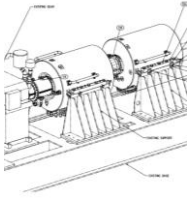


Serica Energy and Siemens Energy

Revamp to right size compressors

Andy Wood, Rotating Equipment Engineer, Serica Energy

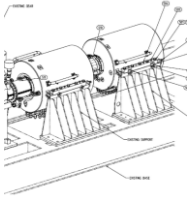
*Demi Ademuyewo, UK Offshore Accounts Client Manager,
Siemens Energy.*



Bruce MP and export compressor revamp

TLB: Emissions Reduction Technology Showcase 29th May 2024

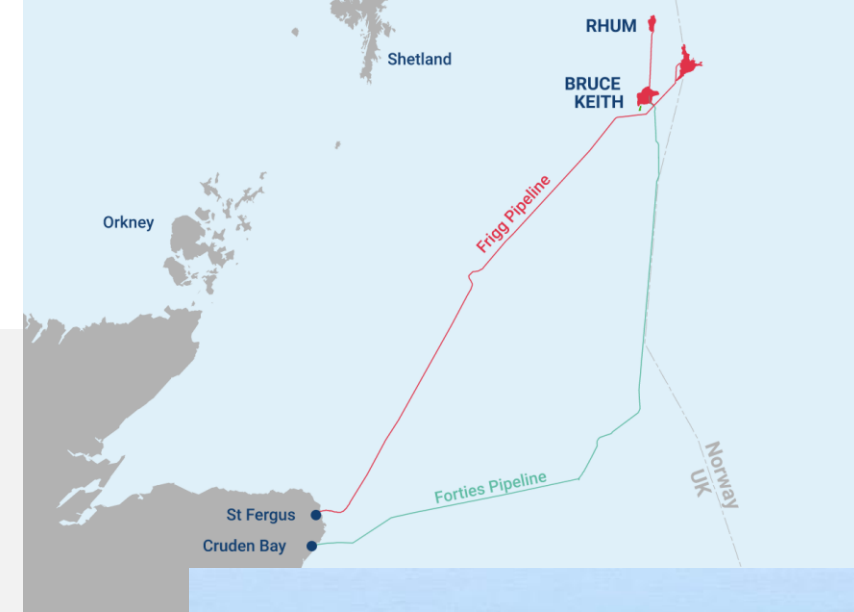




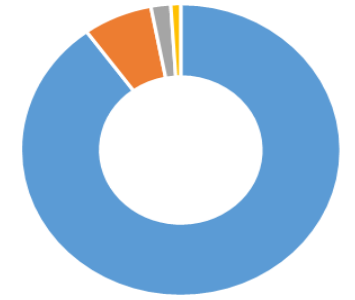
Bruce asset introduction

TLB: Emissions Reduction Technology Showcase 29th May 2024

- Fields: Bruce, Keith and Rhum, NNS
- 2018 emissions: 286,000 teCO₂e (NSTD benchmark)
- 2022 emissions: 233,000 teCO₂e (18% reduction)
- 2023 emissions: 191,317 teCO₂e (extended TAR)
- 2022 carbon intensity: 16.5kg CO₂/boe [North Sea av. 21.2kg CO₂/boe]
- 2023 carbon intensity: 16.4 kg CO₂/boe



Proportion of Scope 1 CO₂ Emissions

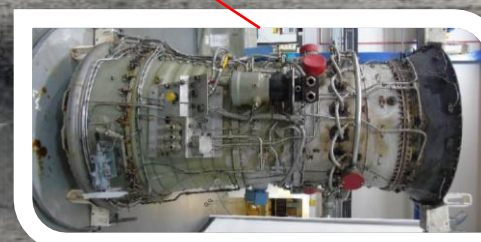


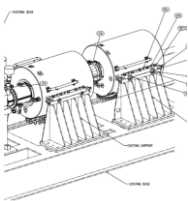
■ Fuel gas usage ■ Flaring ■ Diesel Usage ■ Venting

Tertiary compression
(LPBC) 8.5MW
~45,000Te CO₂/yr

Primary & Secondary
compression
(MPX) 19- 24MW
~100,000Te CO₂/yr

Electrical power
generators
6 MW
~ 50,000Te CO₂/yr

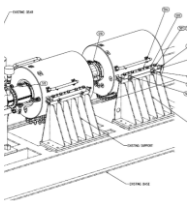




MPX revamp context

TLB: Emissions Reduction Technology Showcase 29th May 2024

- Serica Energy purchased Bruce in 2018.
- Medium Pressure (MP) and export (X) compressors have had little to no maintenance since install.
 - Excellent reliability experienced since export install in 1993 and coupled MP stage install in 2000.
- Degraded efficiency and constraints on throughput.
- Third party tie-backs have increased uncertainty around upgrade map.
- Focus of NSTD goal and achievability of revamp combined with collaborative work with Siemens pushed MPX forward.
 - 16th largest emitter in North Sea.



MPX revamp goals

TLB: Emissions Reduction Technology Showcase 29th May 2024

 SERICAENERGY

 SIEMENS
energy

- Provide reliable medium pressure and export compression until CoP; 2035+
- Reduce fuel gas usage and increase sales gas.
 - Efficiency improvement of 10 - 20 %
- Provide 10 – 20,000 tonnes of CO2 reduction per year.
- Minimise risk posed during installation and ensure performance in operation.
 - Full compressor casing to reduce offshore complications.
 - Onshore factory acceptance testing to ensure performance pre-installation.
- Short project lead-time to maximise return.





SE Centrifugal Solutions – Revamp drivers

TLB: Emissions Reduction Technology Showcase 29th May 2024



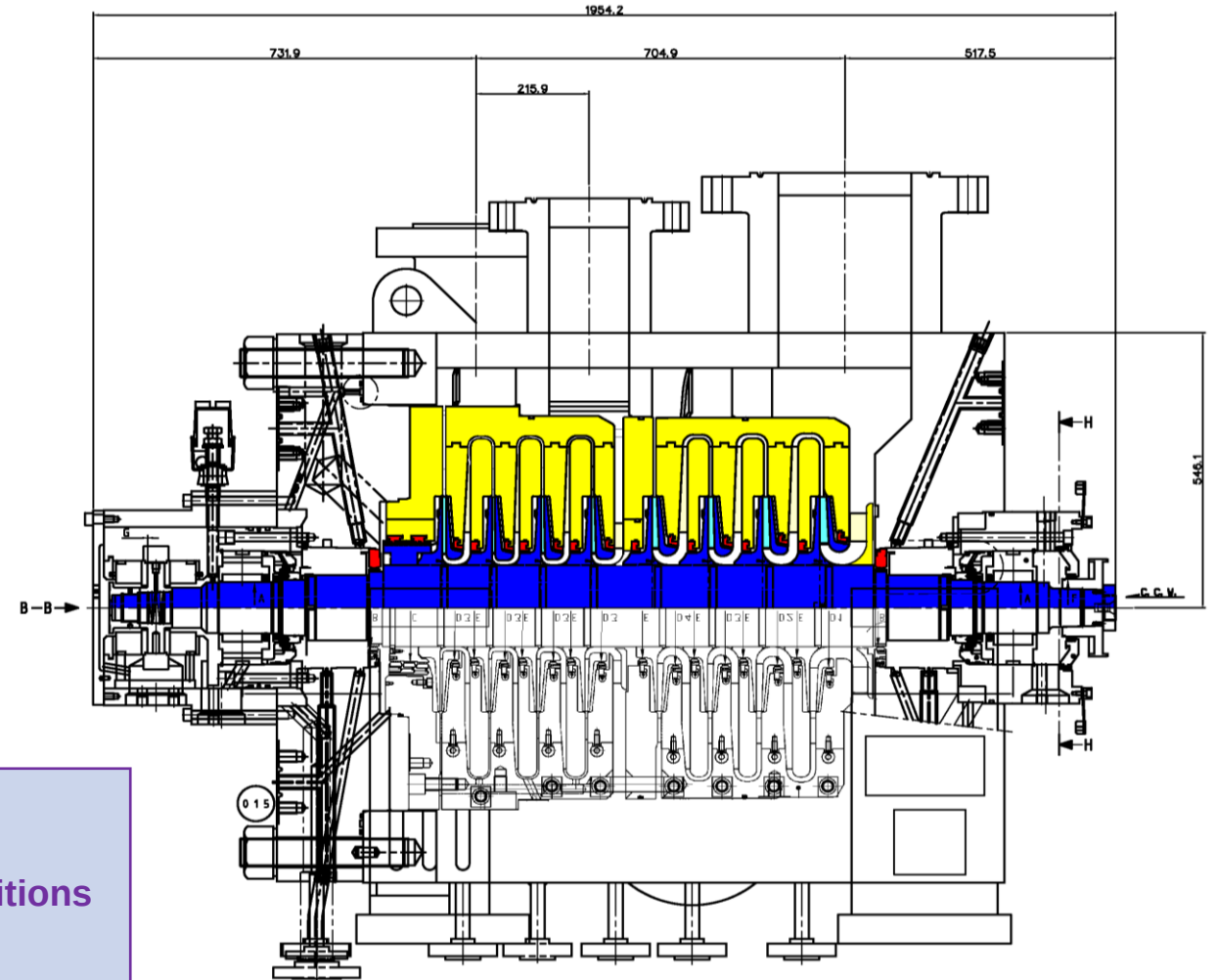
Revamp

Operator requirements and operating conditions often change over time such that the original compressor aero design is no longer appropriate for the new conditions.

When a compressor is operating far from its intended design, a new aerodynamic bundle (stationary aero plus rotor) can be designed and provided to return the compressor to optimum operation / efficiency or changed process conditions.

Benefits may include:

- ✓ Increased efficiency
- ✓ Matching future conditions
- ✓ Reduced emissions





SE Centrifugal Solutions – Revamp drivers

TLB: Emissions Reduction Technology Showcase 29th May 2024

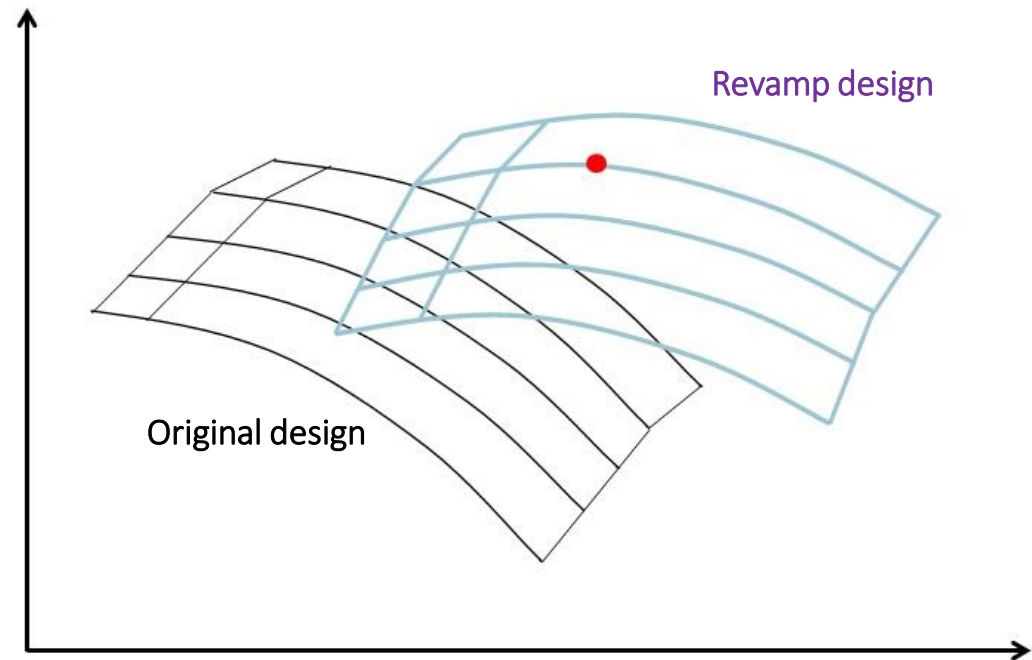
Why revamp?

Changes in operating conditions:

- Gas composition, molecular weight changes
- Capacity
- Pressures
- When efficiency gain justifies it

When to revamp?

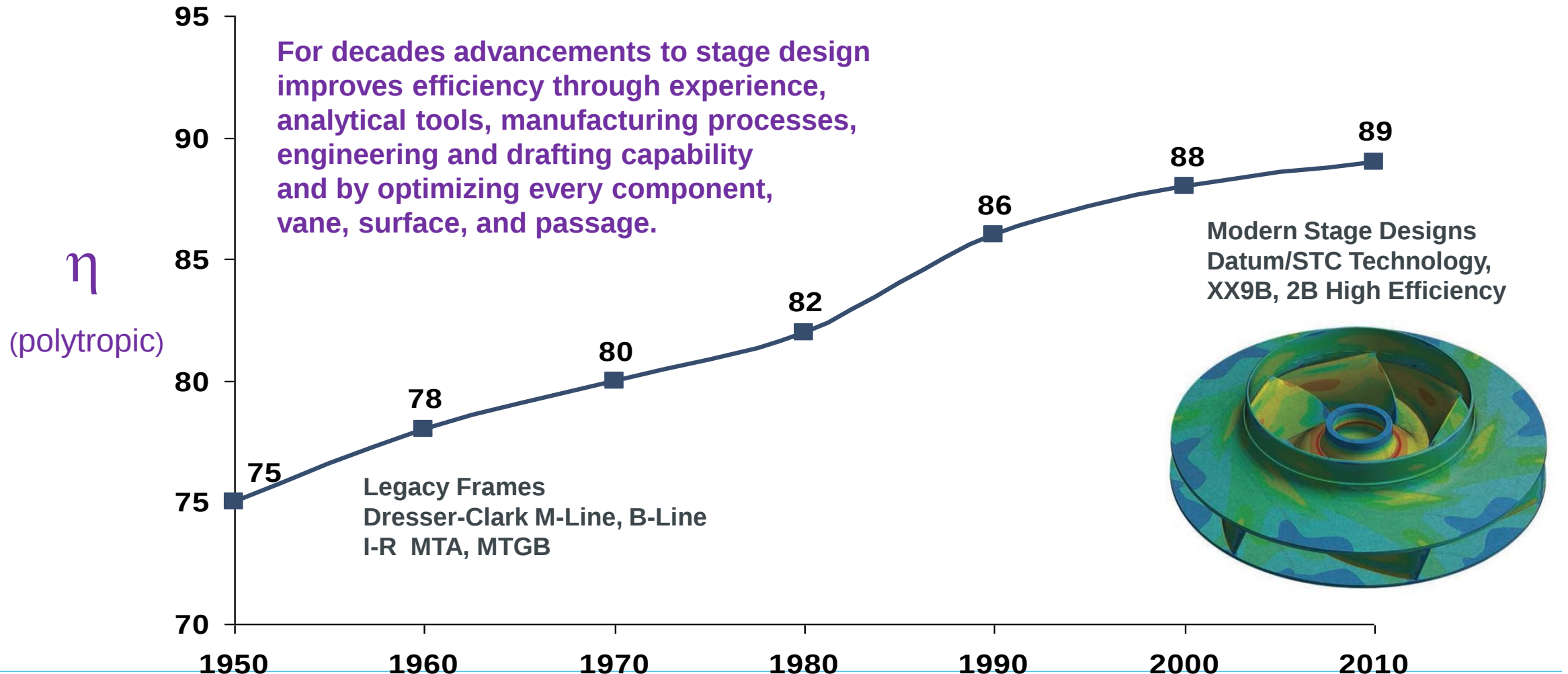
- During the early stages of outage planning
- During routine evaluations of plant process
- Before you proceed with repairs to strategic spares
- In combination with electrification





SE Centrifugal Solutions – Revamp drivers

TLB: Emissions Reduction Technology Showcase 29th May 2024



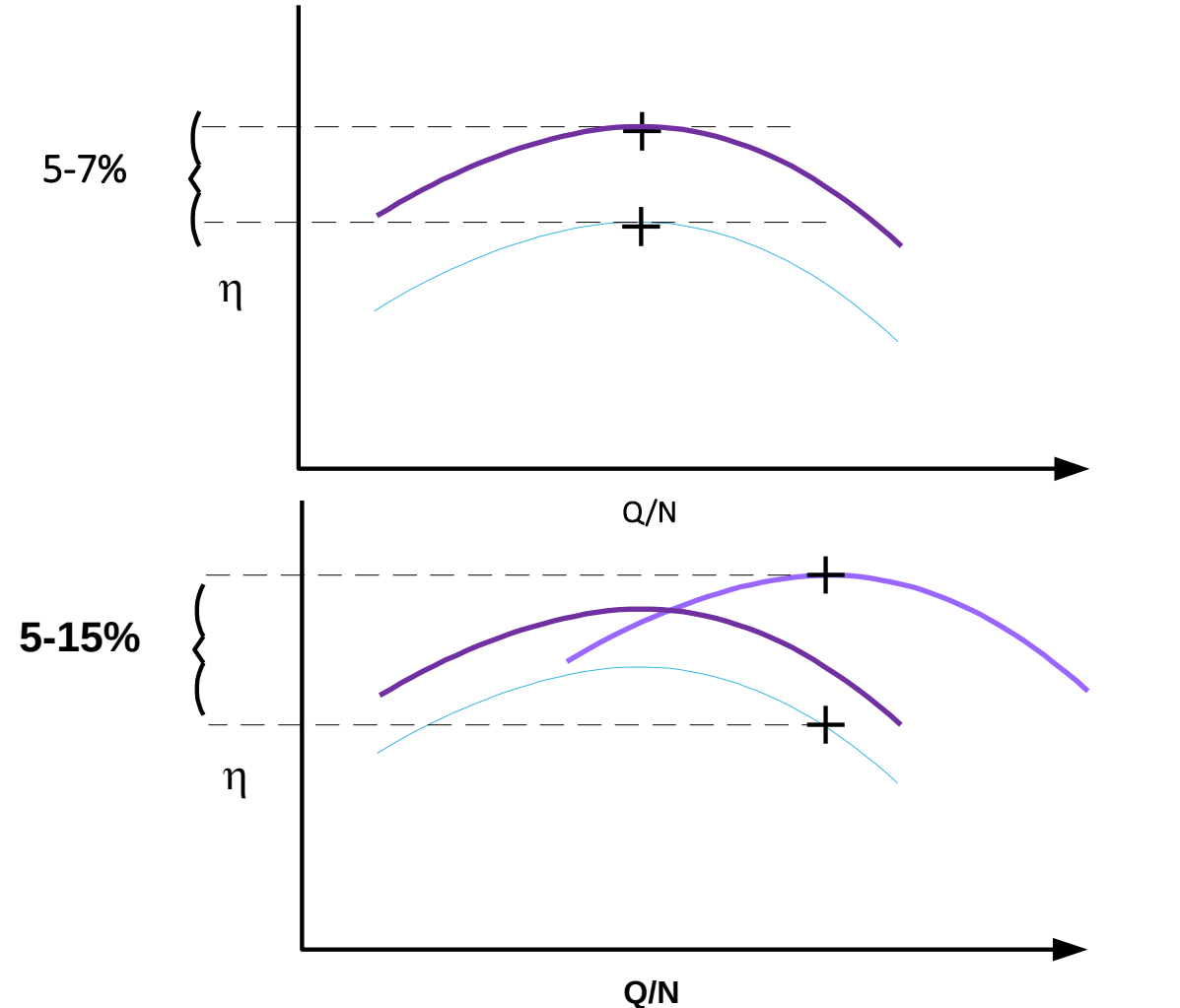


SE Centrifugal Solutions – Revamp drivers

TLB: Emissions Reduction Technology Showcase 29th May 2024

Centrifugal compressor Revamp benefits

- Energy consumption decrease
- Driver emission optimization
- Capacity increase within given driver power rating
- Wider operating flow range from surge to overload: better operating flexibility





SE Centrifugal Solutions – Revamp drivers

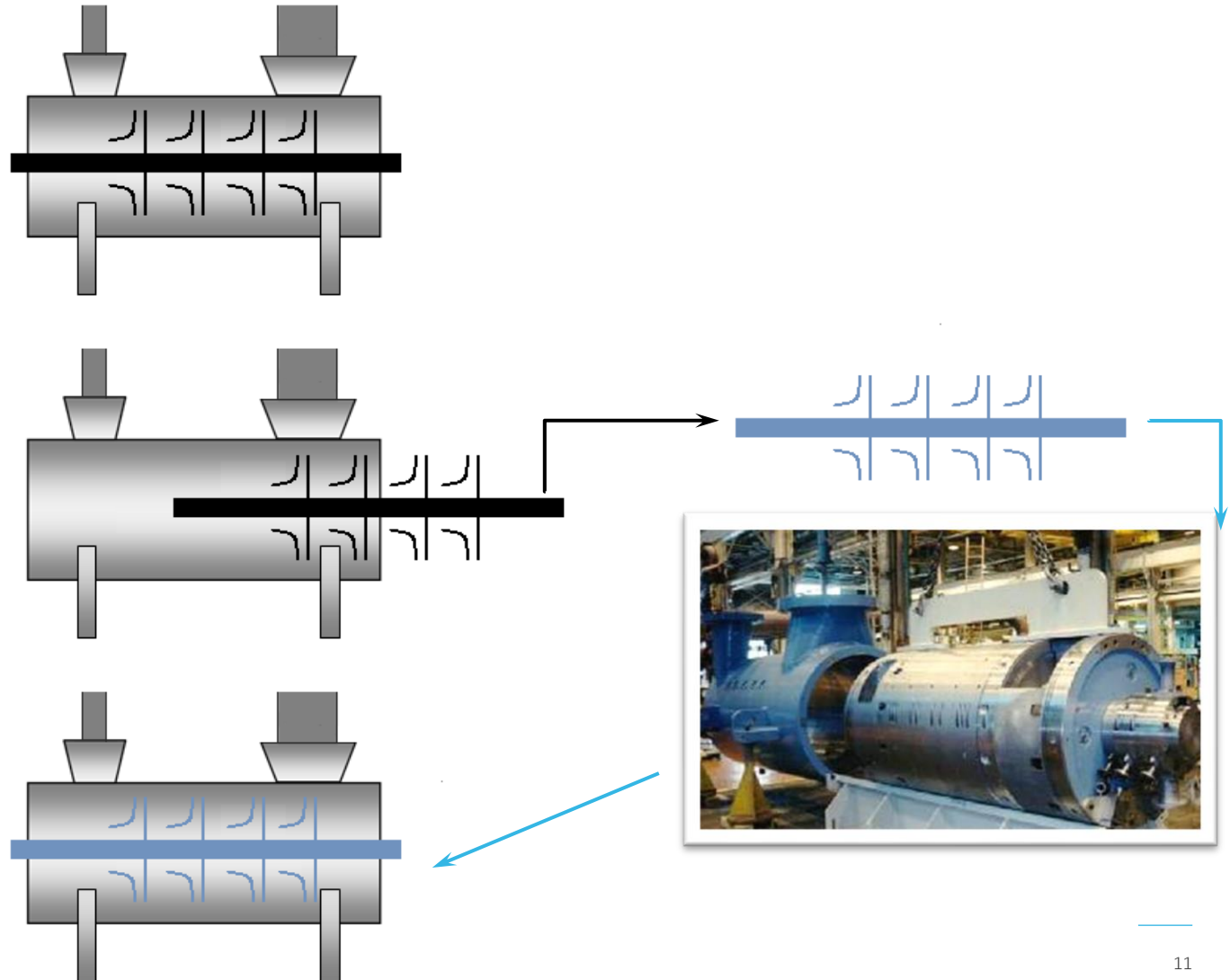
TLB: Emissions Reduction Technology Showcase 29th May 2024

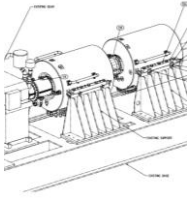
Revamp Standard scope

Only the design of the flow path will be modified: statics parts (diaphragms, return bend) and rotor (shaft and impellers)

Casing and Process piping

The casing can be re-used or supplied identical to original, and therefore there is no modification on process piping: reduced shutdown time, reduced installation costs, reduced risks





Bruce MP and export compressor revamp

TLB: Emissions Reduction Technology Showcase 29th May 2024

