

Cementing a **generator** reliability upgrade

CUSTOMER

Cement producer

LOCATION

Indonesia

INDUSTRY

Cement

KEY SERVICES

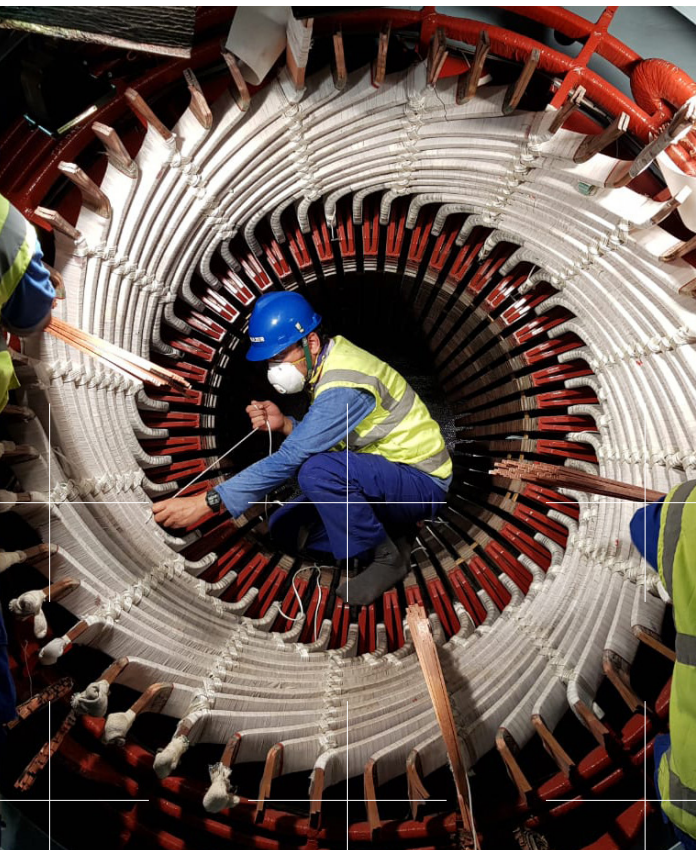
1. Generator refurbishment

2. Reverse engineering

3. Repair and overhaul services

4. Root cause analysis

5. Coil manufacturing



Operations grounded caused by stator winding design deficiency for generator



A 55 MW turbo generator at a cement facility suffered a breakdown, caused by strand-to-strand faults that eventuated into a stator connection phase ground fault. Due to the excessive amount of winding oil contamination from a leaking bearing labyrinth seal, the ground fault flash resulted in a stator fire. The failure was attributed to the stator winding design having parallel stranding, which caused high circulating currents. As this was the only power source for the facility, production was immediately halted, risking the delivery of orders to customers.

- A rapid generator repair was required to ensure the cement producer could meet existing orders, work through the existing stockpile and minimize downtime
- The winding in the generator required changing from parallel stranding to guard against future failures
- OEM and service providers approached by the cement producer could only offer parallel strand conductors and completion schedules of several months
- No vendor could offer a stop gap repair for the generator to get production back online
- The downtime was placing increased pressure on the cement producer's other regional facilities as they worked to compensate shortfall and meet demand



THE SOLUTION

Best-in-class reverse engineering and robust supply chain- a recipe for success



Due to a proven track record supporting the customer's various production facilities, Sulzer was awarded the repair and upgrade project by direct appointment. Sulzer proposed installing 360° Roebel bars as the most optimal solution, a configuration unavailable from the OEM. Furthermore, Sulzer completed a partial repair to the failed stator windings, enabling the producer to work through their material stockpile, meet existing orders and minimize reputational impact.

- Leveraging on Sulzer's global network of experts and capabilities, the Indonesian team collaborated with Sulzer's Birmingham Service Center in the UK to produce 48 top bars and 48 bottom bars with a 360° Roebel
- Using data collected by the Indonesia field services team from the stator and existing top and bottom bars, the Birmingham Service Center reverse engineered the winding to incorporate a 360° Roebel despite the short length of the stator core
- Access to engineering and manufacturing facilities for high voltage stator coils and half bar production, backed by a comprehensive database and automated design capabilities, enabled an effective and efficient production turnaround
- To ensure a continuous workflow and minimize the duration of the winding process, the bottom bars were shipped first, followed by the top bars, allowing the generator rewind to be completed sooner
- Once the upgrade had been completed and the generator was back up and running, the pressure on the customer's other facilities was alleviated

THE BENEFIT

Quick turnaround minimizes downtime production impact with extended equipment reliability



The entire project was completed within 10 weeks, compared to the lead times of many months offered by competitors. Combined with phased delivery, which reduced the project schedule by several days, this allowed all work to be completed within a 10-12 week shutdown period, minimizing disturbance to operations. Furthermore, upgrading to 360° Roebel unlocked a host of operational benefits.



- Winding temperatures were greatly reduced, allowing the generator to be run more efficiently, providing energy cost savings to the cement plant.
- Electrical circulating currents were all but eliminated, minimizing the risk of any future premature failures.
- Thermal stresses on the winding insulation were much less, improving service life.
- Availability and responsive deployment by Sulzer's field services team for the stop gap repair ensured that the facility could meet existing orders, reducing any revenue loss and minimize reputational impact.
- Immense depth of engineering expertise which saw seamless project collaboration between Sulzer UK's HV coil shop and Sulzer Indonesia's field services team to deliver an interim repair and a novel 360° Roebel bar upgrade ensured an optimal and speedy solution for the customer.





PROJECT KEY FACTS

GENERATOR CAPACITY

55MW

PROJECT LEAD TIME

12 weeks

ROEBEL BARS PRODUCED IN-HOUSE

48 top and 48 bottom bars

THE IMPACT

The unique, customer centric approach of Sulzer prioritized the needs of the cement producer in this generator upgrade project, minimizing any impact to operations or business reputation.