

AVEVA PI WORLD

---

# Rotating Equipment Monitoring

Spirit Energy and ITI Operations

Presented By: Ross Yule and Richard J Wallace

AVEVA

# Spirit Energy



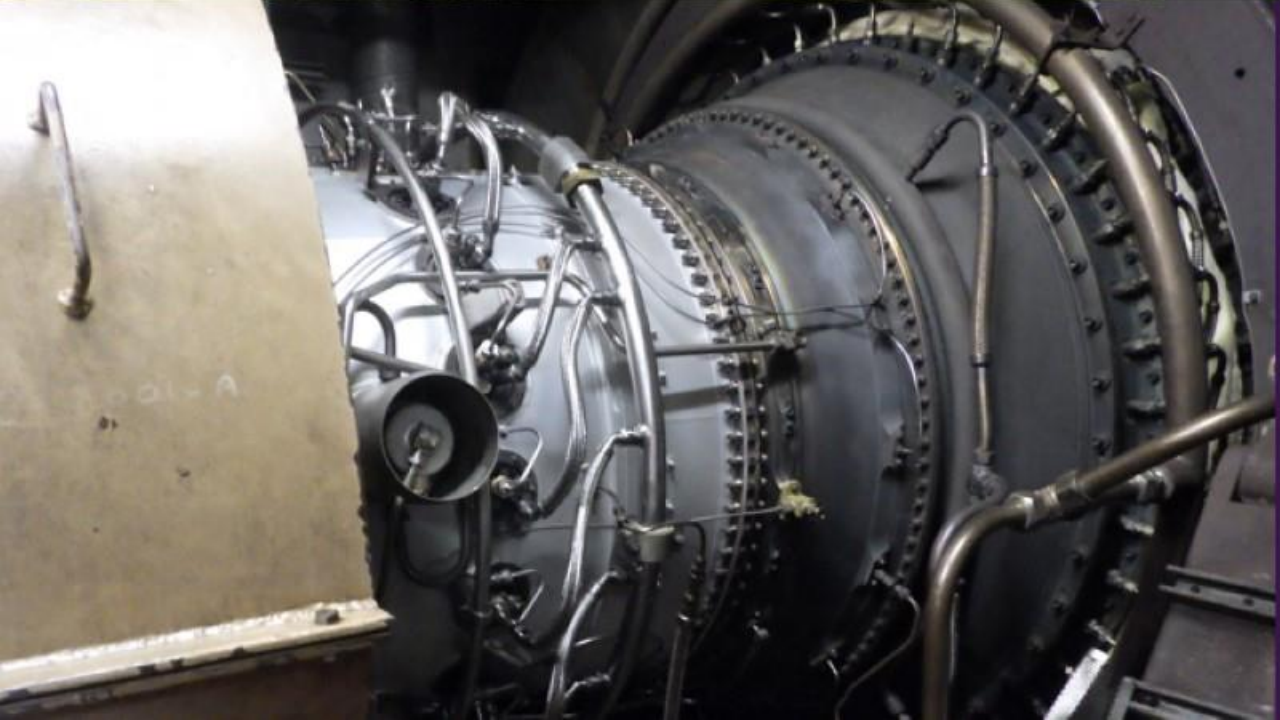
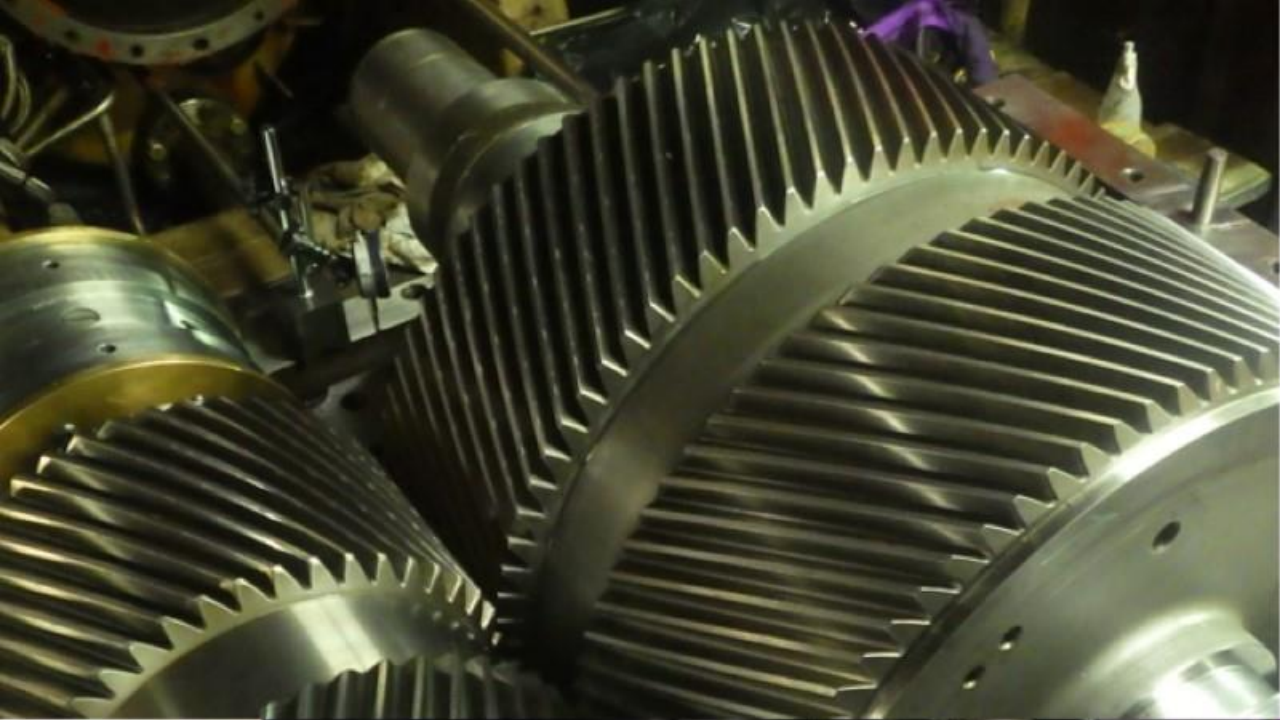
## At a glance

- Oil and Gas Exploration and Production company
- Based in North West Europe
- Assets in UK, Netherlands and Norway
- Largest operated facility is the Morecambe Hub:
  - 2 Onshore Gas Processing Facilities
  - 8 Offshore Platforms
- Further information can be found on our website:

<https://www.spirit-energy.com/>



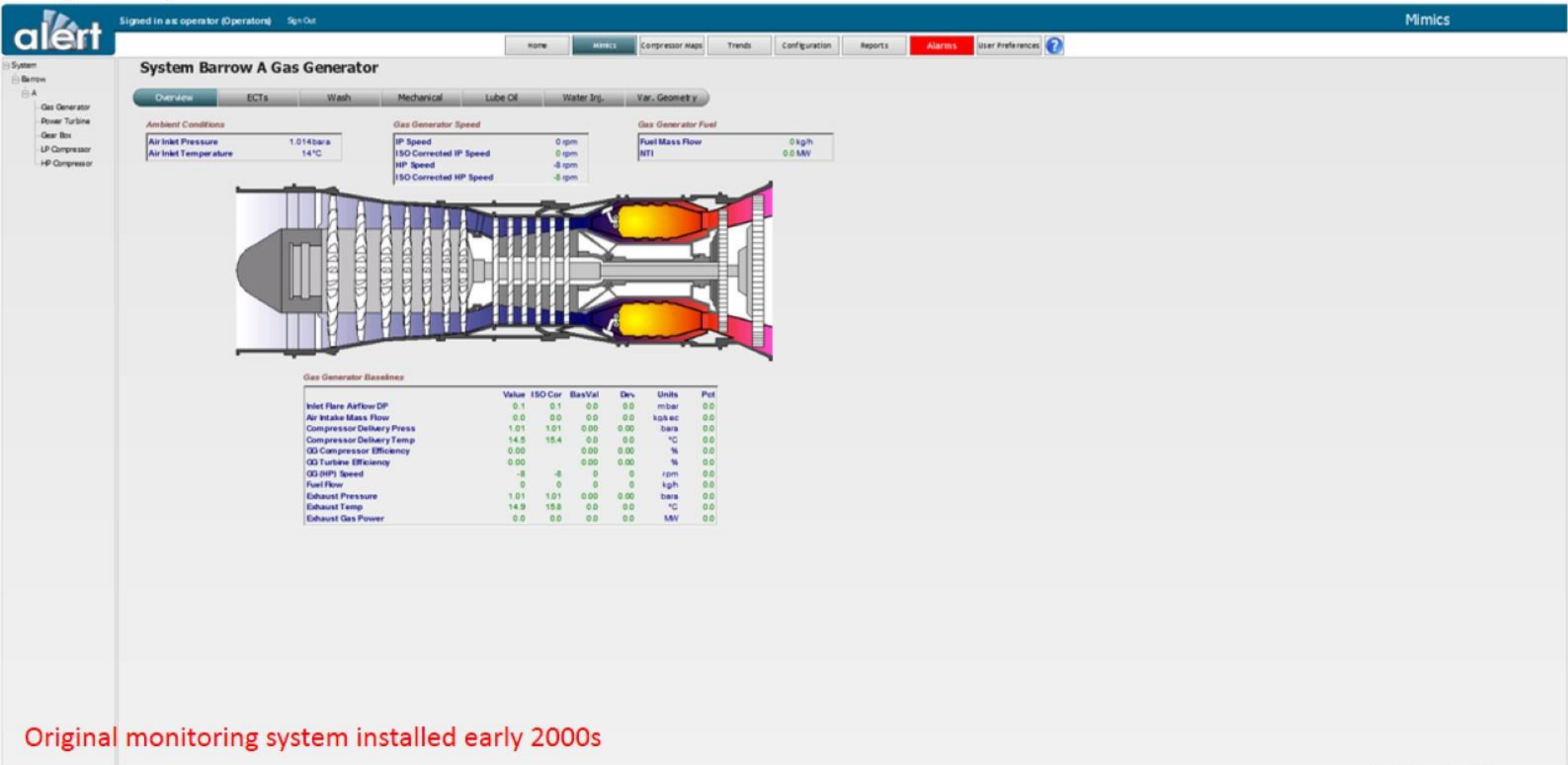




# Rotating Equipment

- Operation and maintenance of Turbines, Compressors, Pumps, etc.
- Critical equipment in plant process
- Robust remote monitoring can allow:
  - Early failure mode identification and mitigation
  - Rapid fault finding investigation and reinstatement

# Original System



NMT FGC Running Monitor [UNDER ...]



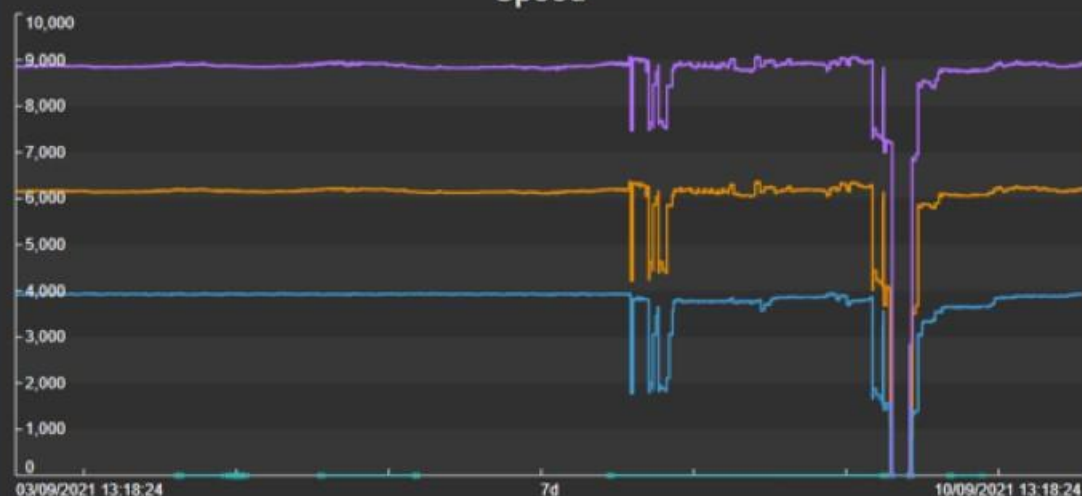
## NMT FGC Running Monitor

To request a display, email ross.yule@spirit-energy.com

**\*ALL VALUES ARE UNDERGOING VALIDATION\***

(New Concept)

## Speed



NMR\_ST80464 Power Turbine  
3,929.2 rpm  
NMR\_ST80459 HP Turbine  
8,893.8 rpm  
NMR\_ST80456 IP Turbine  
6,190.5 rpm  
NMR\_ST80462 Starter  
-2,442 rpm

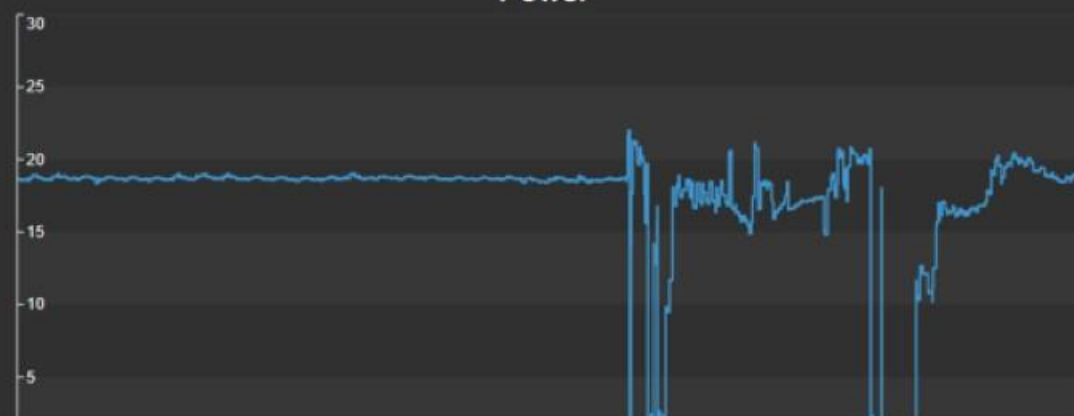
Days Until Next Outage

**-340 d**

Next Outage

**06/10/2020 00:00:00**

## Power



NMR\_XT80642 Torquemeter  
18.886 MW

## Links to Key Monitors:

[Bearing Temperatures](#)[Vibration](#)[Temperature Spread Monitor](#)[Exhaust Thermocouples](#)[Dry Gas Seal - Primary Vent Monitor](#)[Filter Health](#)[Offline Monitor](#)[Process Overview](#)[Compressor Suction/Discharge](#)[Seal Gas Filter Health](#)[VIGV Schedule](#)[Intake Depression Curve](#)

03/09/2021 13:18:24



7d



Now

10/09/2021 13:18:24



## NMT FGC System Overview

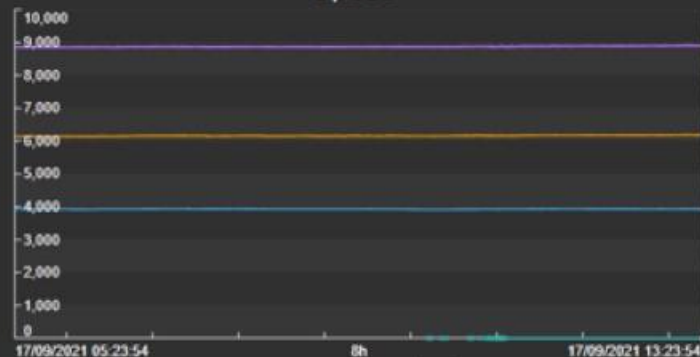


## NMT FGC System Overview

For support, email ross.yule@spirit-energy.com

\*ALL VALUES ARE UNDERGOING VALIDATION\*

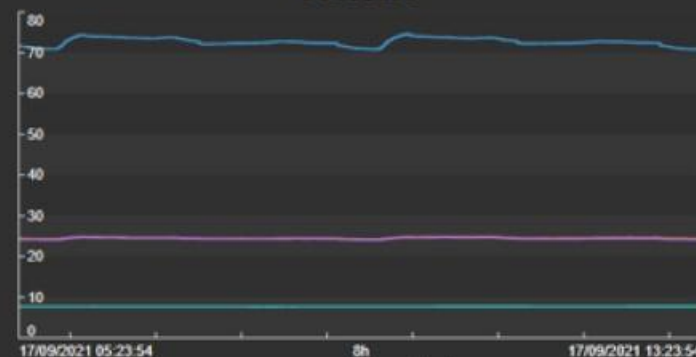
## Speed



NMR\_ST80484 Power Turbine  
3,929 rpm  
NMR\_ST80459 HP Turbine  
9,906 rpm  
NMR\_ST80456 IP Turbine  
6,183 rpm  
NMR\_ST80462 Starter  
0 rpm

0 9 5 5 7 6 0

## Pressure



NMR\_PT80099 HP Discharge Pressure  
71.40 Barg  
NMR\_PT80096 HP Suction Pressure  
24.22 Barg  
NMR\_PT80095 LP Discharge Pressure  
24.47 Barg  
NMR\_PT80092 LP Suction Pressure  
7.79 Barg

- Alarms not configured
- Healthy
- Alarm Pre-Warning
- Alarm

## Dry Gas Seals

P&amp;ID: LP HP

## Health Monitor

- Primary Vent Pressure
- Primary Seal Supply
- Secondary Seal Supply
- Barrier Seal Supply
- Filter Health

## Manual Logger

- Primary Vent Flow
- Primary Seal Control Loop
- Primary Seal Flow

RB211  
SN 1780-403

## Health Monitor

- Temperature Spread Monitor
- Exhaust Thermocouples
- Vibration
- Air Intake Filter

Date of Last Water Wash No Data

## Compressors\*

P&amp;ID\*\*

## Health Monitor

- LPC Pressures
- LPC Temperatures
- HPC Pressures
- HPC Temperatures
- Recycle Valves
- Surge Deviation
- Flow Rate
- Suction Strainers
- Vibration

## Power Turbine

## Health Monitor

- Vibration
- Bearing Temperatures
- Exhaust Temperature

17/09/2021 05:23:54



8h

Now

17/09/2021 13:23:54

3 - Old Overview Screen (read-only)



## NMT FGC System Overview

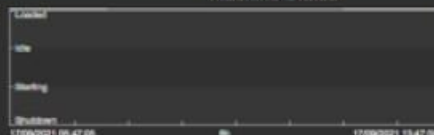
Health



Export

179,248 kg/h

Machine Status

Machine Status  
TURNING  
BURNING  
EARNING

Operating Limits

Process Overview

Capacity  
93 %Compressor Speed  
81.45 %

Gas Generator



HEALTH

Vibration

Air Intake Filter

Temperature Spread Monitor

VIGV

Intake Depression Curve

Bearing Health

OPTIMISED

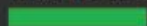
Engine Capacity  
80 %RUN HOURS  
SN 1780/406

TSW: 0 0 2 4 9 9 0

TSO: 0 1 1 7 9 1 0

Fired Starts: 83  
TSO: 0 1 2 6 2 1 0

Power Turbine



HEALTH

Vibration

Bearing Temperatures

Exhaust Gas Temperatures

Power

Sealing Air Pressure

Speed

POWER

Measured

Max Available

Based on Fuel Gas

No Data

No Data

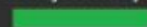
No Data

RUN HOURS

SN TBC

TSO: 0 3 3 0 9 1 0

Water Injection System



HEALTH

Filter

Pressure

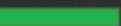
Temperature

Equipment

EQUIPMENT



Gearbox



HEALTH

Vibration LS HS

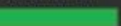
Bearing Temperatures

RUN HOURS

SN B-Wheels

TSO: 0 0 2 4 9 9 0

Ventilation



HEALTH

Temperature

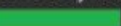
Flow

EQUIPMENT



Temporary Monitor

Fuel Gas System

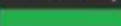


HEALTH

Filter

Temperature

Dry Gas Seal System



HEALTH

Primary Vent

Filter

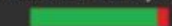
Pressure

Flow

Secondary Vent Gas

Oil Contamination

Main Lube Oil System



HEALTH

Filter

Pressure

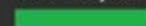
Temperature

Equipment

EQUIPMENT



GG Oil System



HEALTH

Filter

Pressure

Temperature

Equipment

EQUIPMENT



17/09/2021 05:47:05



8h

Now

17/09/2021 13:47:05





## At a glance

- Established in 1972 we are the UK's first OSIsoft Premier Partner.
- Developing the PI system for more than 20 years.
- More than 50% of UK accredited OSIsoft PI Engineers are ITI Staff.
- Focus on highly regulated industries, deemed to be Critical National Infrastructure.
- 150 staff working out of 5 regional UK offices.
- Dedicated 24/7/365 support, service and maintenance structure.
- Further information can be found on our website:

<https://www.itigroup.co.uk/>



AVEVA



# How did ITI help bring an Operational Model into a Deployable Product?

Robust, deployable, flexible, Agile built, remote monitoring

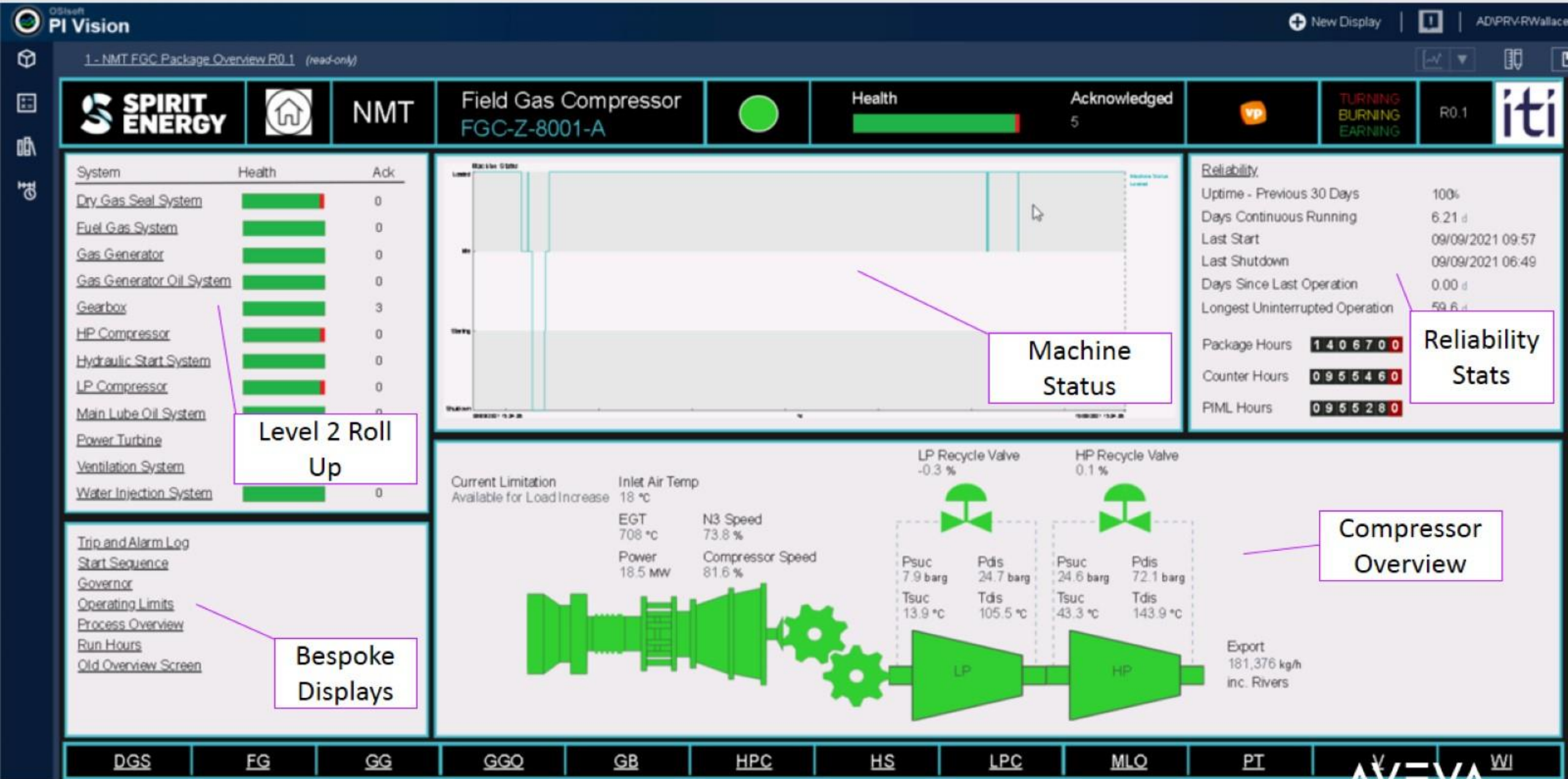
- Take the MVP and build a scalable and deployable solution
  - Agile method, using Sprints, with daily stand-ups
  - This enables continual feedback, and engineers to quickly see updates
- MVP had: (1) limited data, (2) draft analytics, (3) lack of consistency in visuals
- ITI :
  - Assisted with the PI infrastructure, PI Asset Framework and Vision
  - Data volume was hugely increased following install of PI Connector OPC UA
  - Improved the efficiency of analytics by applying general best practice
  - Provided expert UI / UX advice, style guides, and enhanced screens
- Way forward with ITI?
  - Expand rotating equipment application to use Power BI
  - Utilise PI data platform in other sectors in business, expose it's benefit, and solve other Business Problems (currently working with e.g. HCA, Process Engineers)



Filter	Name	Description
Template: SE Base		
Asset	Asset Name, from Asset Code	
AssetCode	Asset Code (element name)	
Database	Name of current database	
ElementName	Name of equipment - matches element	
SerialNumber	Serial number of equipment - uses Asset and Equipment Name	
Server	Name of current PI server	
System_ITI	Name of current PI system	
TagPrefix	Pre-qualifier to tag names e.g. "NMT"	
Template: RE-4 Instrument		
Level1	Name of Level 1, up three layers e.g. PGC-A	
Level2	Name of Level 2, up two layers e.g. 1st Stage Compressor	
Level3	Name of Level 3, up one layer, e.g. Pressure	
Level4	Name of Level 4 (this level) e.g. Discharge Pressure	
Machine Status		

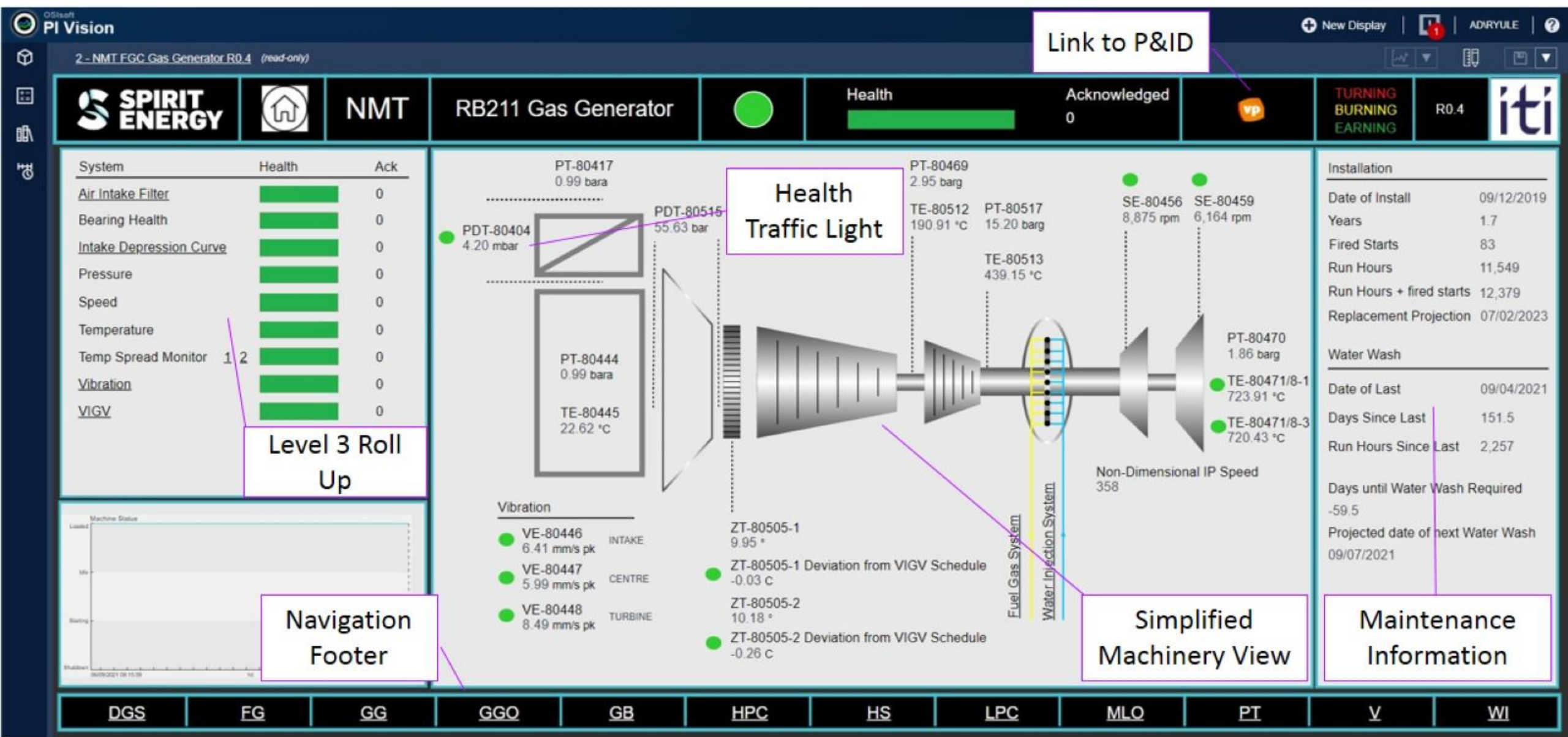


# Level 1 Overview Screen

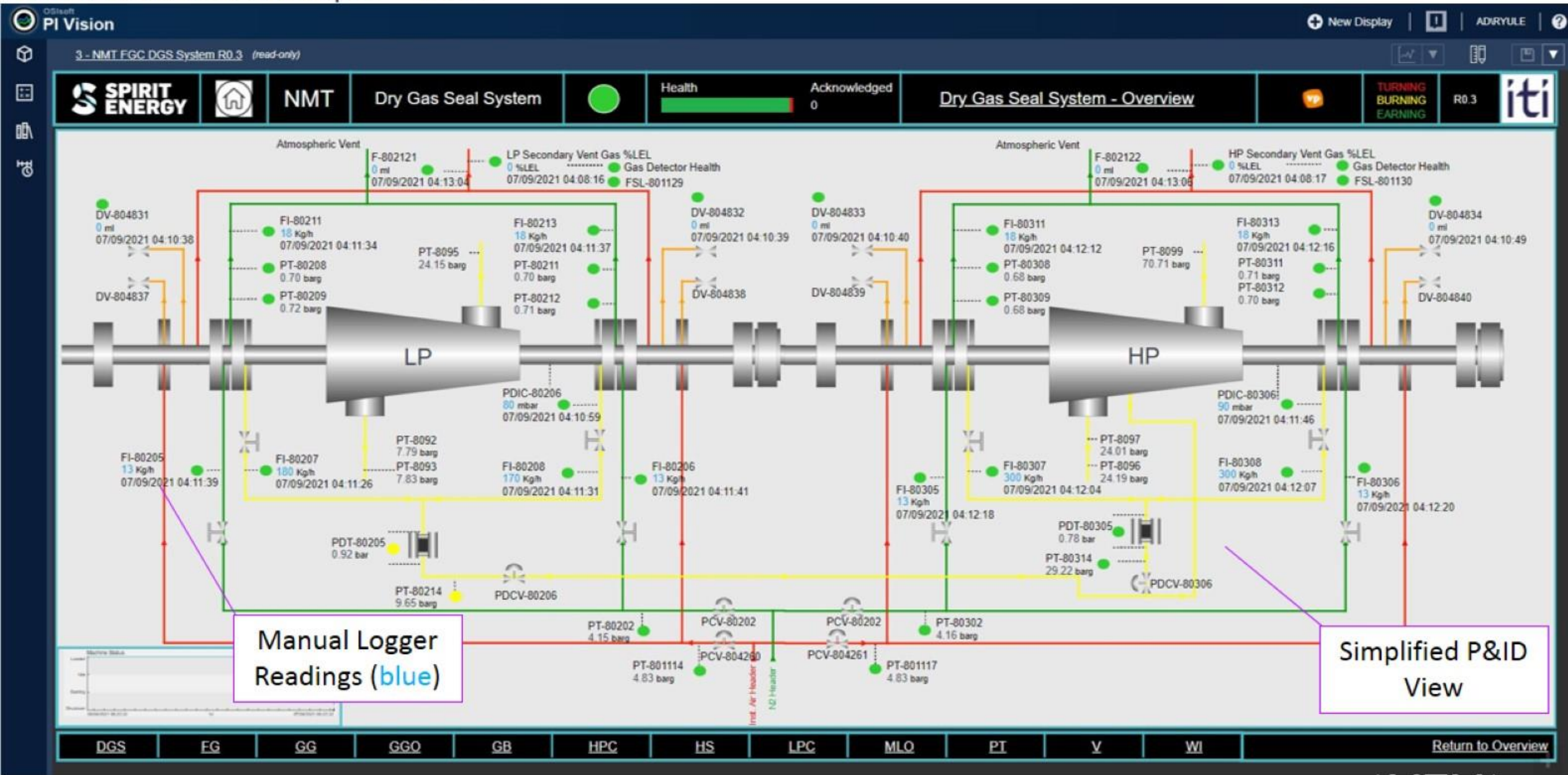




# Level 2 Screen example – Gas Generator

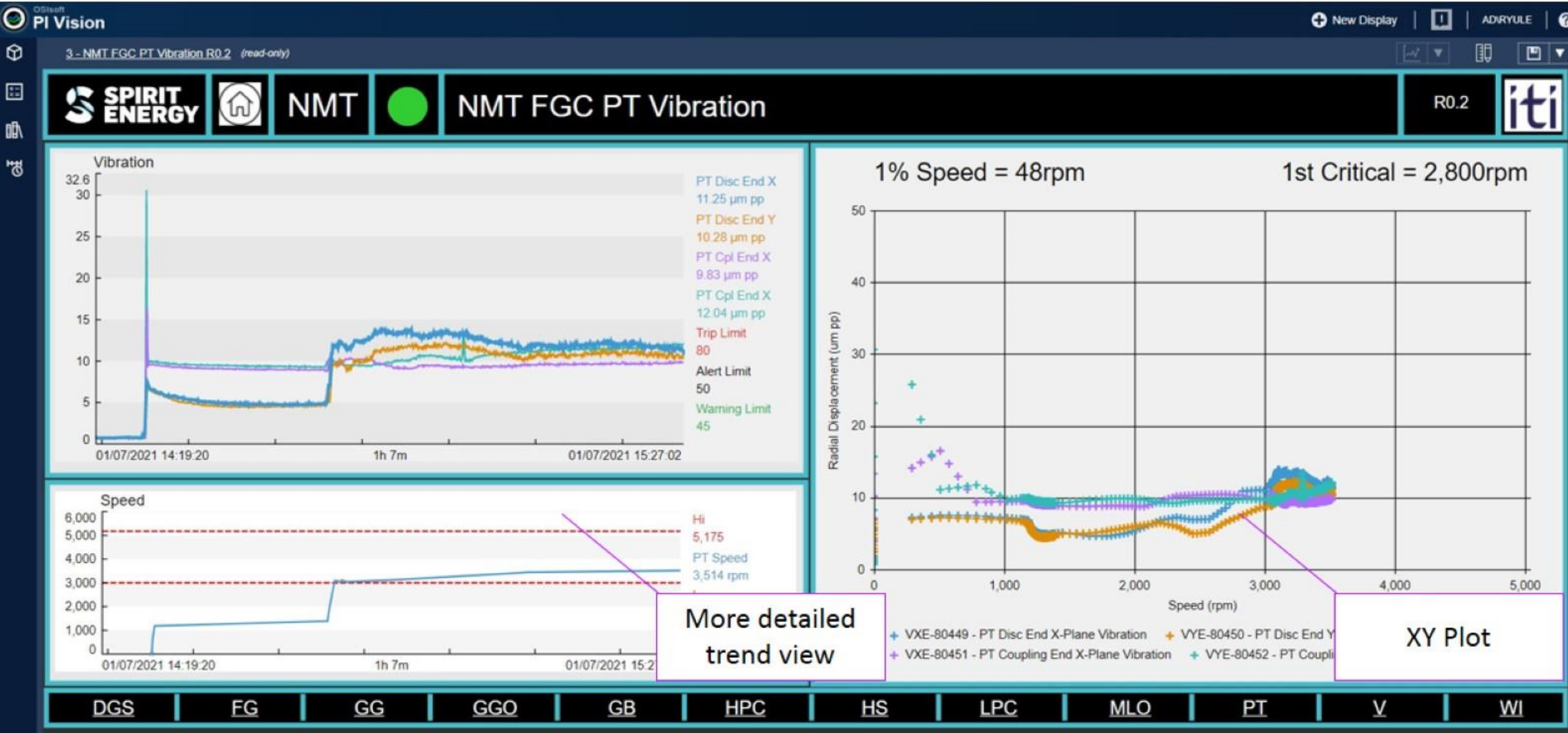


# Level 2 Screen example – DGS





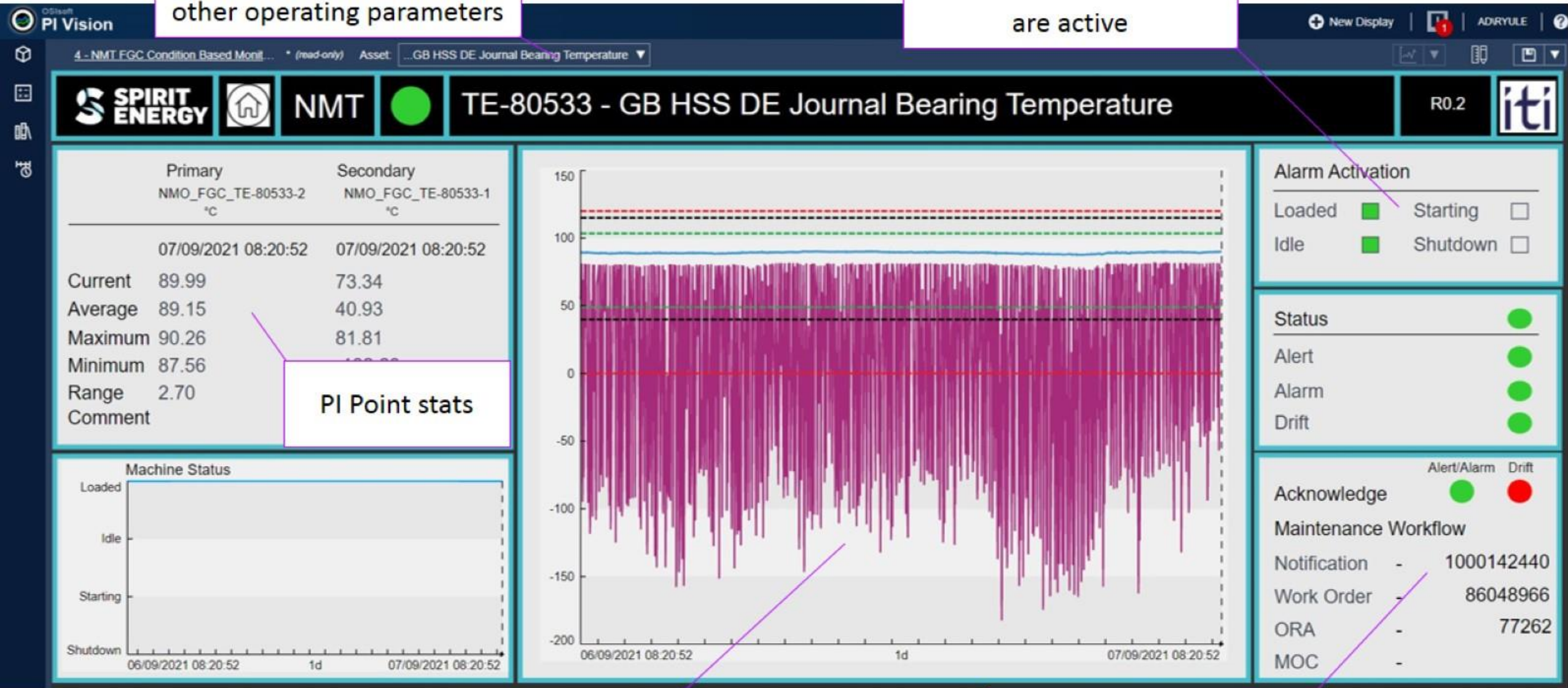
# Level 3 Screen example – Power Turbine Vibration



# Level 4 Screen example – Bearing Temperature

Context switching to all other operating parameters

Machine states alarms are active



PI Point stats

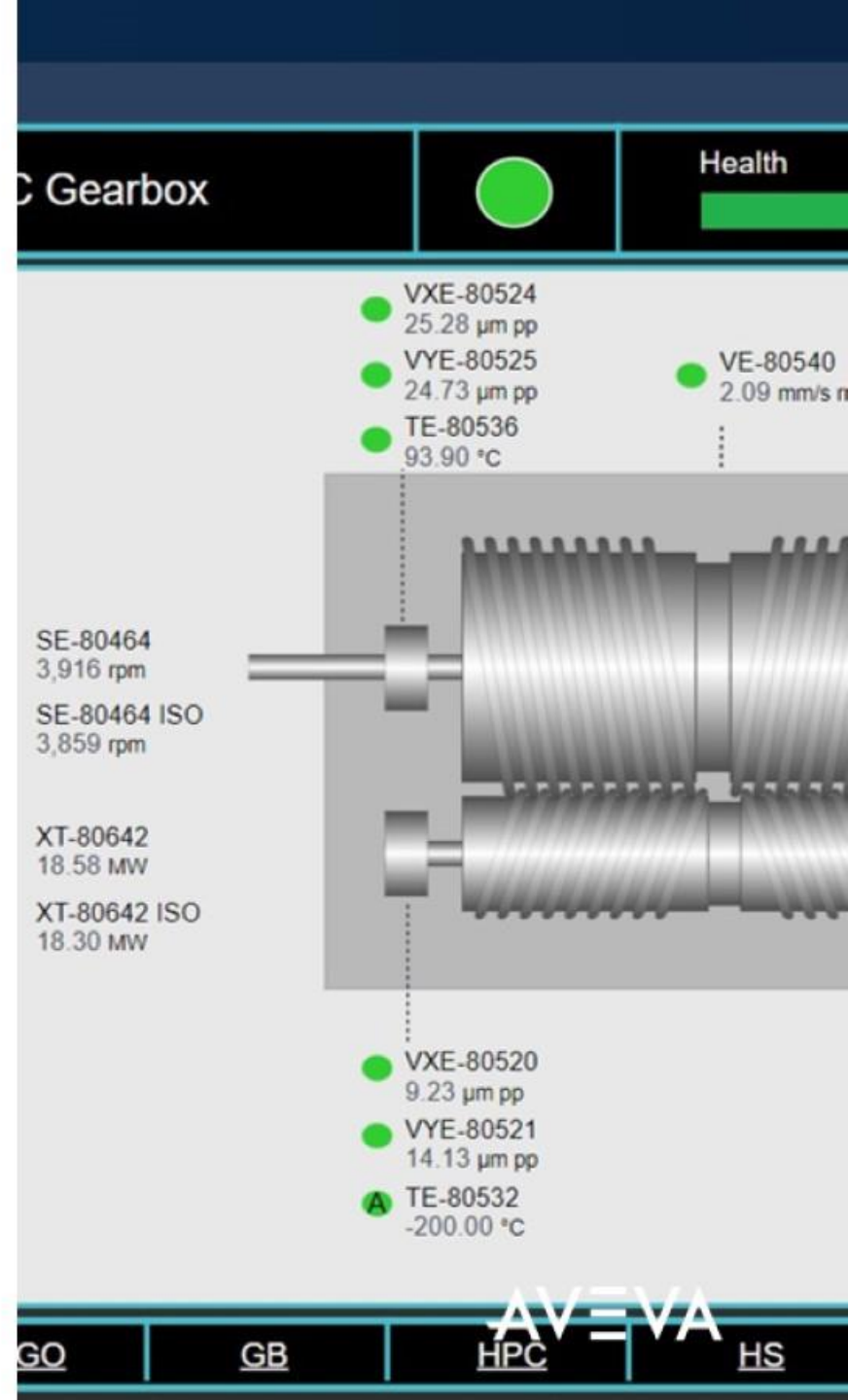
Trend view with operating envelope

"Acknowledge" and link to maintenance process



# What's Next?

- Automate “Trip Log” Event Frames to generate reliability statistics in PowerBI.
- Roll-out system to other critical plant equipment.
- Provide data input on PI Vision for acknowledgements, date of maintenance, etc.
- Application of advanced analytics to help early identification of failure modes.
- Work with equipment OEM's to develop models to improve condition monitoring.
- Bring CMMS (SAP) data into the PI System (e.g. maintenance metrics and spares availability)
- Take lessons learned from rotating equipment and use across other parts of business (e.g. hydrocarbon accounting, process)





# Delivering critical equipment reliability



## Challenge

Provide detailed monitoring of critical plant rotating equipment to deliver high uptime availability, including pumps, compressors and gas turbines.



## Solution

Deployed the latest AVEVA PI System technology including

- PI AF
- PI Manual Logger
- PI Connector
- PI Vision

for Equipment Monitoring and Condition Based Maintenance.



## Benefits

Increased production and operational efficiency, mobile inspections, exception-based surveillance, facilitating rapid fault investigation and resolution.





## Ross Yule

### Rotating Equipment Engineer

- Spirit Energy
- [Ross.yule@spirit-energy.com](mailto:Ross.yule@spirit-energy.com)



## Richard J Wallace

### Senior Systems Engineer


- ITI Operations
- [Richard.wallace@itigroup.co.uk](mailto:Richard.wallace@itigroup.co.uk)





This presentation may include predictions, estimates, intentions, beliefs and other statements that are or may be construed as being forward-looking. While these forward-looking statements represent our current judgment on what the future holds, they are subject to risks and uncertainties that could result in actual outcomes differing materially from those projected in these statements. No statement contained herein constitutes a commitment by AVEVA to perform any particular action or to deliver any particular product or product features. Readers are cautioned not to place undue reliance on these forward-looking statements, which reflect our opinions only as of the date of this presentation.

The Company shall not be obliged to disclose any revision to these forward-looking statements to reflect events or circumstances occurring after the date on which they are made or to reflect the occurrence of future events.

 [linkedin.com/company/aveva](https://www.linkedin.com/company/aveva)

 [@avevagroup](https://twitter.com/avevagroup)

#### ABOUT AVEVA

AVEVA, a global leader in industrial software, drives digital transformation for industrial organizations managing complex operational processes. Through Performance Intelligence, AVEVA connects the power of information and artificial intelligence (AI) with human insight, to enable faster and more precise decision making, helping industries to boost operational delivery and sustainability. Our cloud-enabled data platform, combined with software that spans design, engineering and operations, asset performance, monitoring and control solutions delivers proven business value and outcomes to over 20,000 customers worldwide, supported by the largest industrial software ecosystem, including 5,500 partners and 5,700 certified developers. AVEVA is headquartered in Cambridge, UK, with over 6,000 employees at 90 locations in more than 40 countries. For more details visit: [www.aveva.com](https://www.aveva.com)