

18-MAY-2022

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# Utilities and Co-Gen Monitoring – Creating Situational Awareness And Operational Excellence with PI System

**Presented By:** Sükrü Çelik (IVC)

**Implementation Partner:** Animesh Kadam (ECGiT) and Akash Misal (ECGiT)

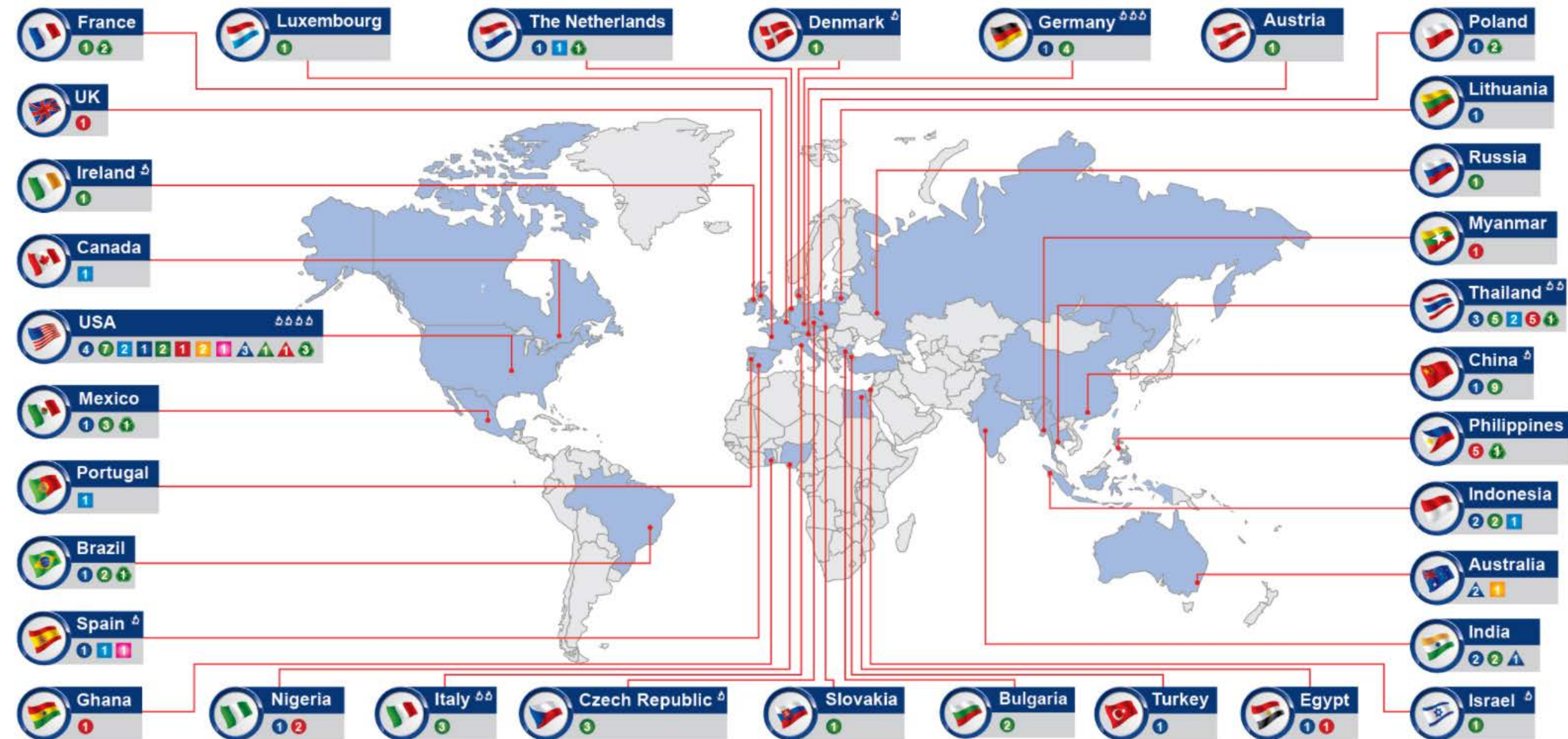
**AVEVA**

# Summary

- Introduction
- Business Challenges
- Solution Approach
- Solution Architecture
- Digitalization Journey with PI System
- Demo

# Location of Operating Sites

124 operating sites, 33 countries, 6 continents



# Indorama Ventures Limited

## Visio

To be a world-class sustainable chemical company making great products for society.

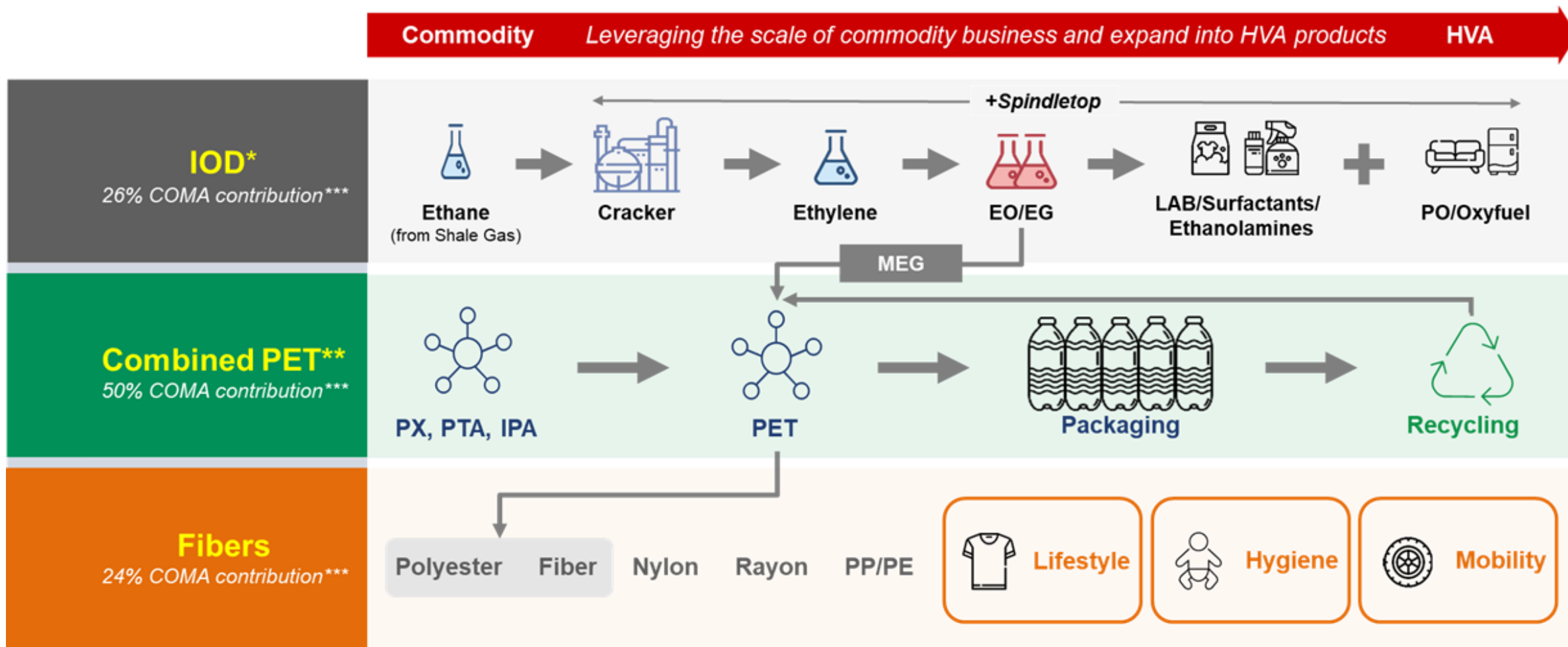
## Missio

We commit to be a responsible industry leader leveraging on the excellence of our people, processes, and technologies to create value for our stakeholders.

## Value

- ✓ The customer is why we exist.
- ✓ Our people make the difference.
- ✓ We see change as an opportunity.
- ✓ Diversity is our strength.
- ✓ We are responsible.

# What We Do....



Note: \*IOD = Integrated Oxides and Derivatives; \*\*Combined PET includes PET, PET HVA, PTA, PX, recycling, packaging, and specialty chemical;  
 \*\*\*COMA (contribution margin) contribution is calculated using IVL pro forma including Spindletop financials as of LTM 3Q19  
 Source: IVL Analysis

# Indorama Ventures Corlu PET, Turkey



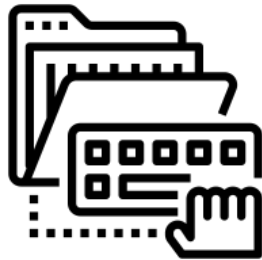
- Indorama Ventures Corlu PET, formerly Polyplex Turkey, is a PET facility located in the European Free Zone in Corlu, northwest of Turkey near Istanbul within close proximity of biggest PET resin consumers in the region.
- The acquisition strengthens IVL's leadership across Europe while broadening access, not only to traditional Northern European markets but also the emerging markets of Southeast Europe.
- Its products serves both MNCs and local brands in food and beverage, household, personal care.

# Business Challenges At IVC Turkey

## Lack of Visibility in Utility And Cogen Operations



**Standalone  
Data Sources**



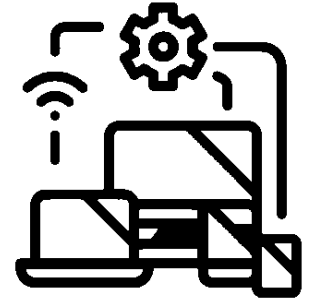
**Manual Data  
Entry**



**Real-time  
Access to Data**



**Data Analytics**



**Single Platform to  
Monitor the Plant**

# Solution

## Solution Approach

- Centralization of Utility and Cogen data on Single Platform.
- Provision of Real-time Monitoring and Real-time Analysis to Facilitate inter departmental co-ordination.
- Single Dashboard to Manage Utility Supply and Consumption
- Ensure Better management of Power Generation and Consumption.

## Implementation

- All Stand-alone PLCs integration with Master PLC
- On Boarding of Energy Meter data.
- PI AF Template designed for each Equipment and Process with working limits.
- PI AF Analytics build to Calculate Utility Supply & Consumption, and Cogen Production.
- PI AF Event frames designed to Notifications.
- PI Vision Real-time Dashboards designed for Equipment and Process.

## Benefits

- All Stand-Alone Systems integrated on single platform
- Historical Data helps to get real-time process insights with PI Analytics
- Single Dashboard For Utility Supply & Consumption, NG Gas Production
- Effective Energy Management on both supply and consumption side.
- Man hours reduced in data capture, consolidation and reporting - Approx. 80 Man Days Per Annum



# Solution Architecture

## Utility Area

Compressors



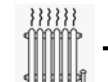
Chillers



Cooling Fans



HTM Heaters



Energy Meters



## Cogen Area

Engines



Boiler



DG



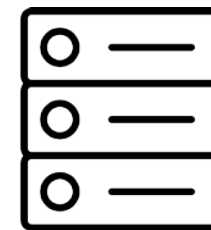
Master PLC



PI Interface



Data Archive



AF, PI VISION



End Users

# IVC Turkey Digitalization Journey With PI System

Phase I

Situational Awareness

- Connecting Disparate Systems
- Real-time view of Process, Assets, Ops
- KPI's & Dashboards

Phase II

Operational Excellence

- Excursion Monitoring
- Real-time Decisions with AF Analytics
- Shift Performance Assessment

Phase III

Monitoring of Utility Consumption & Optimization

- Utility monitoring Power, NG, N2 Compressed Air,
- Emission Monitoring

Phase IV

Asset Optimization and CBM

- Asset Analytics
- MTBF/MTTR / Uptime
- CBM
- Asset Performance Management.

Phase V

Enabling Advanced Analytics

- Cloud Connectivity
- Advanced Analytics (AI/ML Based)
- AR/VR
- Predictive Analytics





# DEMO

# Pi ViSiON

❖ Online condition monitoring with PI Vision, all online parameters of the plant could be seen from every where.



# Utility Area

**Cooling Fans**

Utility Department

PARAMETERS	VALUE
Frequency	0 Hz
Temperature	15,8 °C

PARAMETERS	VALUE
Frequency	23,7 Hz
Temperature	23,8 °C

PARAMETERS	VALUE
Frequency	50,1 Hz
Temperature	24,1 °C

SSP FLOW  
210,5 m3/h

PARAMETERS	VALUE
Frequency	0 Hz
Temperature	12,7 °C

PARAMETERS	VALUE
Frequency	42,2 Hz
Temperature	14,6 °C

PARAMETERS	VALUE
Frequency	38,7 Hz
Temperature	23,8 °C

CP FLOW  
185,89 m3/h

**Instrument Air Compressor-1**

PARAMETERS	RANGE	VALUE
Outlet Air Pressure	6.5-7.5 bar	7,0
Element Outlet Temp	<120 °C	36,4
Dew Point Temperature	1-7 °C	2,1 °C
Actual Speed	1000-3000 rpm	908
Working hours	Hours	14,110 h
Working Load Capacity	0 - 100 %	No Tag

**Instrument Air Compressor-2**

PARAMETERS	RANGE	VALUE
Outlet Air Pressure	6.5-7.5 bar	6,9
Element Outlet Temp	<120 °C	15,5
Dew Point Temperature	1-7 °C	3,2 °C
Actual Speed	1000-3000 rpm	0
Working hours	Hours	0 h
Working Load Capacity	0 - 100 %	No Tag

Main Line Flow

PARAMETERS	UNITS	VALUE
Main line Orifice Flow	m3/h	137,7

Main line Orifice Totalizer

**CP CHILLED WATER FLOW**  
185,29 m3/h

Utility Department

Expansion Tank Level

Chilled Water Flow: 189,7 m3/h

VAM CHILLER

Parameters	Range	Value
Instant TR	> 400 TR	207
Chiller Water Inlet Temp	8-13 °C	9,2
Chiller Water Outlet Temp	5-9 °C	5,9

TRANE CHILLER

Parameters	Range	Value
Cooling Capacity (In%)	>20-100	
Chiller Water Inlet Temp	9-13 °C	
Chiller Water Outlet Temp	8-11 °C	

PUMP 1

Parameters	Range	Value
Instant KW	0 - 75	0 kW
Frequency Hz	0 - 60	0,00 Hz

PUMP 2

Parameters	Range	Value
Instant KW	0 - 75	15,2 kW
Frequency Hz	0 - 60	30,87 Hz

Pressure Gauge: 0 - 6 bar, Value: 4,46 bar

ALARM

**N2-PLANT 1**

**N2-PLANT 2**

Pressurization Unit

# Chillers

THERMAX-TRANE Details

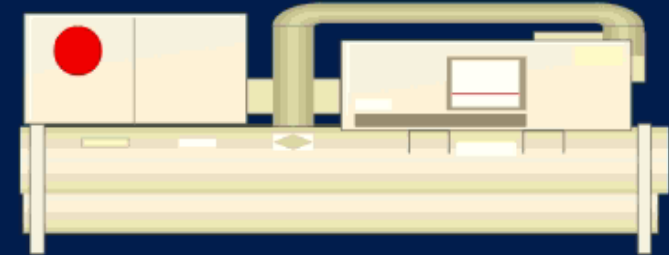


## VAM CHILLER



Utility Department

## TRANE CHILLER



PARAMETERS	RANGE	VALUE
Tower Water Inlet Temp	25-30 °C	7.7
Tower Water Outlet Temp	25-35 °C	8.9
Chiller Water Inlet Temp	9-13 °C	12.4
Chiller Water Outlet Temp	8-11 °C	9.2
Chiller Water Flow	145-241 m3/h	6.5516
Instant TR	< 400 TR	0

PARAMETERS	RANGE	VALUE
SCV (steam valve) Base	< %100	0
Vapour Pressure	3-8 bar	No Tag

PARAMETERS	UNITS	VALUE
Purge Run Hrs	Hrs	No Tag
M/C Operating Hrs	Hrs	No Tag

PARAMETERS	RANGE	VALUE
HTG Temperature	< 150 °C	10.4
HTG Vapour Temp	< 90 °C	9.0
Spray Solution Temp	< 50 °C	11.5
U-Tube Temp	< 35 °C	8.3
LTG Temp	< 90 °C	12.0
HTG Top Temp	< 150 °C	11.1
HTG Bottom Temp	< 150 °C	10.5
Actual diff. (Temp Diff)	< 10 °C	0.6
Vacuum Pressure	5-30 mmHg	27.7
Concentration	< %64	0.6
HTG Gauge Press(steam)	< 0 bar	No Tag
HTG Gauge Press(Condenser)	< 6 bar	No Tag

PARAMETERS	RANGE	VALUE
Tower Water Inlet Temp	25-30 °C	10.7
Tower Water Outlet Temp	25-35 °C	11.4
Chiller Water Inlet Temp	9-13 °C	18.0
Chiller Water Outlet Temp	8-11 °C	17.8

PARAMETERS	UNITS	VALUE
Compressor Working Hours	Hrs	6,332

PARAMETERS	RANGE	VALUE
Evaporator Cooling Gas Press	> 300 kPa	338
Evapo Gas-Water Temp Diff	> 5 °C	No Tag
Expansion Valve Position %	> %50	No Tag
Evaporator Coolant Level mm	>(-6) - (+10)	No Tag
Condenser Saturated Gas Temp	> 50 °C	No Tag
Condenser Refrigerant Pressure	> 1000 kPa	337
Condenser Gas-Water Temp Diff	> 5 °C	No Tag
System Cooling Gas Diff Press	> 500 kPa	No Tag
Oil Pressure	> 900 kPa	No Tag
Compressor Outlet Refr Temp	> 80 °C	No Tag
Discharge Superheat Out Temp	> 30 °C	No Tag
Cooling Capacity	>%20-%100	0%
Oil Sensor Status Ok/Not Ok	Wet	No Tag

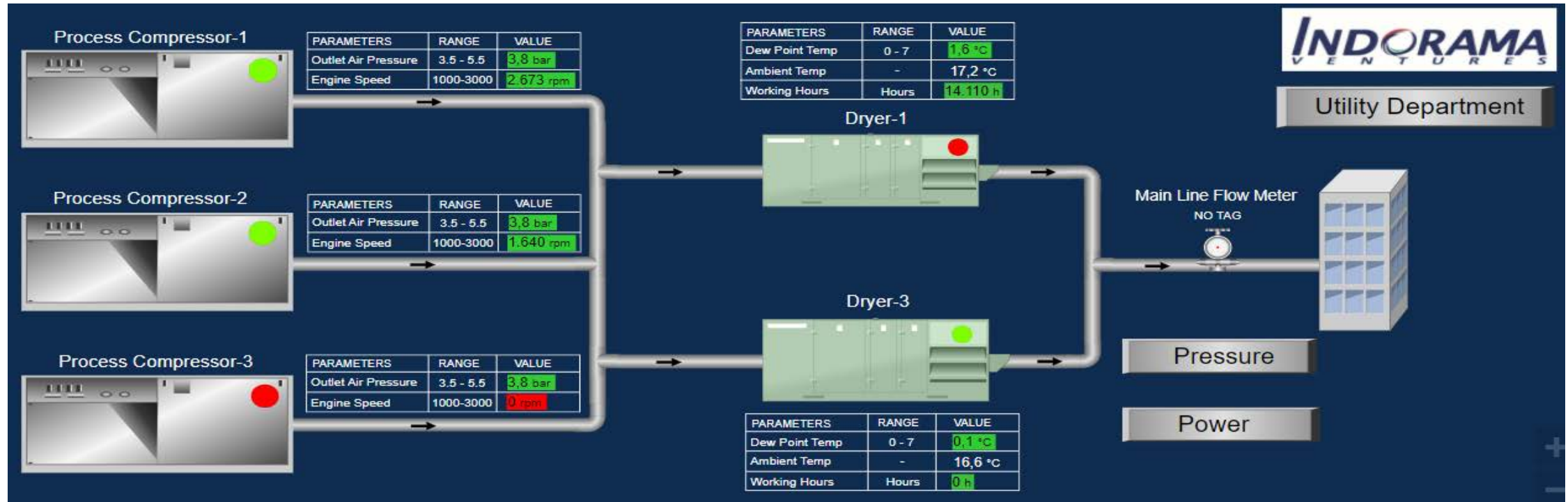
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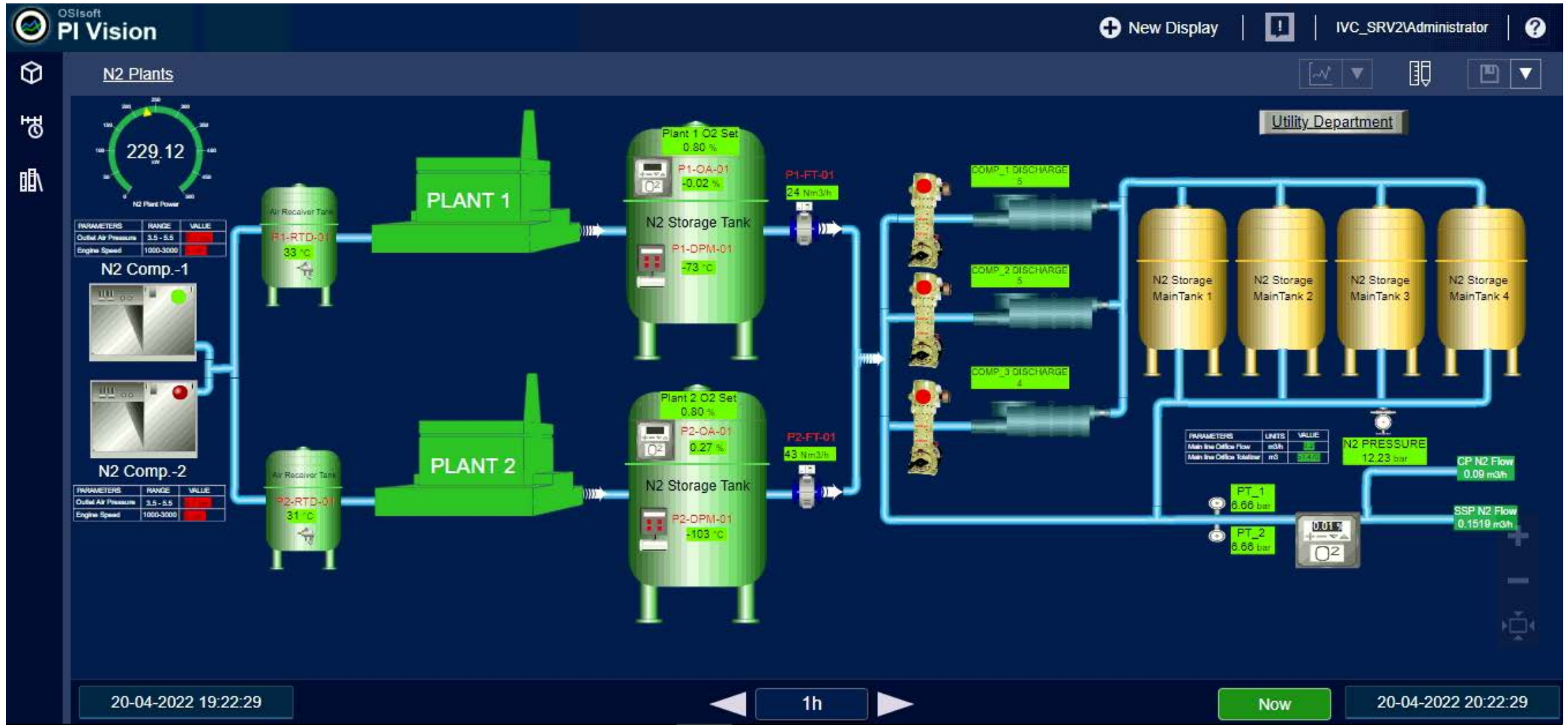
Now

20-04-2022 20:13:32

# Compressors

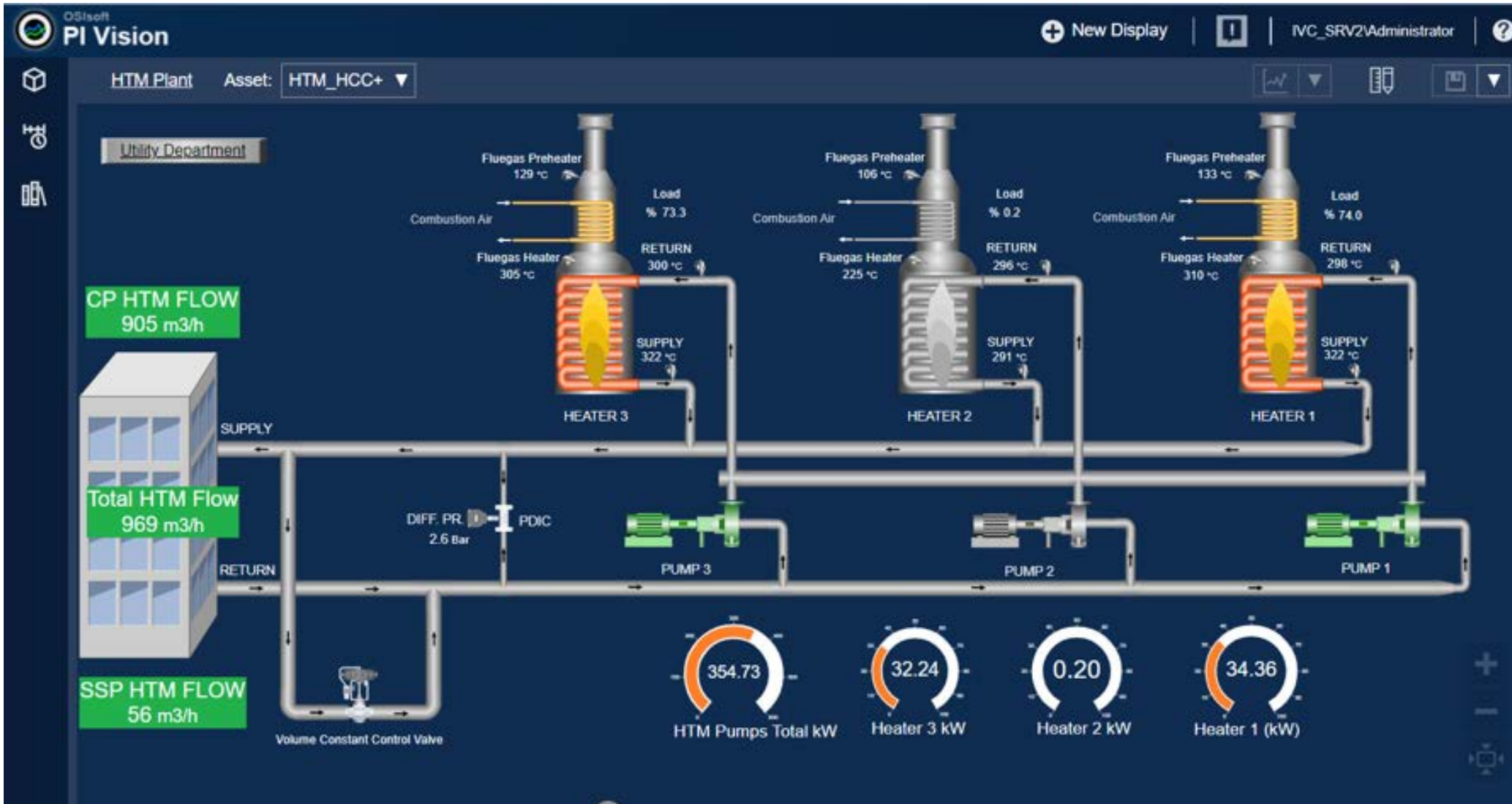


# Nitrogen Plant

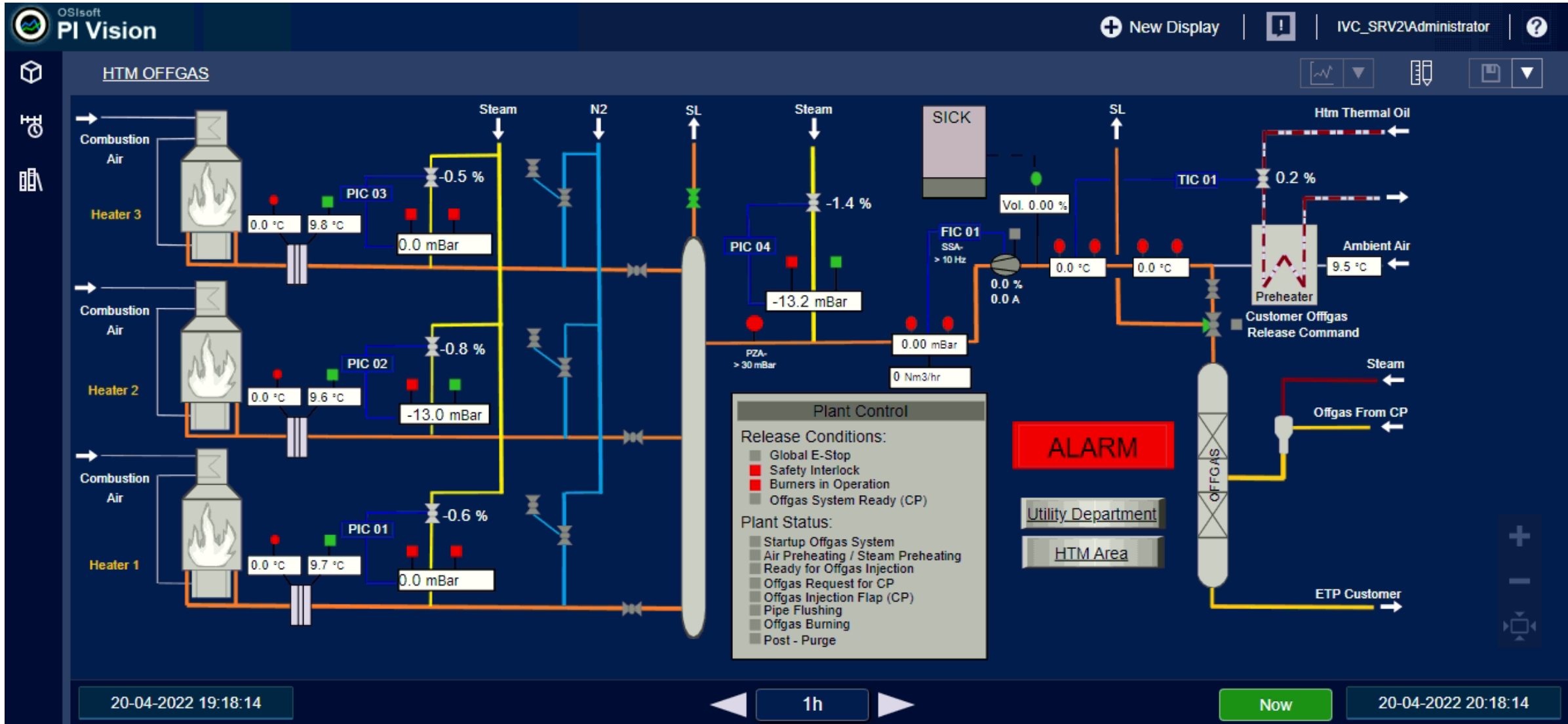




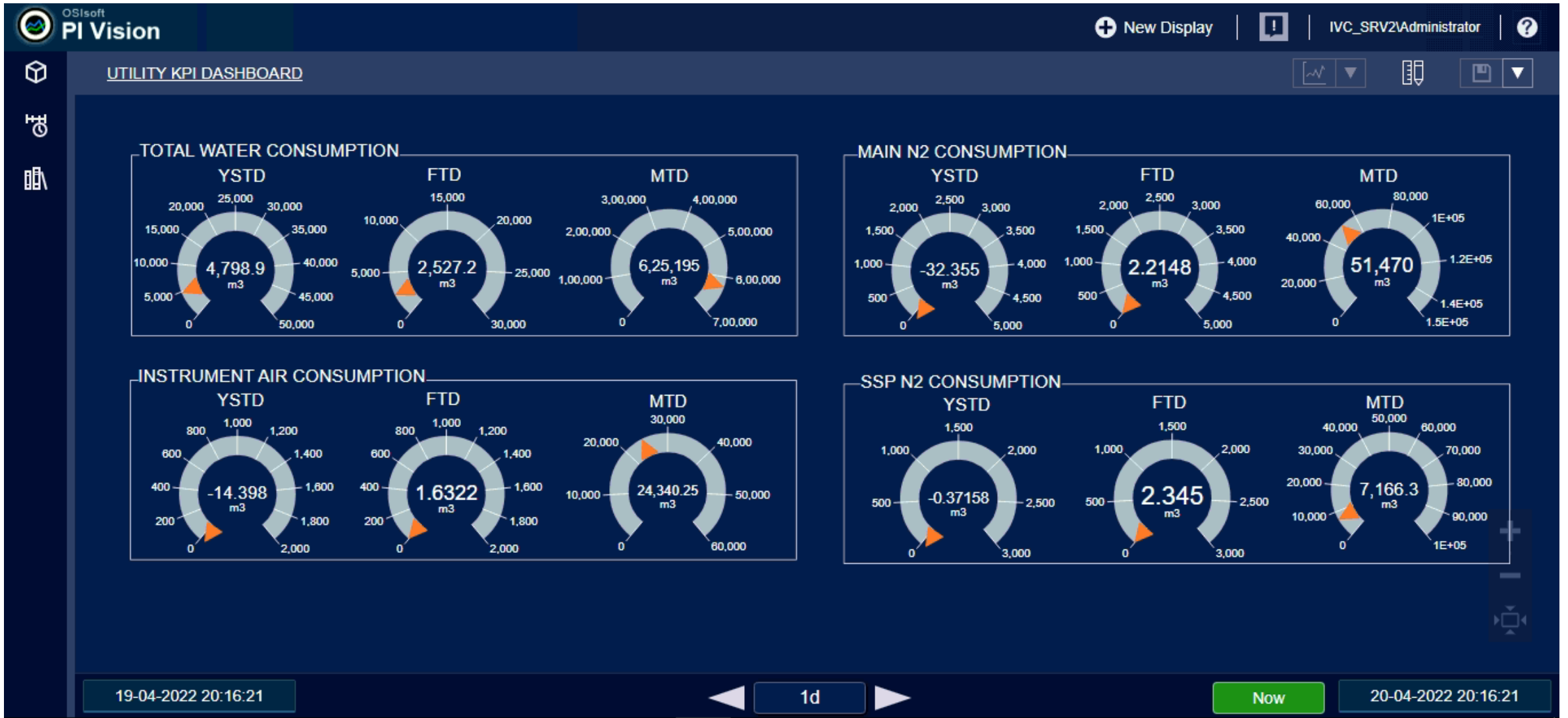
# HTM



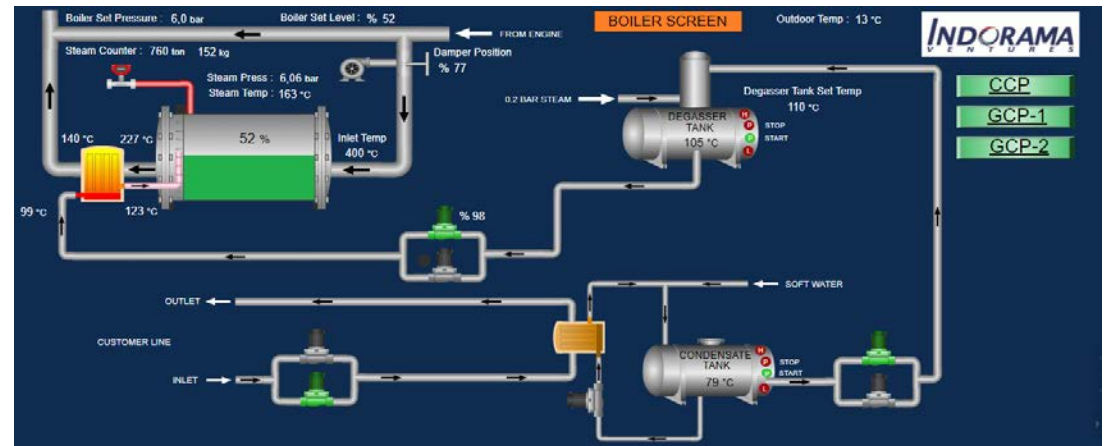
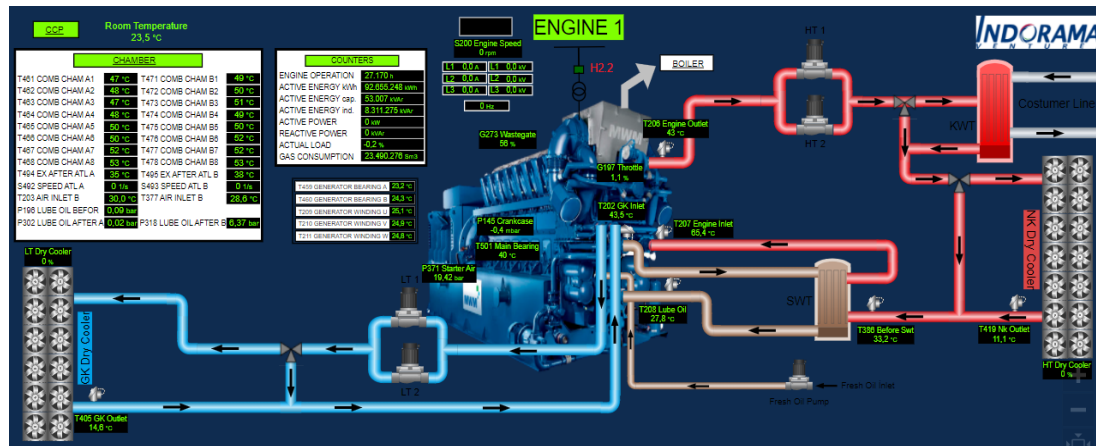
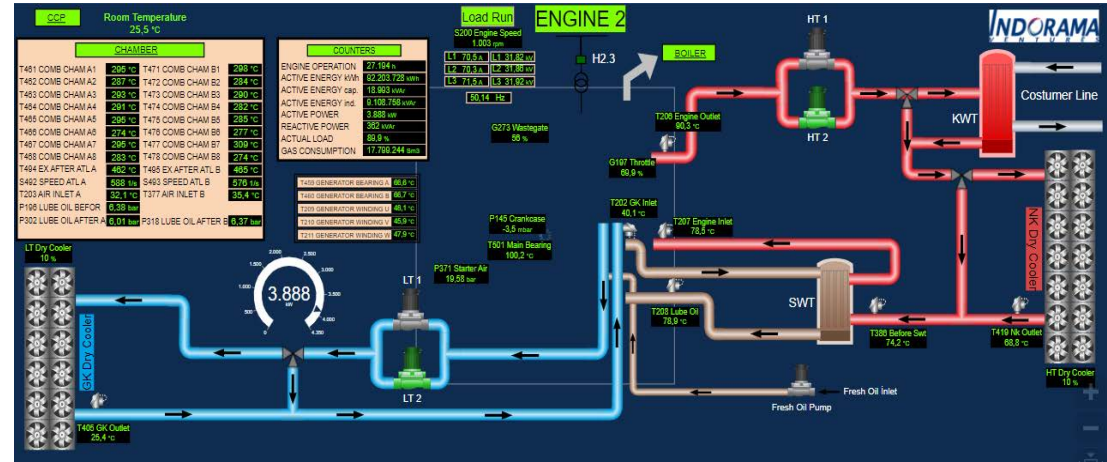
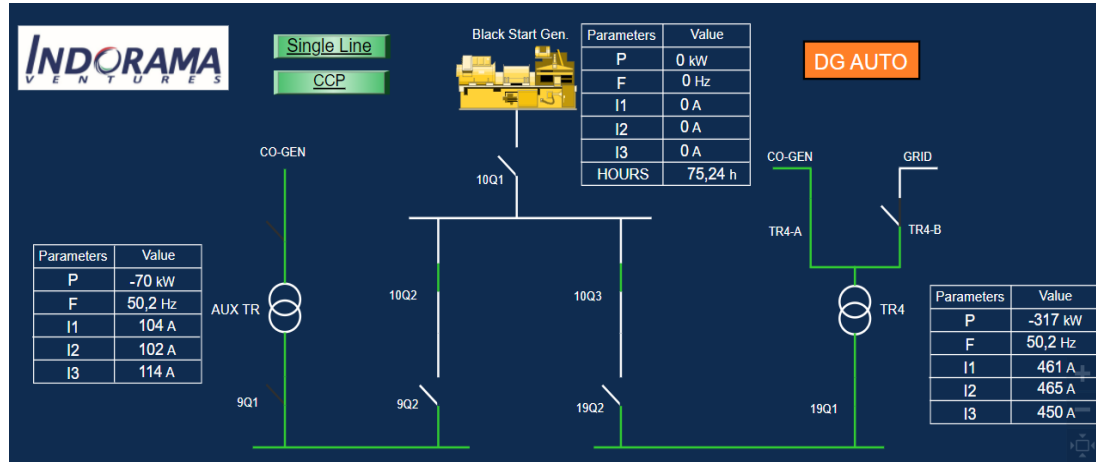
# HTM OFFGAS



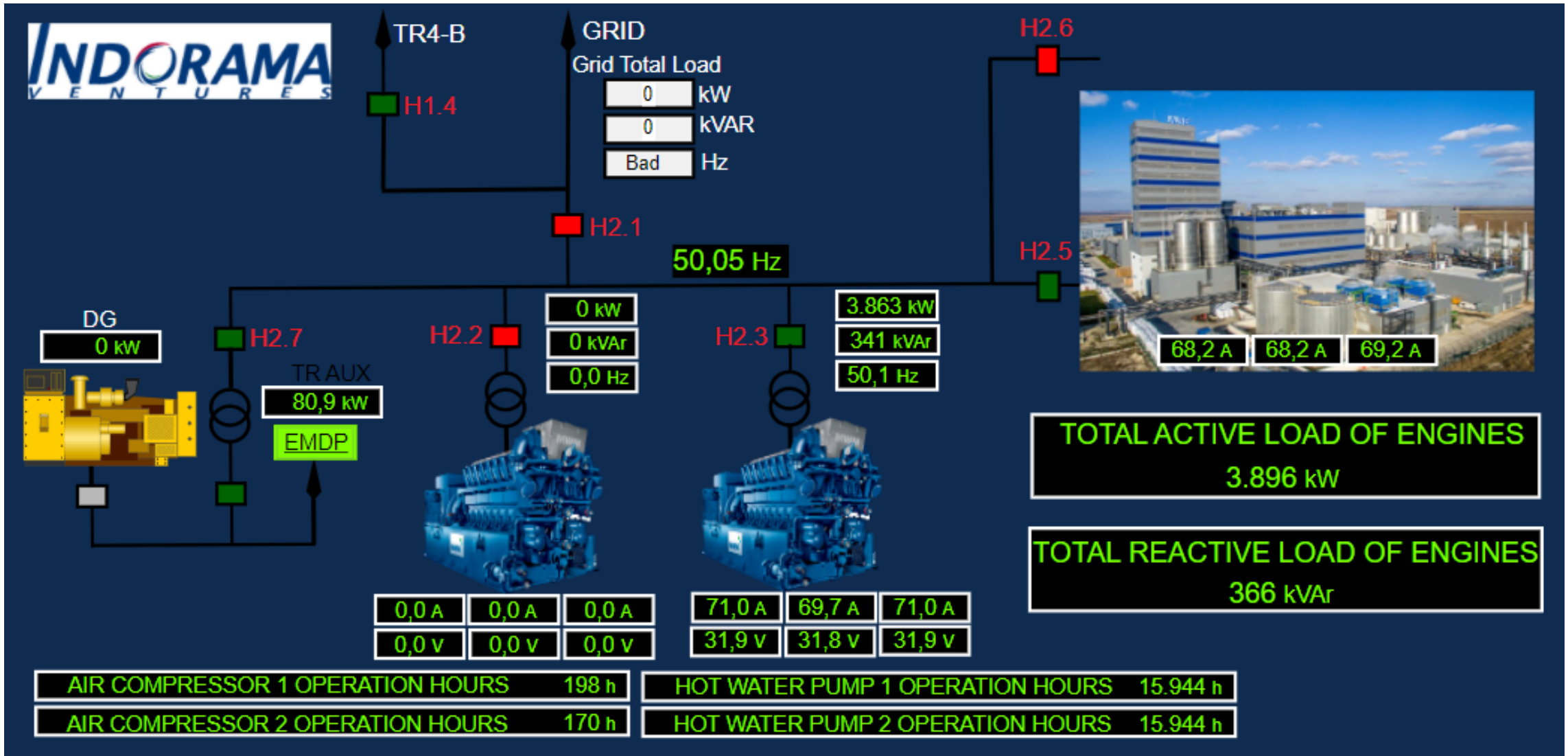
# Utility – KPI



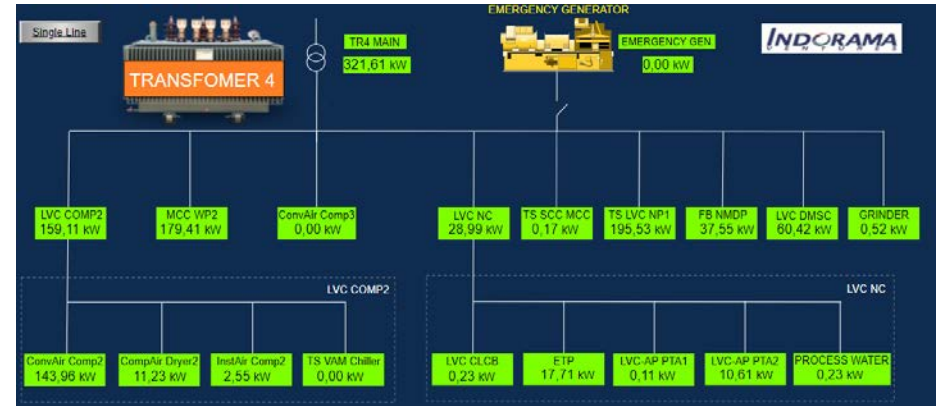
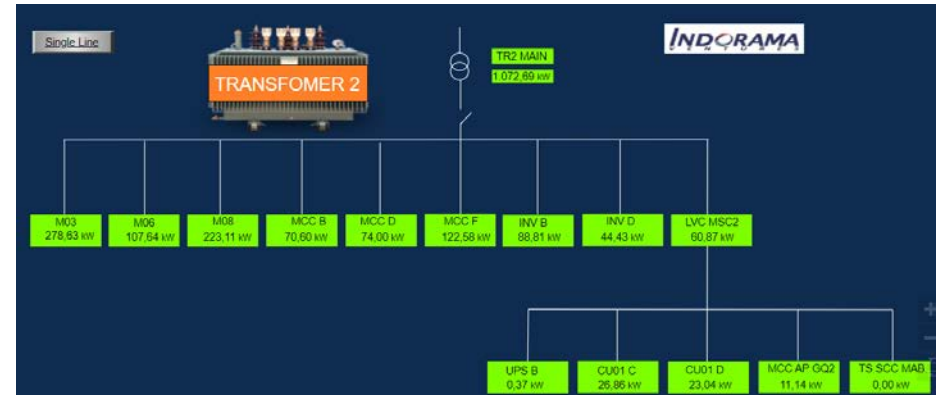
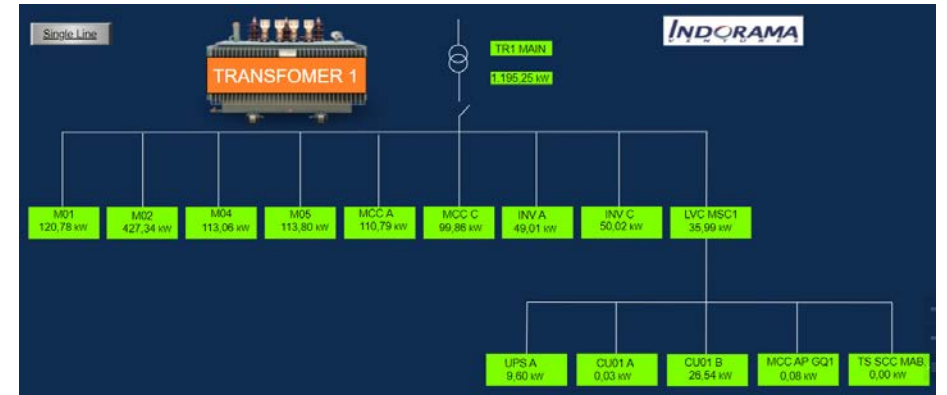
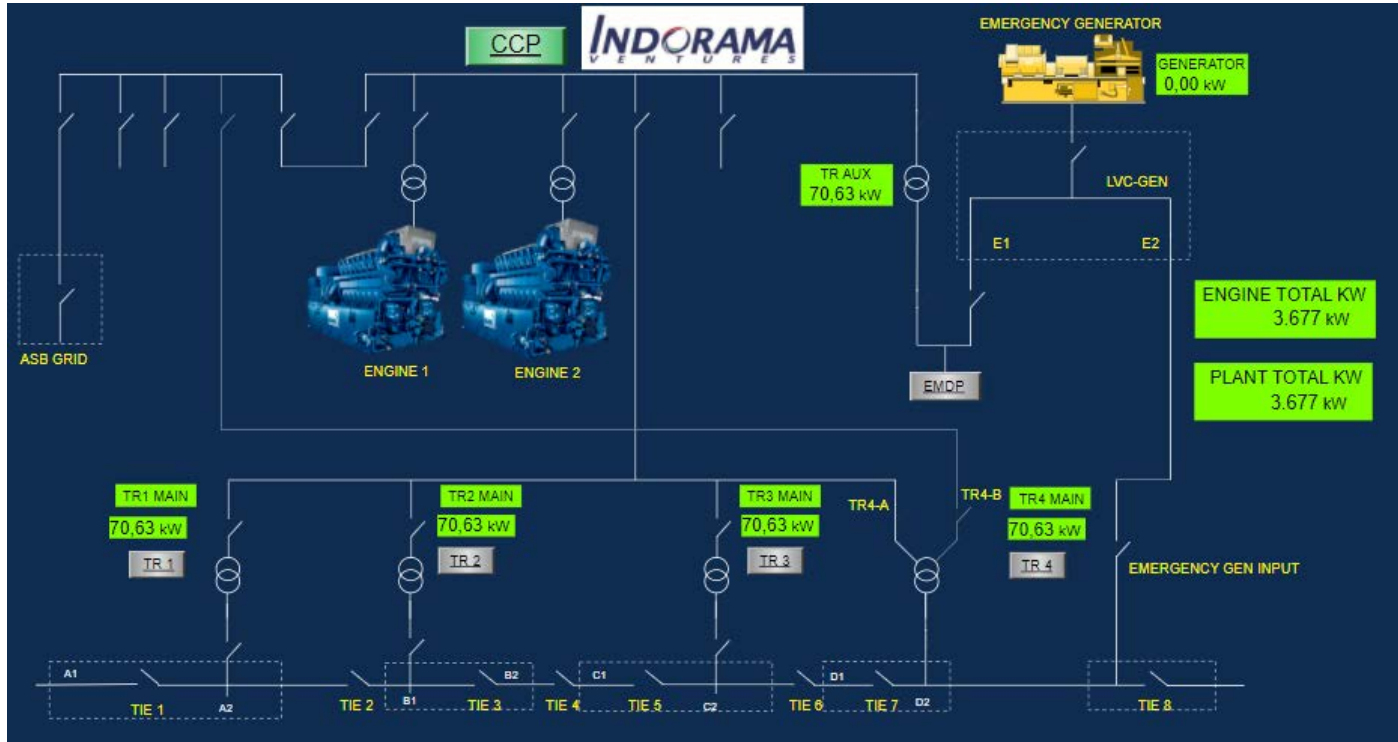
# Cogen – Overview



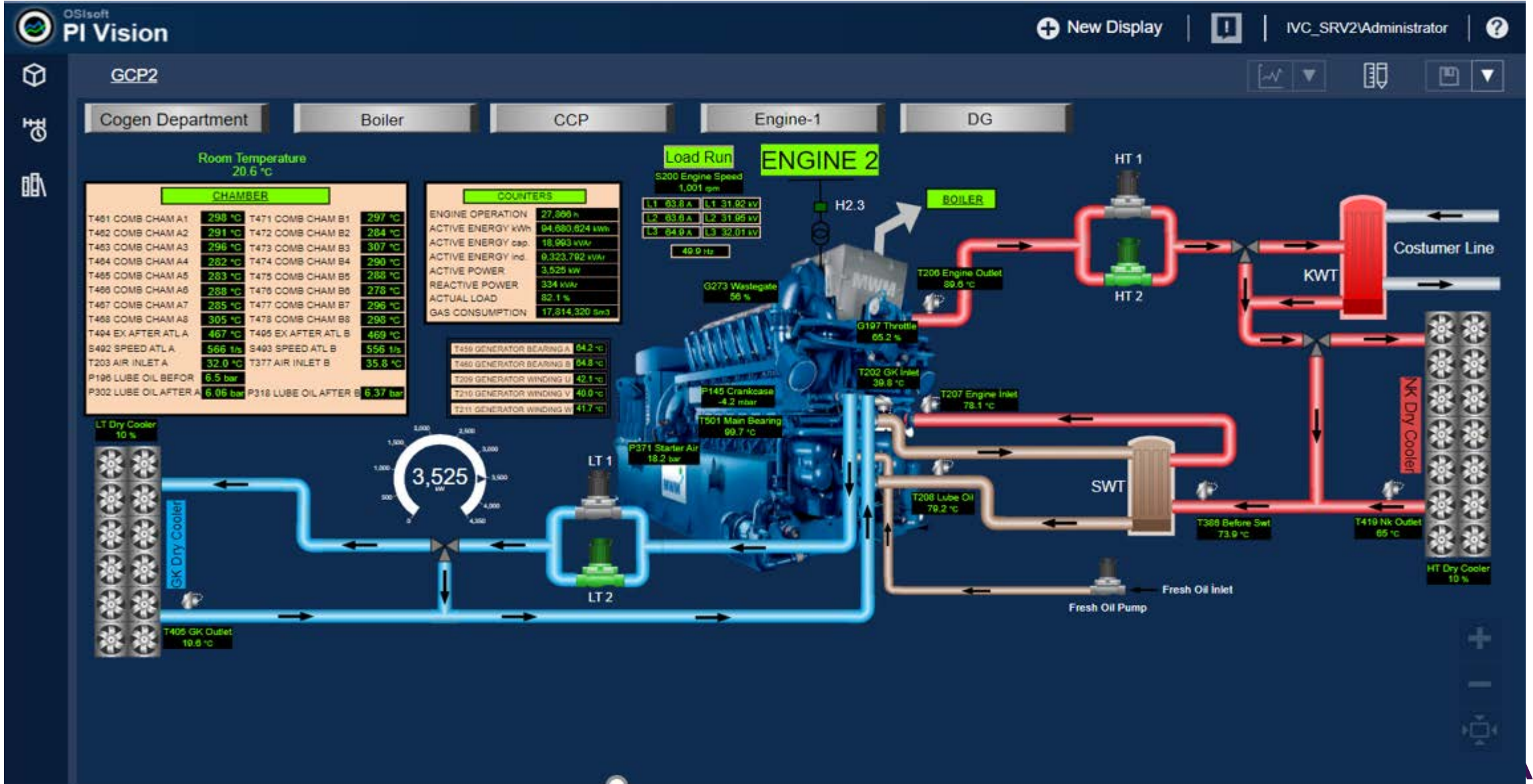
# Co-Gen



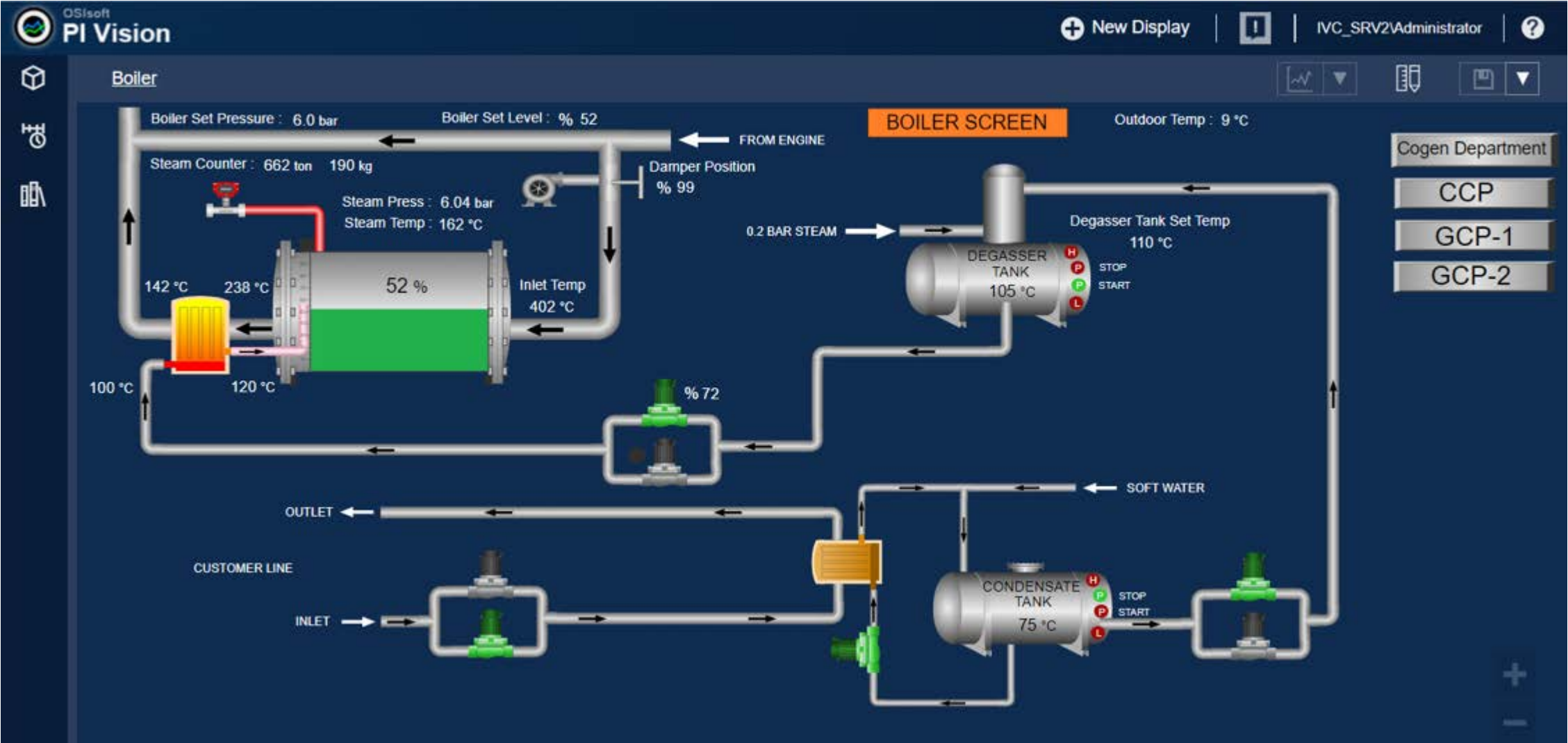
# Co-Gen



# Engine



# Boiler





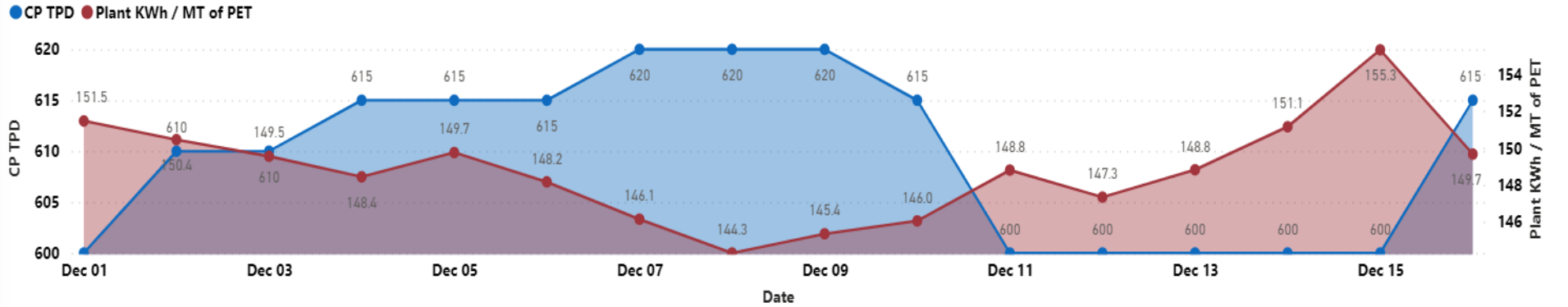
\$0.033      \$1,230,671      7733      7740

2020

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

### Plant KWh / MT of PET



### CP TPD and Daily Power Cost by Date



MASTER

User

Assign Screen

UTILITY

Dashboard

KPIs

Data Input

COGEN

Dashboard

Data Input

CP & SSP

Dashboard

Data Input

ASB NG USD/Sm3

\$3.179

NG Cost [D/M/Y]

\$2,976,267

CP [D/M/Y]

9755

SSP [D/M/Y]

9740

2020

Jan

Feb

Mar

Apr

May

Jun

Jul

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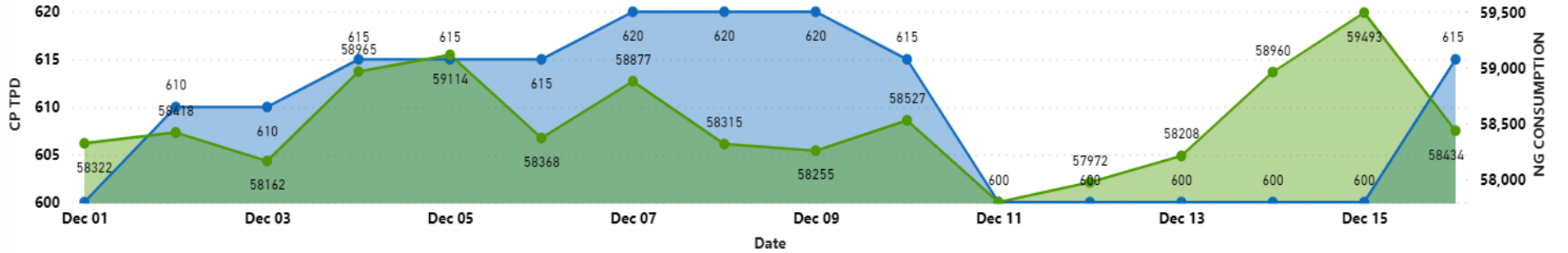
14

15

16

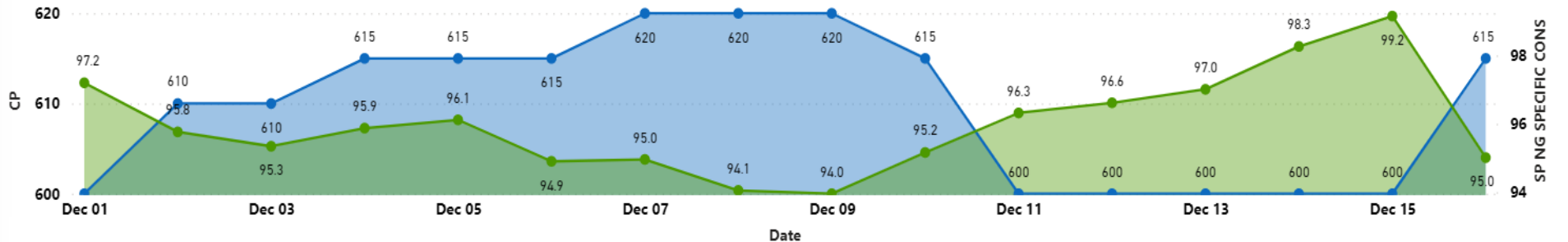
CP TPD & NG CONSUMPTION

● CP TPD ● NG CONSUMPTION



CP TPD & SPECIFIC NG CONSUMPTION

● CP ● SP NG SPECIFIC CONS



[MASTER](#)
[User](#)
[Assign Screen](#)
[UTILITY](#)
[Dashboard](#)
[KPIs](#)
[Data Input](#)
[COGEN](#)
[Dashboard](#)
[Data Input](#)
[CP & SSP](#)
[Dashboard](#)
[Data Input](#)
**Power Cost USD/kW**

\$0.053

**Power Cost [D/M/Y]**

\$1,230,691

**ASB NG USD/Sm3**

\$3.179

**NG Cost [D/M/Y]**

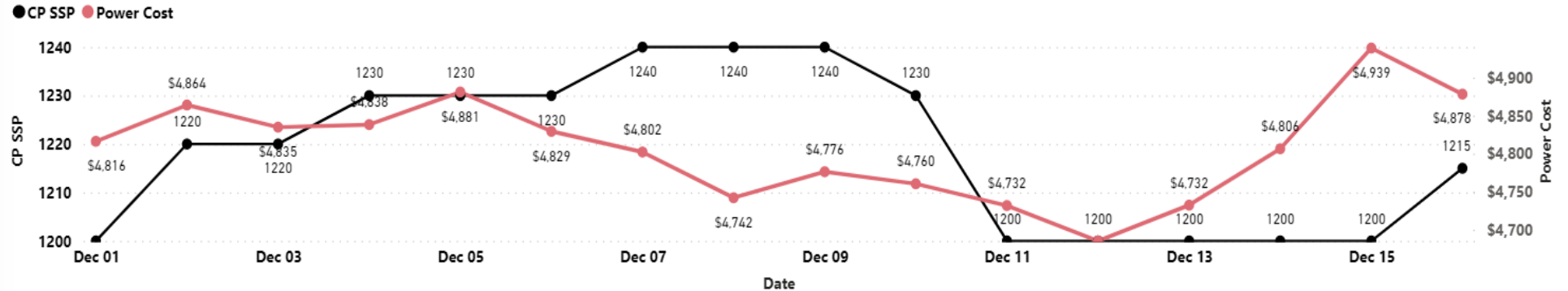
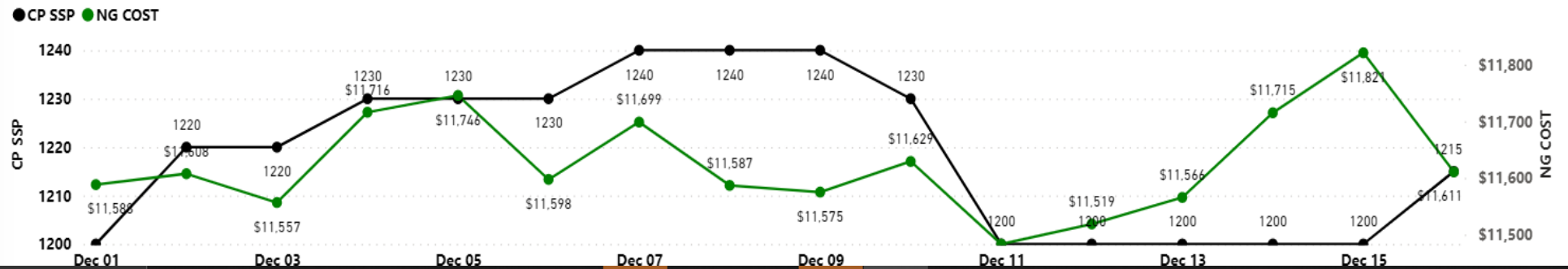
\$2,976,267

**CP [D/M/Y]**

9755

**SSP [D/M/Y]**

9740

**2020**
[Jan](#)
[Feb](#)
[Mar](#)
[Apr](#)
[May](#)
[Jun](#)
[Jul](#)
[Aug](#)
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[14](#)
[15](#)
[16](#)
**CP+SSP (TPD) vs POWER COST**

**CP+SSP (TPD) vs NG COST**


MASTER

- User
- Assign Screen

UTILITY

- Dashboard
- KPIs
- Data Input

COGEN

- Dashboard
- Data Input

CP & SSP

- Dashboard
- Data Input

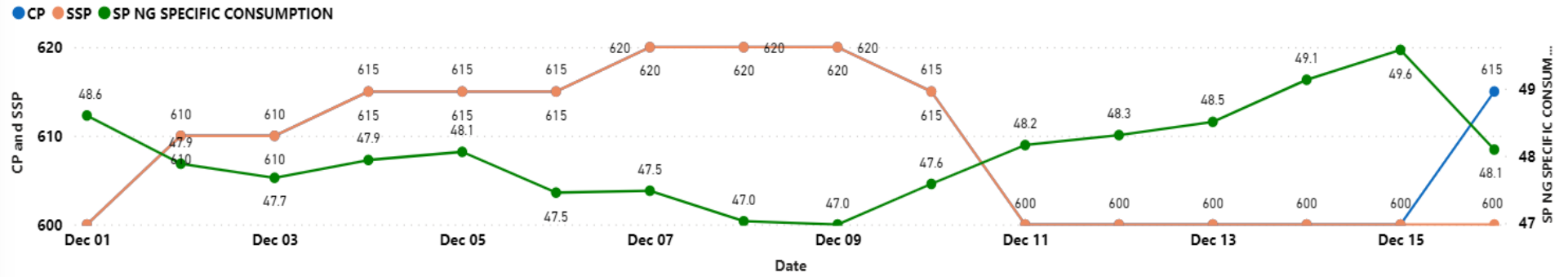
Power Cost USD/kW	Power Cost [D/M/Y]	ASB NG USD/Sm3	NG Cost [D/M/Y]	CP [D/M/Y]	SSP [D/M/Y]
\$0.053	\$1,230,691	\$3.179	\$2,976,267	9755	9740

2020

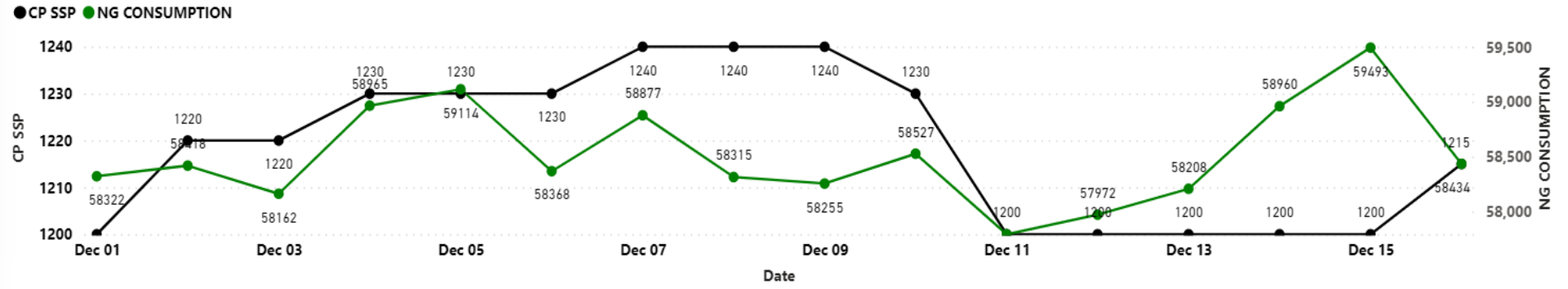
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CP SSP (TPD) vs SPECIFIC NG CONSUMPTION



CP+SSP (TPD) vs NG CONSUMPTION





## Sükrü Çelik

Lead Engineer

- Indorama Ventures Çorlu PET, Turkey
- [sukru.C@tr.indorama.net](mailto:sukru.C@tr.indorama.net)



## Animesh Kadam

Project Manager

- ECGIT PRIVATE LIMITED
- [animesh@ecgit.com](mailto:animesh@ecgit.com)



# Questions?

Please wait for the microphone

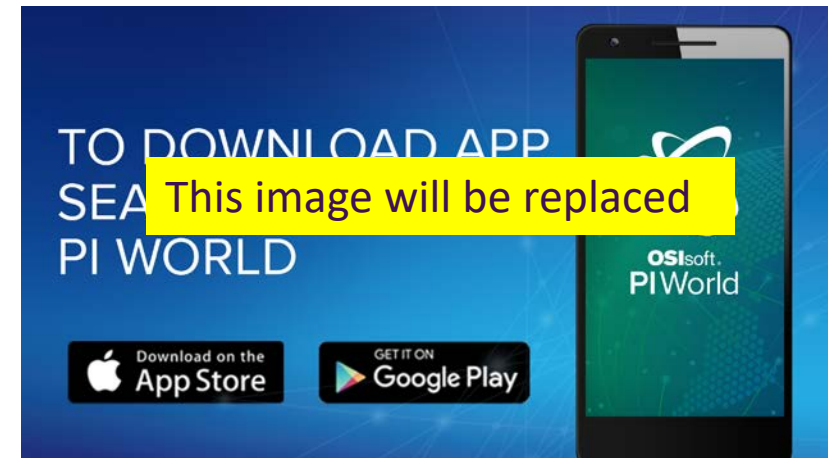
- State your name and company



# Please remember to...

Complete the survey!

- Navigate to this session in the mobile agenda for the survey



*“The secret of getting ahead is getting started.”*


**Mark Twain**


DZIĘKUJĘ CI  
 NGIYABONGA  
 TEŞEKKÜR EDERİM  
 DANKIE  
 TERIMA KASIH  
 СПАСИБО  
 GRAZIE  
 МАХАДСАНИД  
 GO RAIBH MAITH AGAT  
 БЛАГОДАРЯ  
 GRACIAS  
 ТИ БЛАГОДАРАМ  
 TAK DANKE  
 RAHMAT  
 HATUR NUHUN  
 PAKKA PÉR  
 HATUR NUHUN  
 PAXMAT САГА  
 CÁM ƠN BẠN  
 WAZVIITA  
 FАLEMINDERIT  
 謝謝  
 ТАРАДН ЛЕІВН  
 KEA LЕВОНА  
 БАЯРЛАЛАА  
 MISAOTRA ANAO  
 WHAKAWHETAI KOE  
 DANKON TANK  
 ТАРАДН ЛЕАТ  
 SALAMAT  
 MATUR NUWUN  
 ХВАЛА ВАМ  
 MULŢUMESC  
 KÖSZÖNÖM  
 PAKMET CIZGE  
 GRAZIE  
 고맙습니다  
 SHUKRA  
 HVALA  
 FАAFETAІ  
 ESKERRIK ASKO  
 HVALA  
 TEŞEKKÜR EDERİM  
 OBRIGADO  
 DANKJE  
 EΥΧΑΡΙΣΤΩ  
 GRATIAS TIBI  
 АЧІЎ  
 SALAMAT  
 MAHALO IĀ 'ŌE  
 TAKK SKALDU HA  
 MERCİ  
 DI OU MÈSI  
 ĎAKUJEM  
 GRAZZI  
 PAKKA PÉR  
 SIPAS JI WERE  
 TERIMA KASIH  
 UA TSAUG RAU KOJ  
 ТИ БЛАГОДАРАМ  
 СИПОС



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