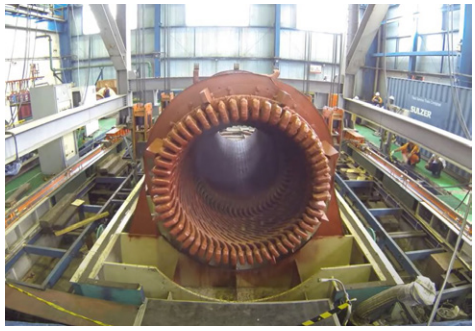
Catastrophic failure of stator core with replacement at fraction of OEM's price

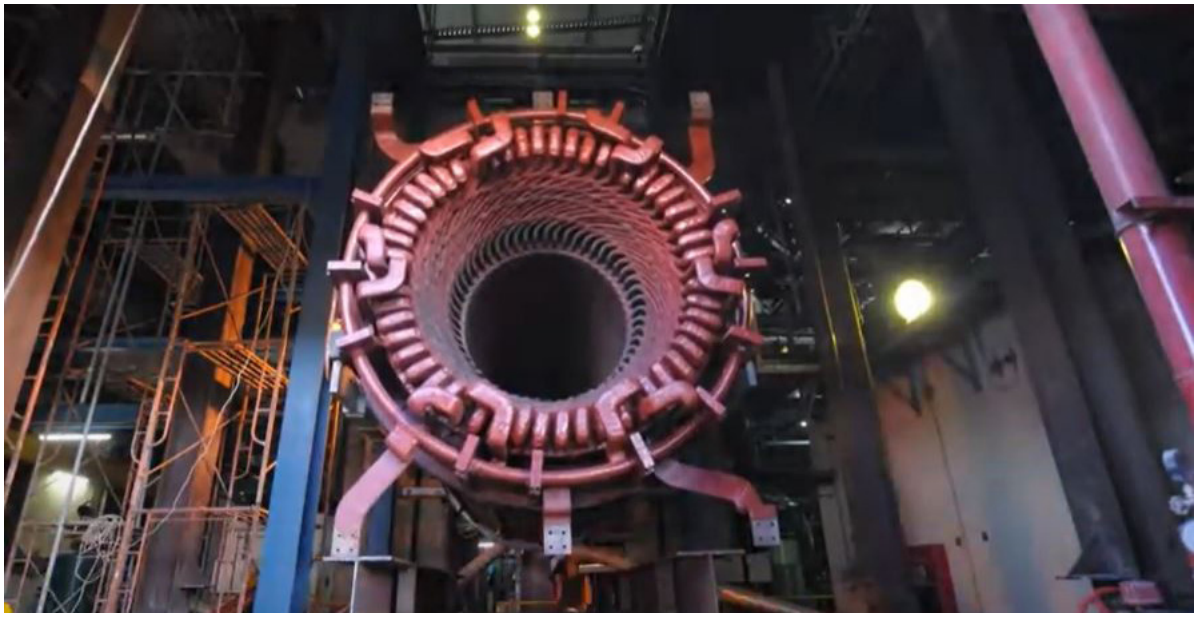
CUSTOMER	Independent power producer
LOCATION	West Sumatra, Indonesia
INDUSTRY	Power Generation
KEY SERVICES	1. Reverse engineering
	2. 24/7 support

THE CHALLENGE

A local repair that had gone all wrong leading to unexpected outage & production losses

- When the generator unit failed for the first time, the operator selected a local repair shop to complete a full rewind.
- The shop re-insulated the existing 11kV copper by hand with only 5 half lap turns, instead of the minimum five
- Poor workmanship meant that adding more insulation would have resulted in the coil no longer fitting in the slot
- Consequentially, the stator suffered major ground fault during re-commissioning, resulting in extensive core damage leading to a major 9-month outage
- Significant loss of revenue was incurred for the outage
- OEM could not provide advanced repairs and offered a complete replacement at US$5million with a lead time of 14 months, which was too hefty and the long lead-time doesn't help
- Sulzer was appointed for a reverse engineering solution at fraction of OEM's cost
- Major hurdles had to be overcome due to the location of the generator being located on the 2nd floor with no suitable access and inappropriate overhead crane



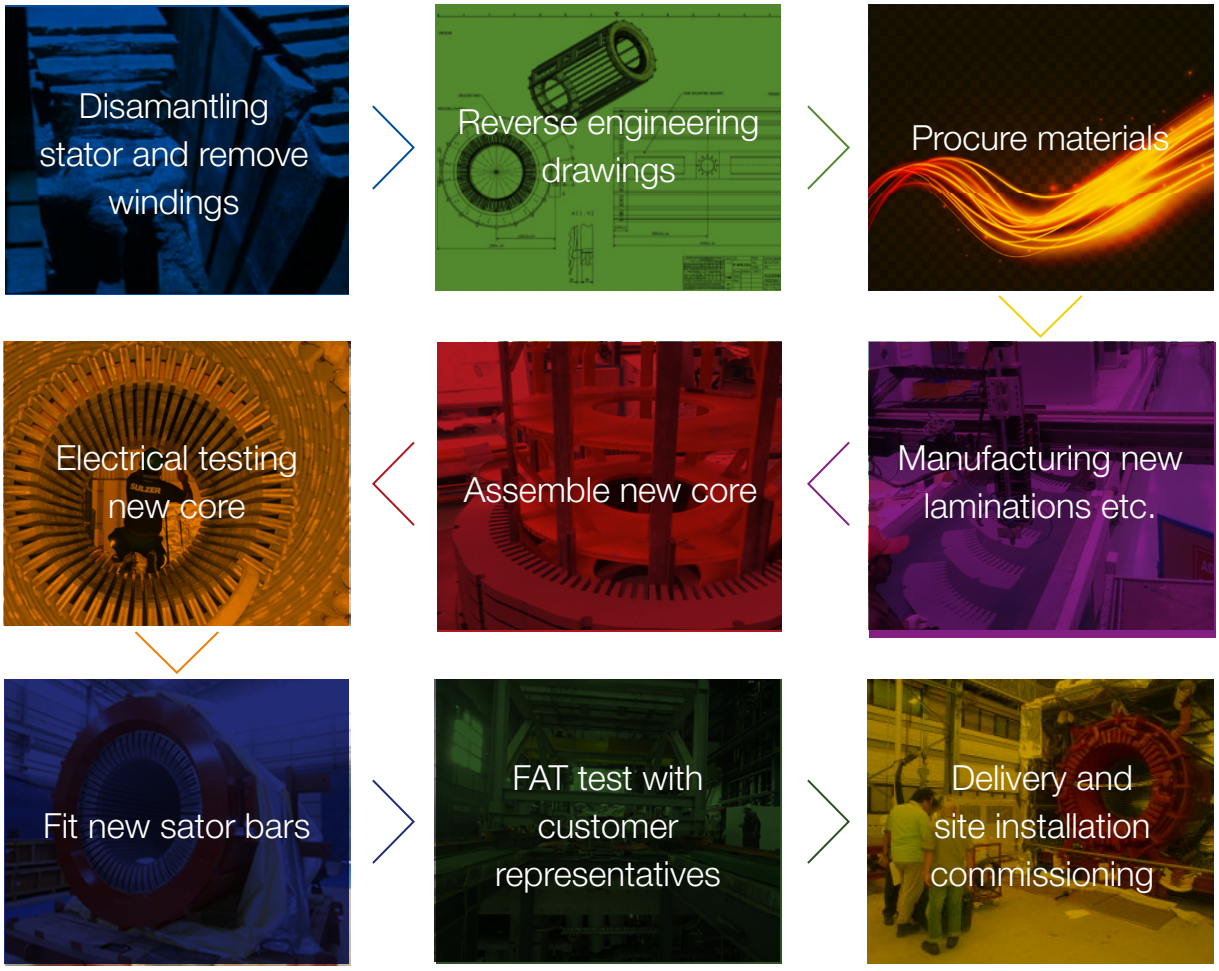


THE SOLUTION

Methodological Reverse Engineering

As one of the industry's leading reverse engineering specialist, fixing legacy units where documentation or manufacturer support is unavailable is Sulzer's forte. Sulzer boasts multiple state-of-the-art facilities globally with in-house coil production capabilities backed by a comprehensive database for coils and other critical components.

- Team of field engineers were dispatched to safely remove the generator which required elaborate planning
- 100% in-house methodological reverse engineering delivered by Sulzer's technical experts backed by high standards of quality control and processes
- An elaborate 10 days of on-site data collection was carried out with scanning and precise measurements captured.
- Robust global supply chain and qualified suppliers with the highest quality controls were activated for sourcing components such as cooling ducts and laminations etc
- Full-rewind with Sulzer UK 11kV stator half bars produced inhouse with accordance to OEM specifications
- Brazing end windings and fitting new H class end caps
- All components and assembly of new stator core done in Sulzer Indonesia with improved electrical grade materials for enhanced equipment lifecycle
- Comprehensive testings- AC Hipot test, ELCID and stator wedge assessments along with final electrical testing
- Full logistical and on-site commissioning support was rendered to bring the new stator core to full operations



THE CUSTOMER BENEFIT

Cost effective new stator core delivered on turnkey & fast-tracked basis

The operational benefits are immense in multiple aspects, from speed, costs, and downtime perspective. The customer was able to:

- Obtain a turnkey solution where Sulzer delivered and project managed the entire endeavor from logistics, root-cause analysis, re-manufacture to commissioning, which not many ISPs or even OEM in the market could undertake
- Obtain a brand-new stator core at a cost difference of US$2.5 million
- Reap the benefits with an equipment life-extension of 30 years compared to OEM's solution
- Reduce the downtime immensely as compared to replacement solution by 40%

On an equipment and engineering perspective, the operation team will be glad that the new upgraded stator core comes with

- Improved core laminated steel with greater efficiency compared with original lamination material due to technical advancement in material technology
- Advanced reverse engineering design
- 11kV roebel stator bars with improved insulation materials
- Improvement in operating under extreme temperatures

“At Sulzer, we never shy away from difficult and complex projects like this, which requires immense expertise to deliver a reverse engineering solution that works, without any drawings from the OEM. We relish the opportunity to support operators with high quality solution at a fraction of the cost compared to conventional OEM replacement.”

Alan Cumberbirch, Head of Business Development, EMS, Indonesia

PROJECT KEY FACTS

COST SAVINGS VS CAPEX REPLACEMENT

US$2.5million

PROJECT LEAD TIME

9 months

LEAD-TIME CUT VS CAPEX REPLACEMENT

40%

EQUIPMENT LIFE-EXTENSION OF

30 years

THE IMPACT

Substantial downtime and investment was avoided by reverse engineering new components and delivering as-new compressor performance for hydrogen process.

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