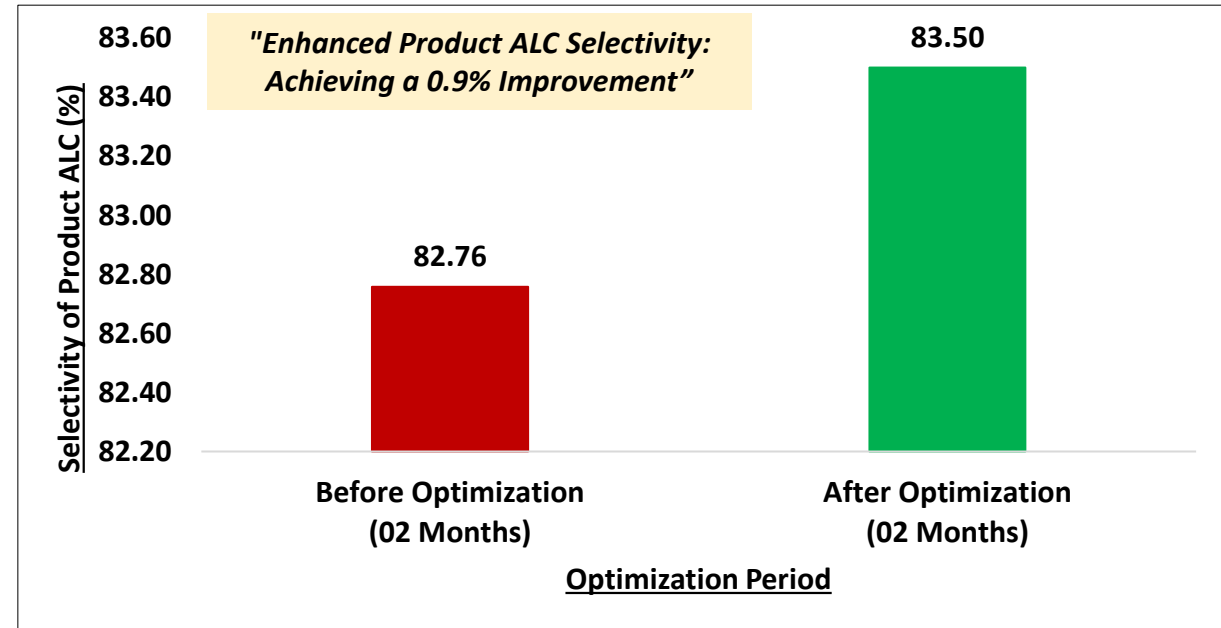
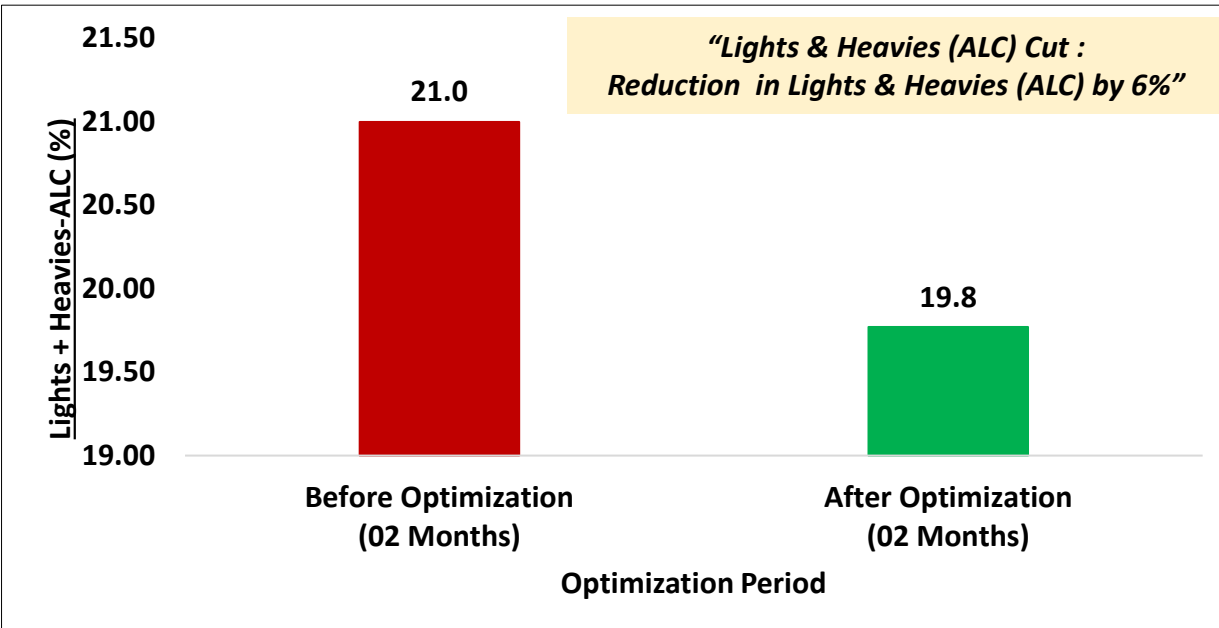
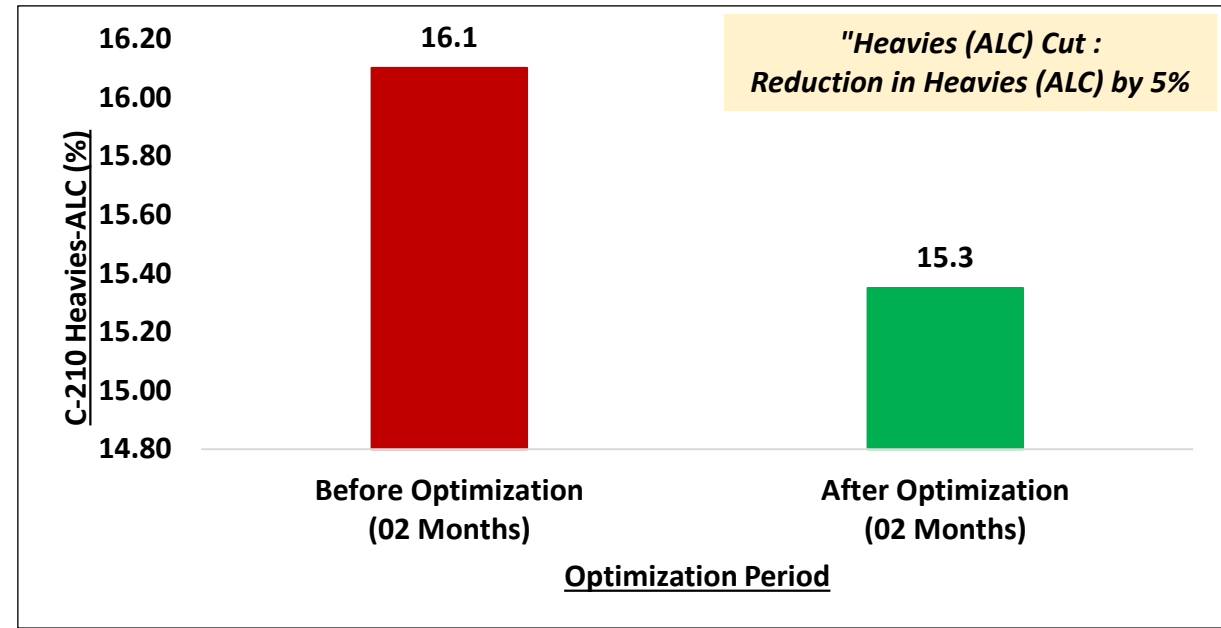
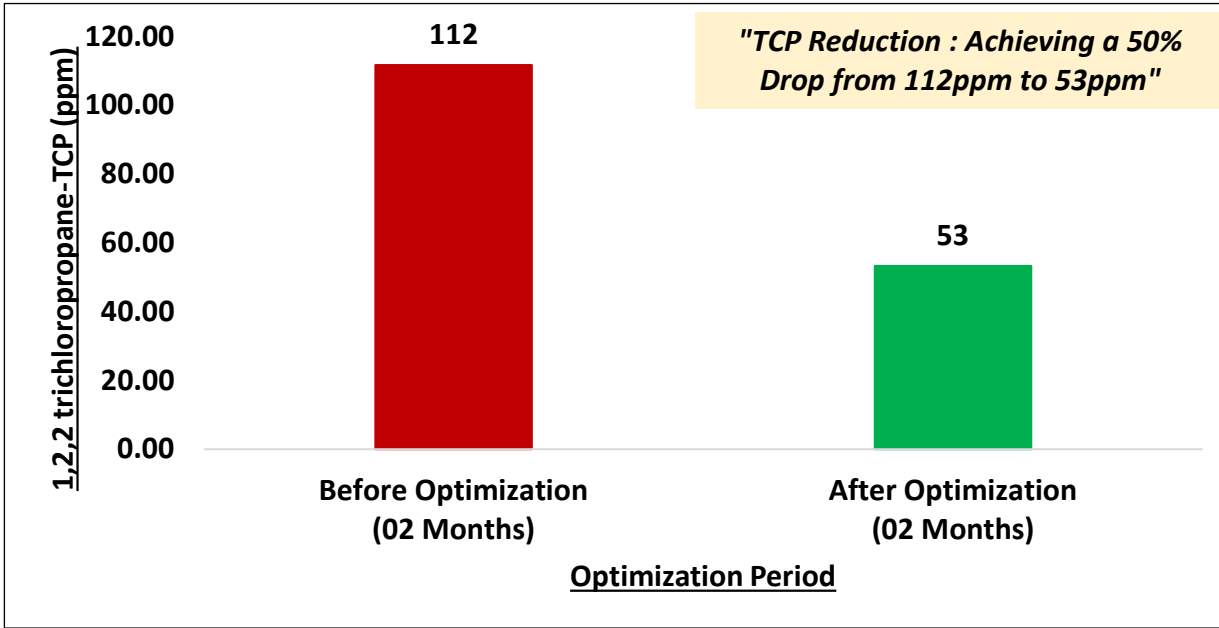


The optimization improvements achieved were:

- 1) Reduction in 1,2,2 TriChloroPropane (TCP) by 50%
- 2) Reduction in Heavies (ALC) by 5% & Reduction in Lights and Heavies (ALC) by 4%
- 3) Enhanced Product ALC selectivity by 0.5% .



Optimization in ECH Section and it's KPI Impact



DCM SHRIRAM



Phone : Office : 0744-2480033
Mob : 9829680535
SHRIRAM FERTILISERS & CHEMICALS
SHRIRAM NAGAR, KOTA – 324004
(RAJASTHAN) INDIA

CERTIFICATE OF APPRECIATION

This is to certify that **AKXA Tech Pvt. Ltd.** has completed the activities at our **DCM Shriram – Caustic Plant** in Kota Complex, on the following Project :

The **Facility for Low Carbon Technology Deployment (FLCTD)** Programme jointly implemented by the **Bureau of Energy Efficiency (BEE)** and the **United Nations Industrial Development Organization (UNIDO)**. FLCTD is supported by the **Global Environment Facility (GEF)** aiming to implement innovative IoT based technology to improve efficient end-use of Energy with a focus on **“Process Fluctuation Optimisation and it’s Impact on KPIs”**.


AKXA Tech, one of the partners selected for the above Project with **UNIDO**, had decided to carry out the **Project Work @ DCM Shriram – Caustic Plant**.

Project Focus : Process Fluctuation Optimisation using IoT based Data Analytics.

Target Area : AKXA has optimized the Brine House, Cell House, CCU(Caustic Concentration Unit) and Flaker Sections for Stable Operation, which resulted in savings in Steam Consumption. Also, Implementation of Catholyte Separator Outlet Temperature Controlling Feed Forward Logic has positively contributed towards reduction in Cell Power Consumption. The overall Auto Utilisation of this loop is almost 100%.

We wish AKXA Tech the very best in their future endeavors.

Authorized Signatory

 (22-Dec-2022)
Prithvi Singh Rathore
HOD (Chlor-Alkali)

SHRIRAM VINYL & CHEMICAL INDUSTRIES
Shriram Nagar, Kota, Rajasthan-324 004 (India), Tel. : +91-744-2480033, 2480011-17, Fax : +91-744-2480238
Registration Office : DCM Shriram Ltd, 2nd Floor, (West Wing), Workmark 1, Aerocity, New Delhi- 110 037 India
www.dcmshriram.com
CIN No. L74899DL1989PLC034923



ADITYA BIRLA CHEMICALS

20th February 2024

To Whomsoever It May Concern

This is to certify that **M/s. AKXA Tech Private Limited** has demonstrated outstanding performance and collaboration in the recent ECH Plant Optimization initiative executed in collaboration with our team at Aditya Birla Chemicals, Rayong, Thailand. Their technical expertise, attention to details and dedication have significantly contributed to the optimization of the ALC reaction temperature and other process parameters resulting in significant improvements in key performance indicators (KPIs).

The collaborative effort between AKXA Tech and our team has been instrumental in achieving enhanced product rates, controlled waste purging, and notable improvements in organic impurities and product purity. The project, initiated on the 25th of September 2023, showcased a successful combination of optimization skills from AKXA Tech's technical team and process optimization strategies from our ABCT team.

We hereby express our appreciation for the professionalism, expertise, and commitment displayed by M/s. AKXA Tech Private Limited throughout this key initiative. Their contributions have undoubtedly played a pivotal role in the success of this optimization initiative.

This certificate is being awarded in recognition of their exceptional performance and valuable collaboration.

Sincerely,



Jyotin Hathi

Vice President (Technical)

Aditya Birla Chemicals (Thailand) Ltd.

Email: jyotin.hathi@adityabirla.com

ADITYA BIRLA CHEMICALS (THAILAND) LIMITED Chlor-Alkali Division

Bangkok Office: Mahatun Plaza, 16th Floor, 888/160-1, Phoenchit Road, Bangkok-10330, Thailand.
Samutprakam Office: 77, Moo 6, Soi Wat Mahawang, Poochacsamingrai Road, Tambol Samrong, Amphur Phraapradaeng, Samutprakam-10130, Thailand.

Tel: 66-2-7485720-23 Fax: 66-2-7485789
Factory: 3 Soi G-2, Prakomsongkroard Road, Tambol Hueypong, Amphur Muang Rayong, Rayong 21150, Thailand.
Tel: 66-38-687356-9, 685073, 685977, 687354 Fax: 66-38-685074, 687365
Visit us at: www.adityabirlachemicals.com

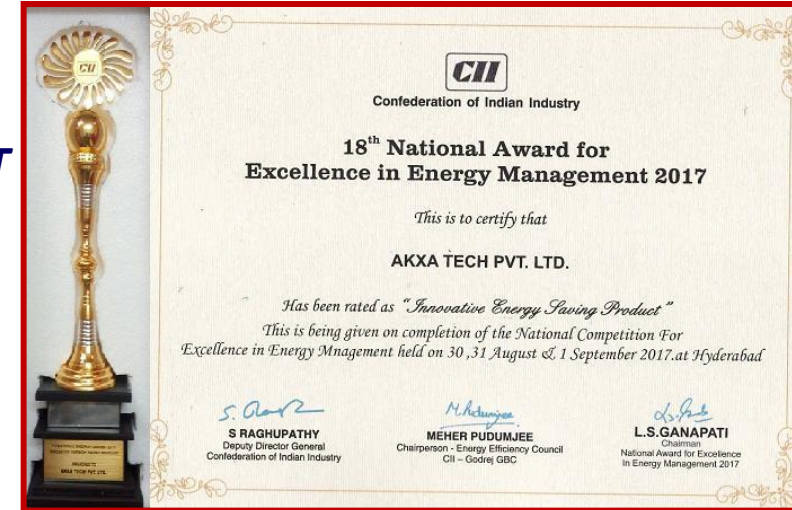
“Give us an opportunity



to bring the BENEFITS of INNOVATIVE CONCEPTS and IoT based DATA ANALYTICS TECHNOLOGY



to help your PROCESS PLANT increase productivity, be more energy efficient and reduce carbon footprint and costs...”



CONTACT:

Raghuraj K. Rao

CEO & Head - Technical Services
email : raghuraj.rao@akxatech.com
Call : +91-9243209569

Alokroy Bose

COO & Head- Business Development
alokroy.bose@akxatech.com
+91- 77989 85114

Mohammed Azeem Pathan

Sr. Engineer - Technical Services
azeem.pathan@akxatech.com
+91 84464 39797

Development Centre : 4859/B52, Sadashiv Nagar, Belagavi, Karnataka, INDIA -590001

Corporate Office : Plot 122 / 1&2, Shinoli (BK), Tal. Chandgad, Dist. Kolhapur, Maharashtra, INDIA – 416 508

UAE office : Xcell International, Fujairah Free Zone, Fujairah, UAE