

COAXIAL BARRIER SEAL OPERATED AS A SEPARATION SEAL IN A PIPELINE COMPRESSOR

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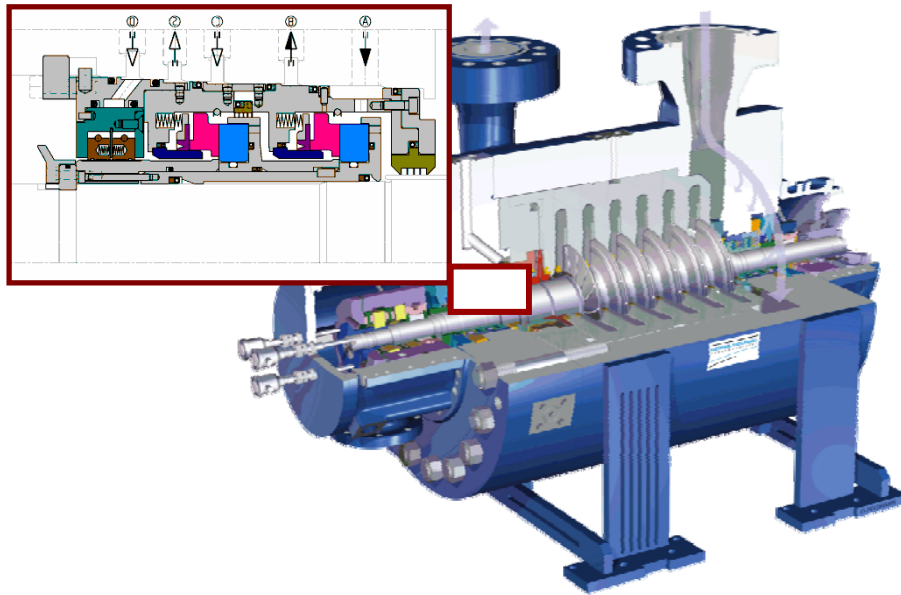
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Content

This presentation will provide details of the first application of a Coaxial Barrier Seal in a pipeline compressor

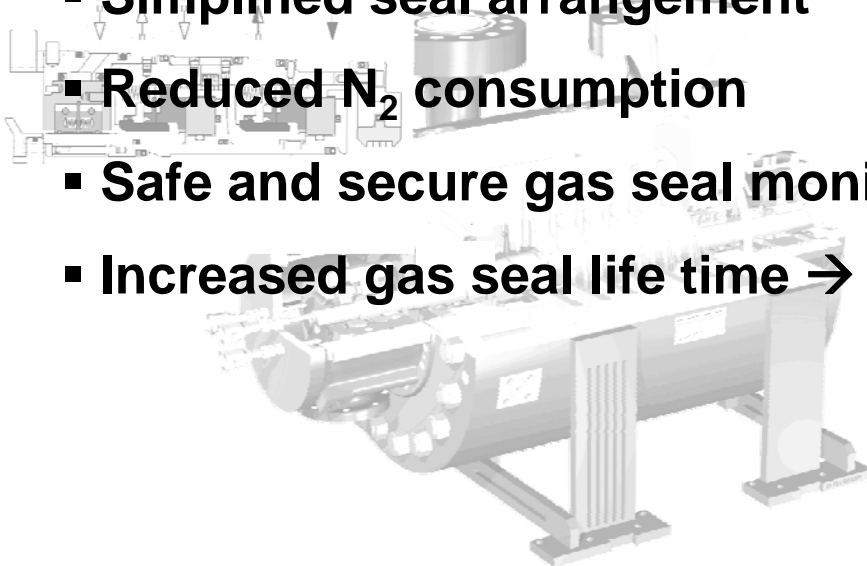
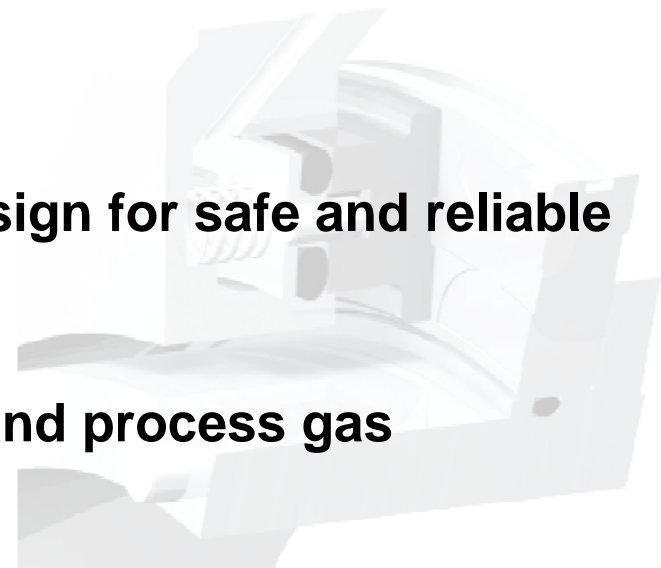


- **Purpose of modification**
- **Preparation / Qualification**
- **Installation**
- **Commissioning**
- **Evaluation**
- **Conclusion**

Purpose of Project

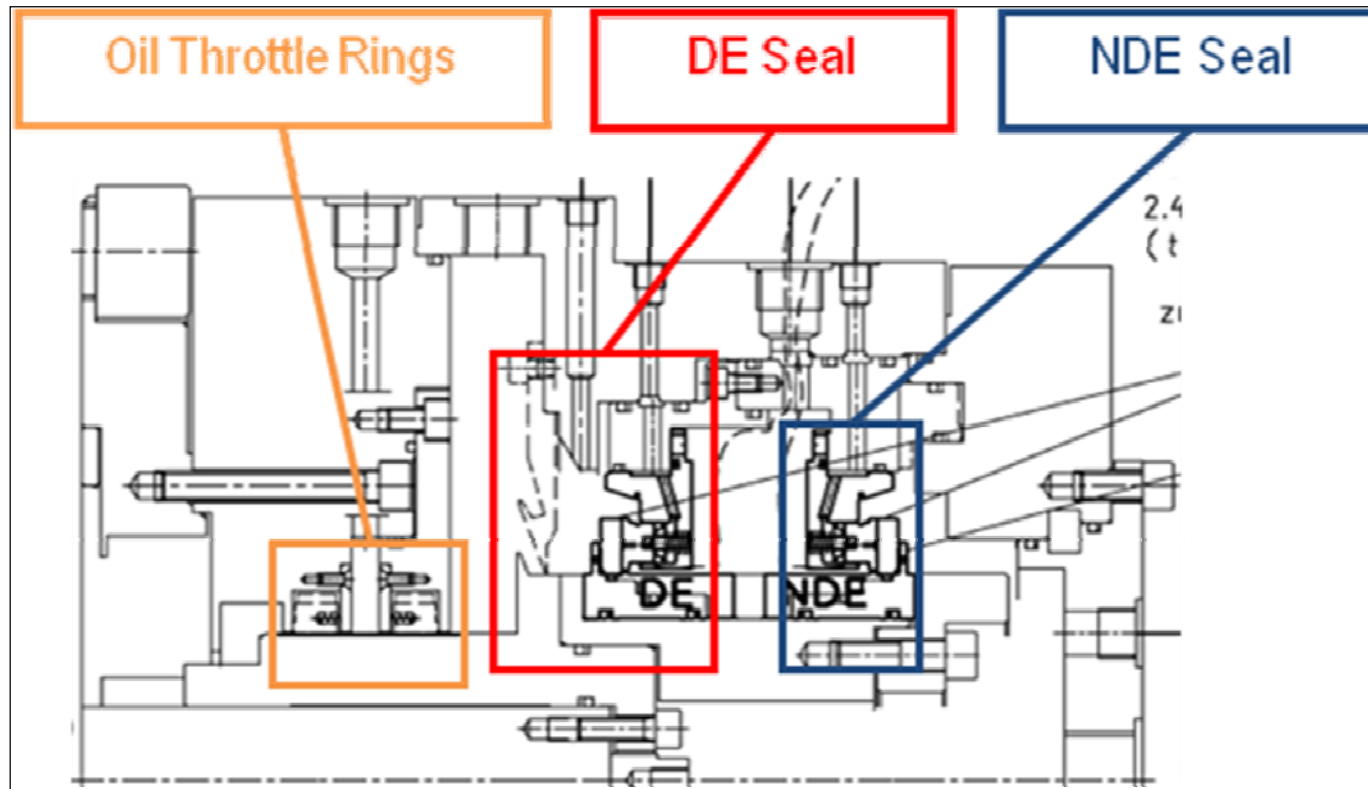
Optimize compressor sealing system design for safe and reliable operation with lower emissions

- **Improved separation between lube oil and process gas**
- **Simplified seal arrangement**
- **Reduced N₂ consumption**
- **Safe and secure gas seal monitoring system**
- **Increased gas seal life time → prolonged MTBF / MTBM**



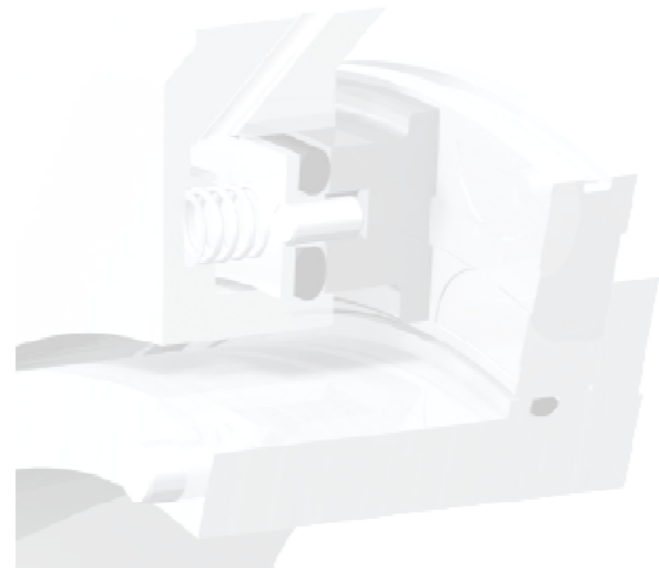
Qualification tests of Coaxial Barrier Seal (prototype testing)

Barrier Seal Supplier Shop Test Set Up



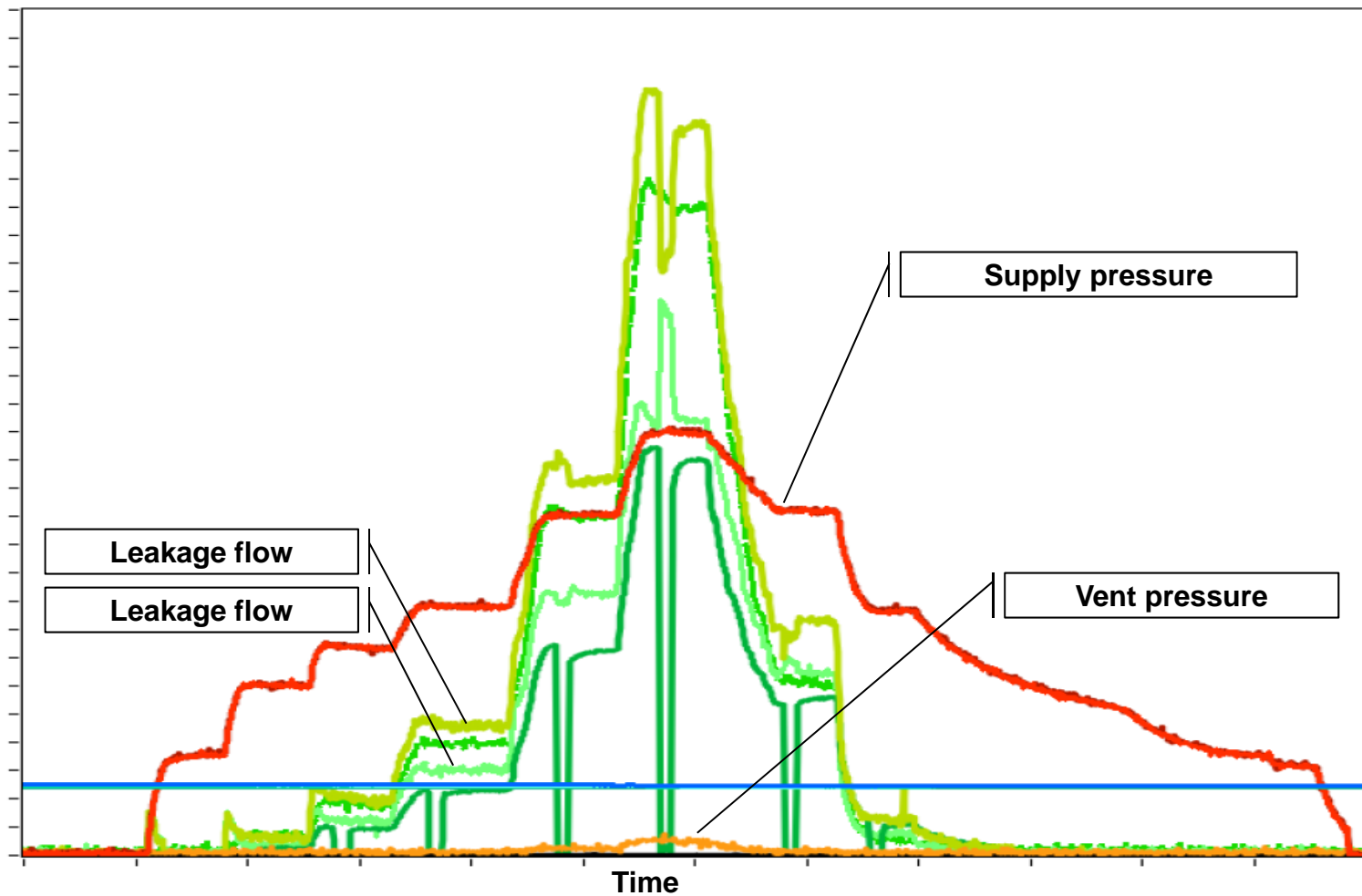
Qualification tests of Coaxial Barrier Seal

- **Static test – gas separation**
- **Normal operation – leakage rates**
- **Low backpressure leakage**
- **High backpressure leakage**
- **Gas consumption at high vent back pressure (with PDCV)**
- **Simulation closed supply line**
- **Long term tests with permanent pressurization of vent cavity**



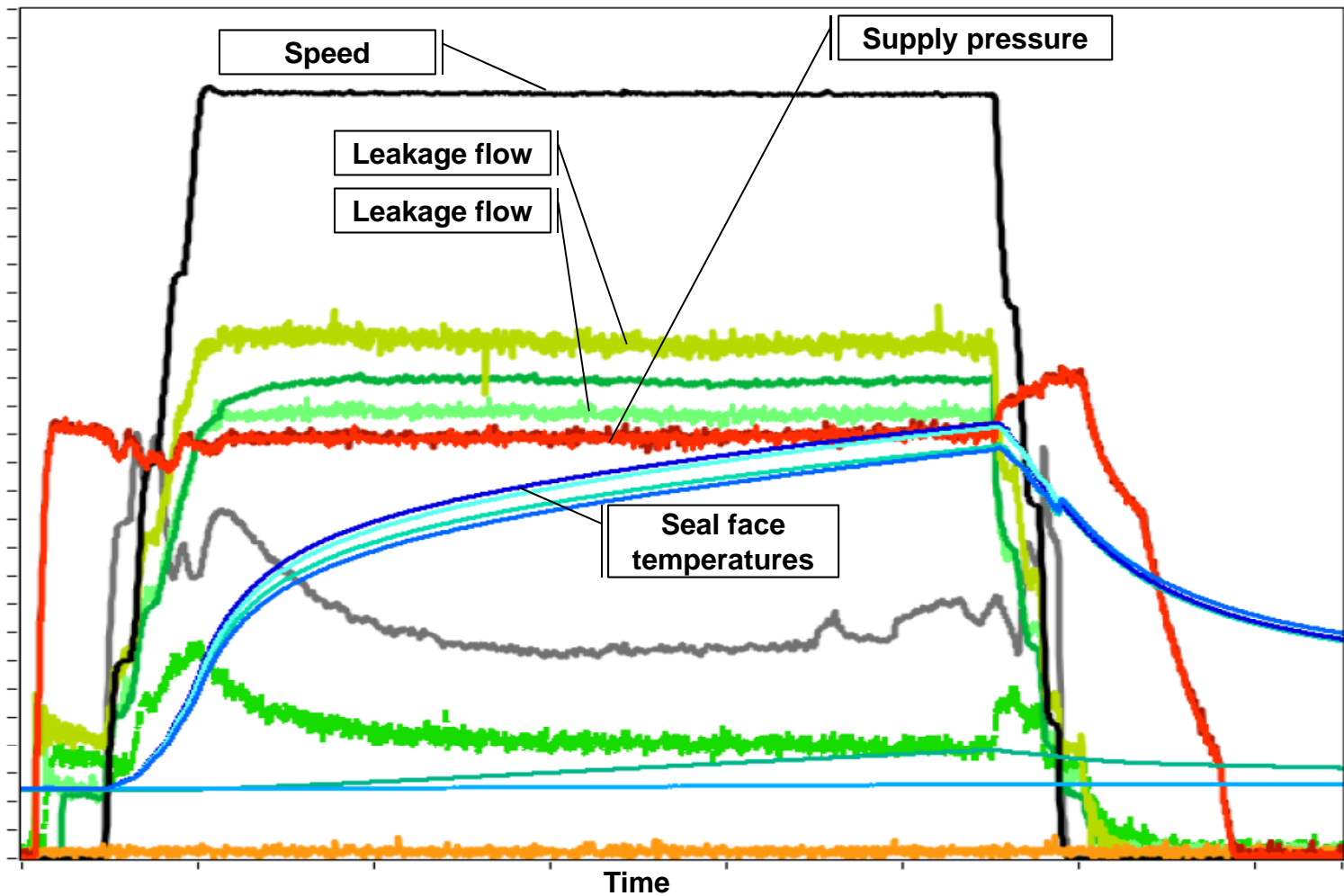
Qualification tests of Coaxial Barrier Seal

Qualification tests (static test)



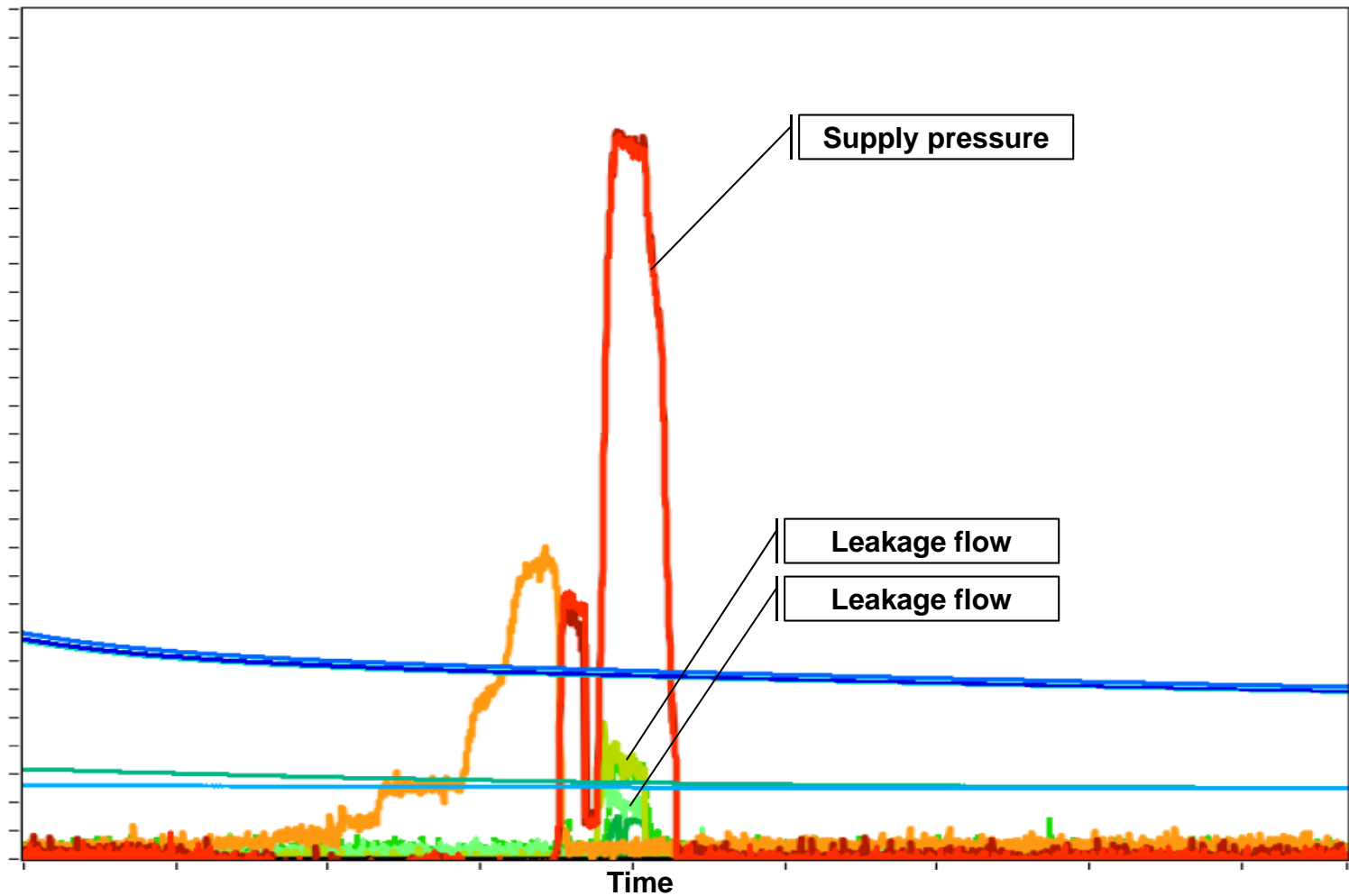
Qualification tests of Coaxial Barrier Seal

Qualification tests (normal operation)



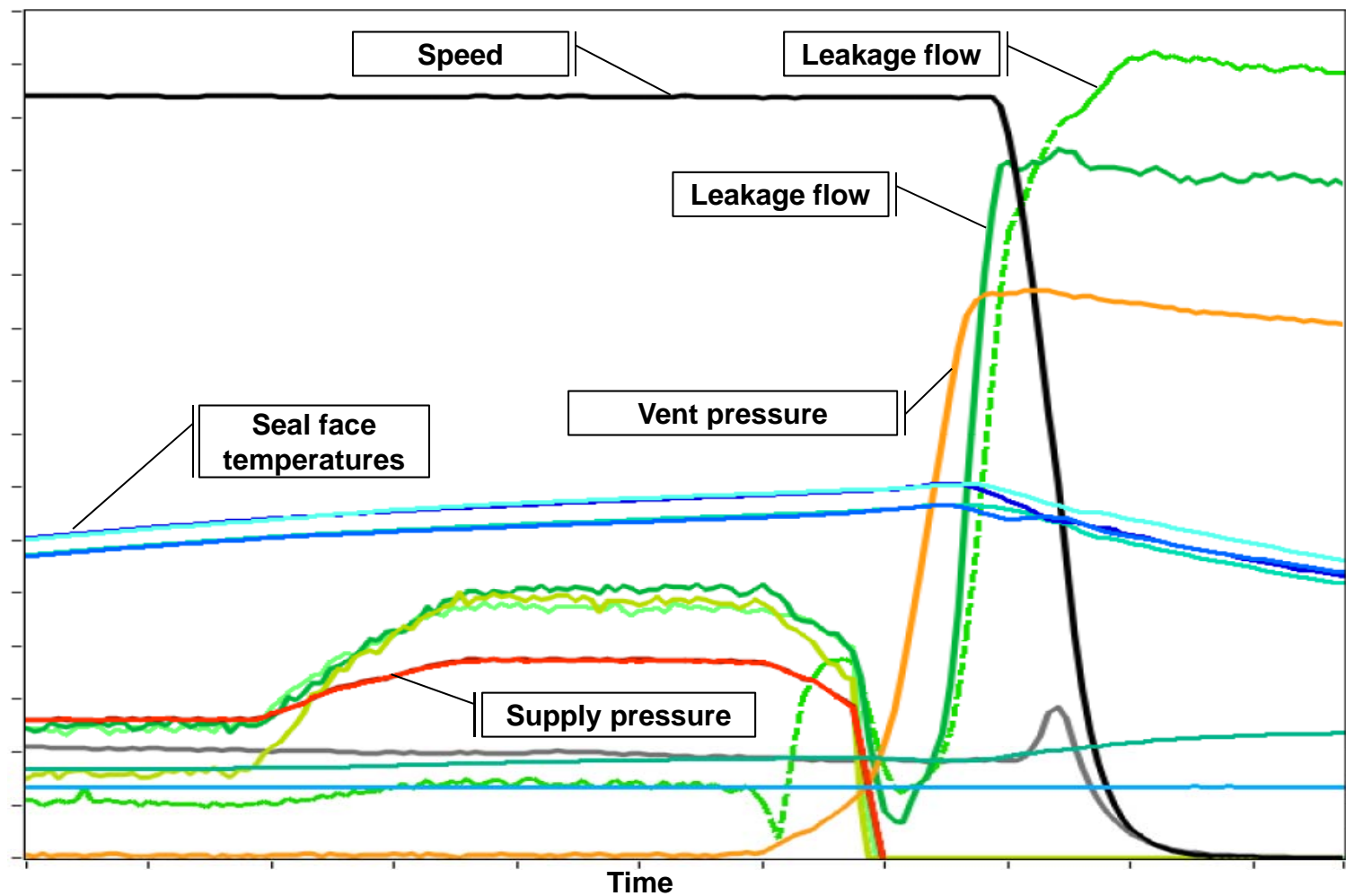
Qualification tests of Coaxial Barrier Seal

Qualification tests (low back pressure/axial shift)



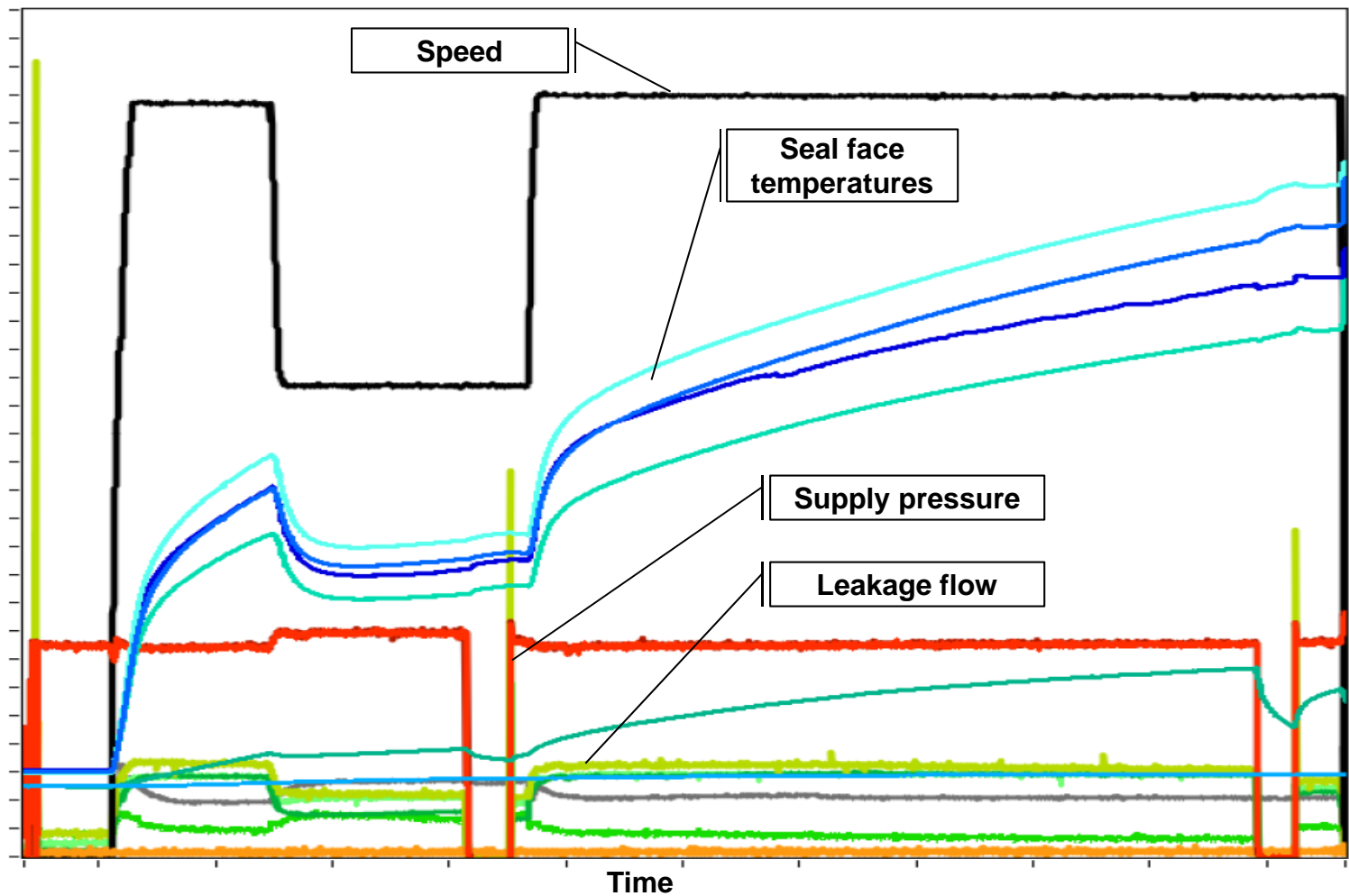
Qualification tests of Coaxial Barrier Seal)

Qualification tests (high back pressure/trip)



Qualification tests of Coaxial Barrier Seal

Qualification tests (N₂ supply failure)



Qualification tests of Coaxial Barrier Seal - Results

- Visual inspection of seal faces (standard at seals suppliers) didn't showed contact marks – like new
- Leakage rates during normal operation was within the specification
- Leakage rates at upset operating conditions even lower than expected
- Stable operation behavior of the coaxial barrier seal during all tests has been observed

**➔ RESULTED IN DELIVERY AND INSTALLATION
RELEASE OF THE SEAL ←**

Installation

Application:
Compressor Station

Location:
Nether Kellet, Lancashire, United Kingdom

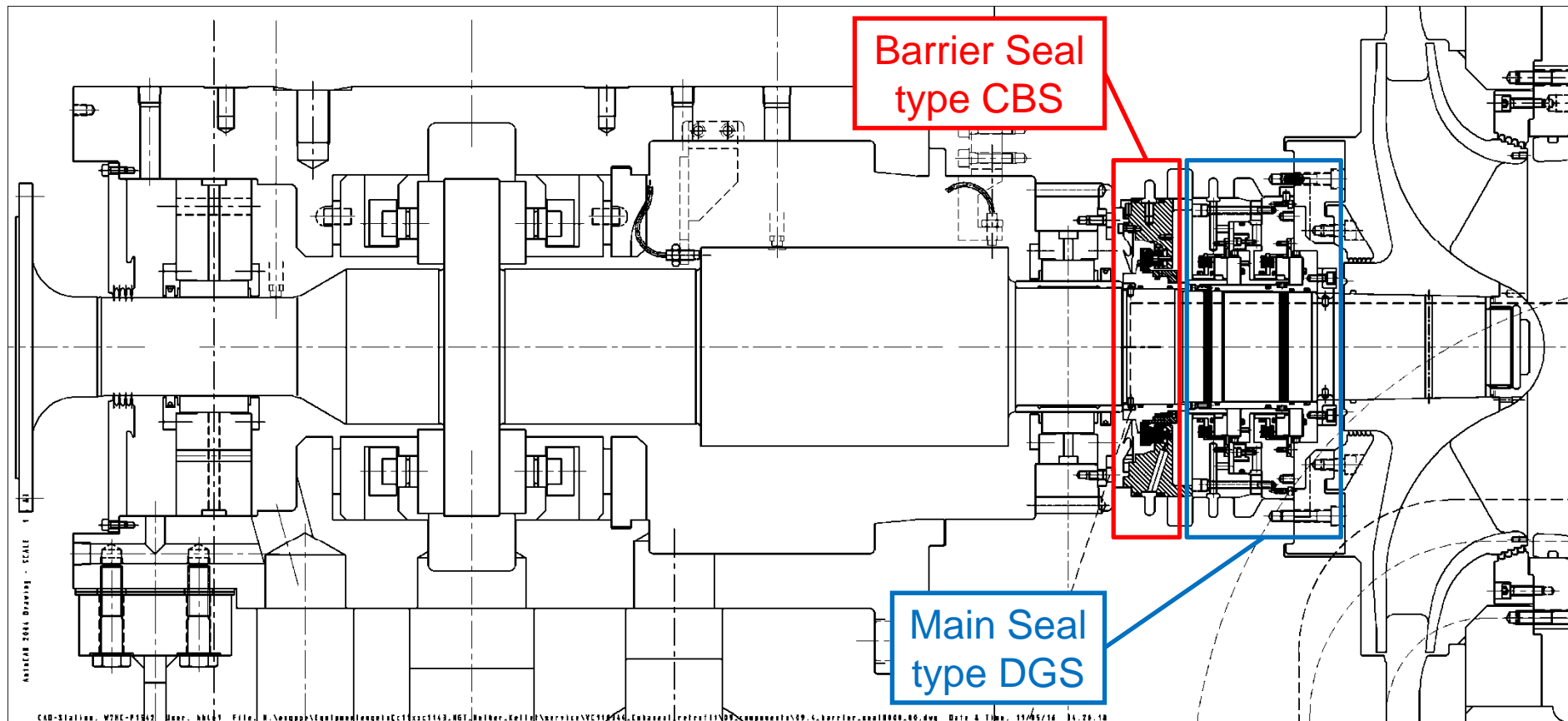
End User:
National Grid Transco plc.



Courtesy of Official National Grid Website

Installation

Compressor Set Up

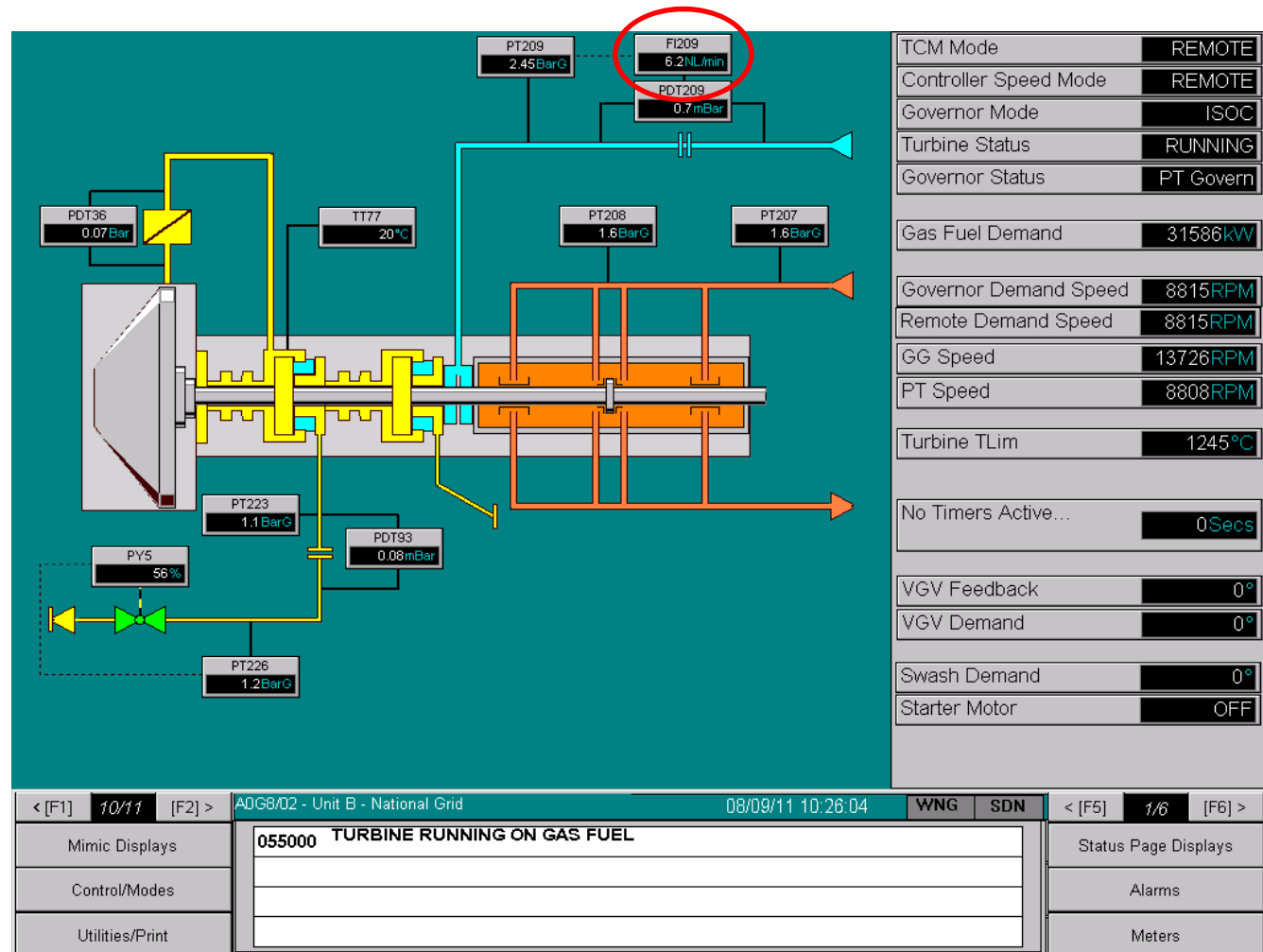


* Comparison at set process conditions 13

Evaluation – Operation after start up with new barrier seal

DCS
Overview :
At normal
load

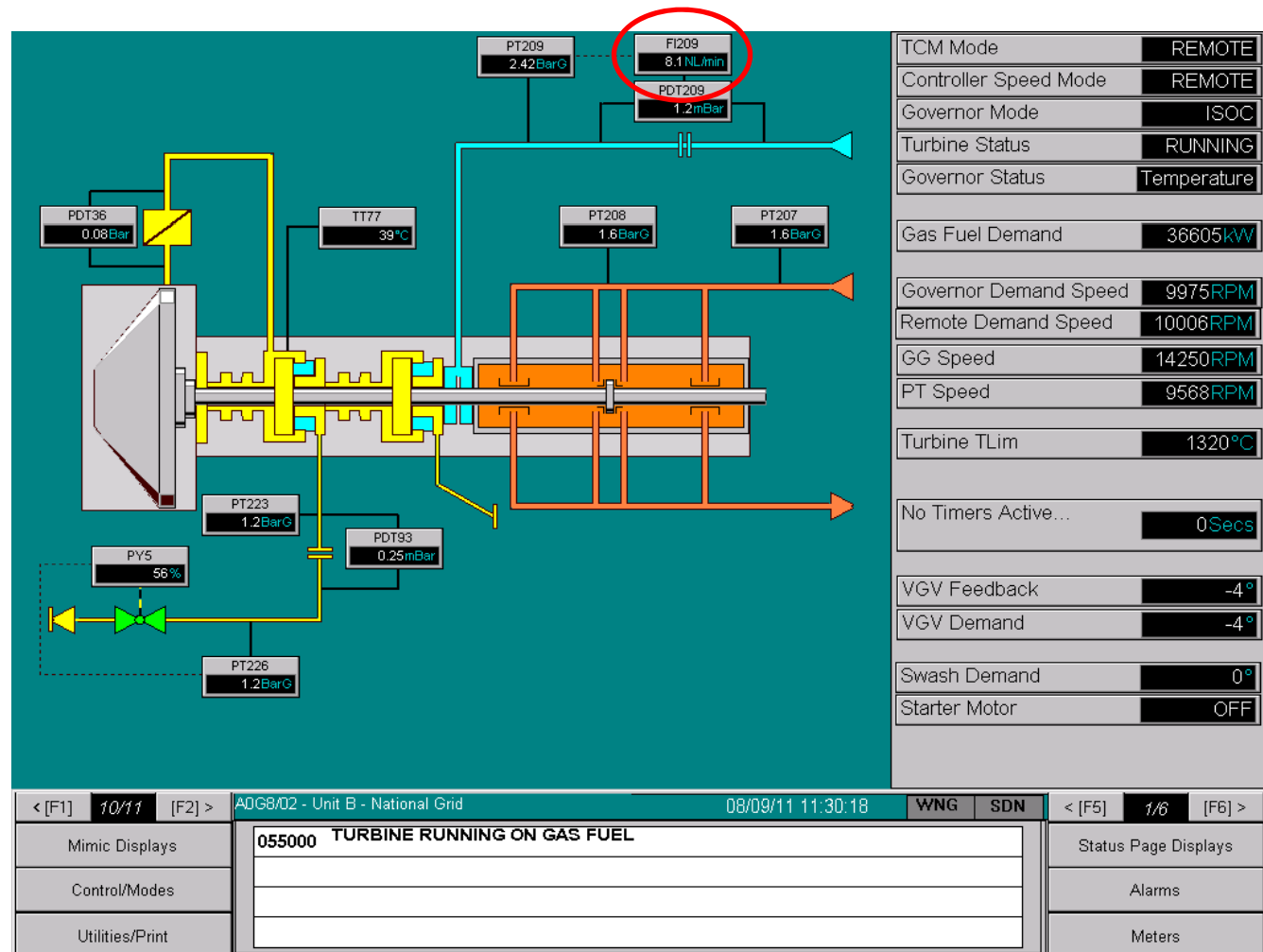
N₂ leakage
rate 6 Nl/min



Evaluation – Operation after start up with new barrier seal

DCS
Overview :
At maximum
load

N₂ leakage
rate 8 NI/min



Evaluation – End User feedback

Operating status

Start up on 2011-09-08

Status on 2012-02-20

- 1,269 operating hours
 - 65 Starts
 - 19 Running Trips
 - 11 Starting Trips
 - 35 Normal Stops

End User quote

"In general, the operation of the CBS is already proving to be a success. There has been a lot of stop – start operation, including ESD trips and it has endured the harshest of tests; performance testing of the compressor during which time the actual Surge line was plotted. There has not been one issue with its operation since installation."

End User unquote

Conclusion

UPGRADE JOB TO COAXIAL BARRIER SEAL WAS A FULL SUCCESS STORY!

Main challenges on this pilot project

- **Understanding the components to be improved on the existing sealing system**
- **Providing a technology which is able to eliminate the existing limitations**
- **Implementation of new technology in an existing system**
- **Coordination of the work with all involved parties**

→ RESULTED IN THE FIRST RUNNING REFERENCE OF THE NEW COAXIAL BARRIER SEAL TYPE ←