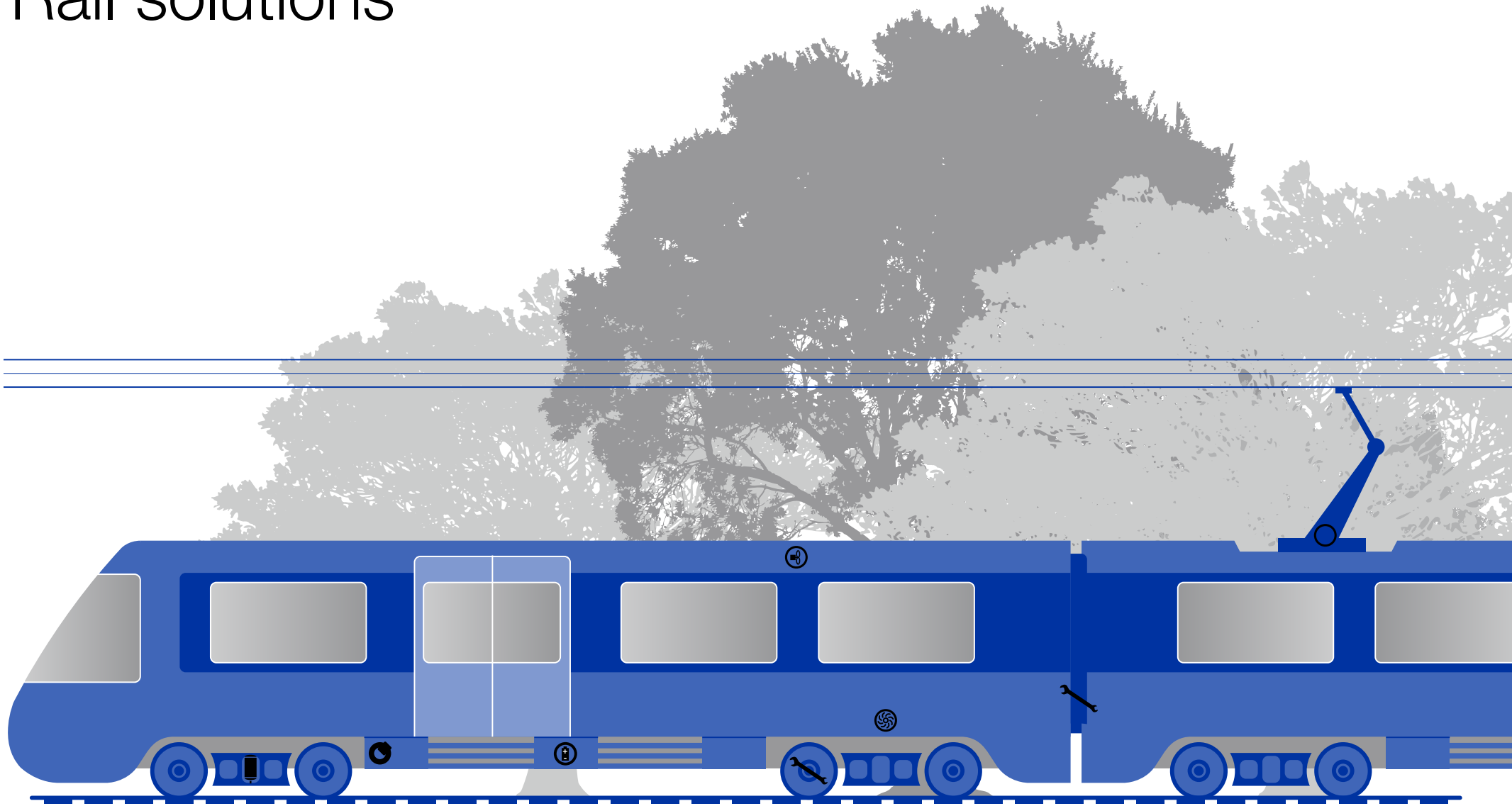


# Rail solutions



# Sulzer's service centre network close to you



Our service centre network has years of experience in bringing rotating equipment expertise closer to you.

Service and repair is our heritage, Sulzer offers first-class support services to ensure the reliability of your equipment.

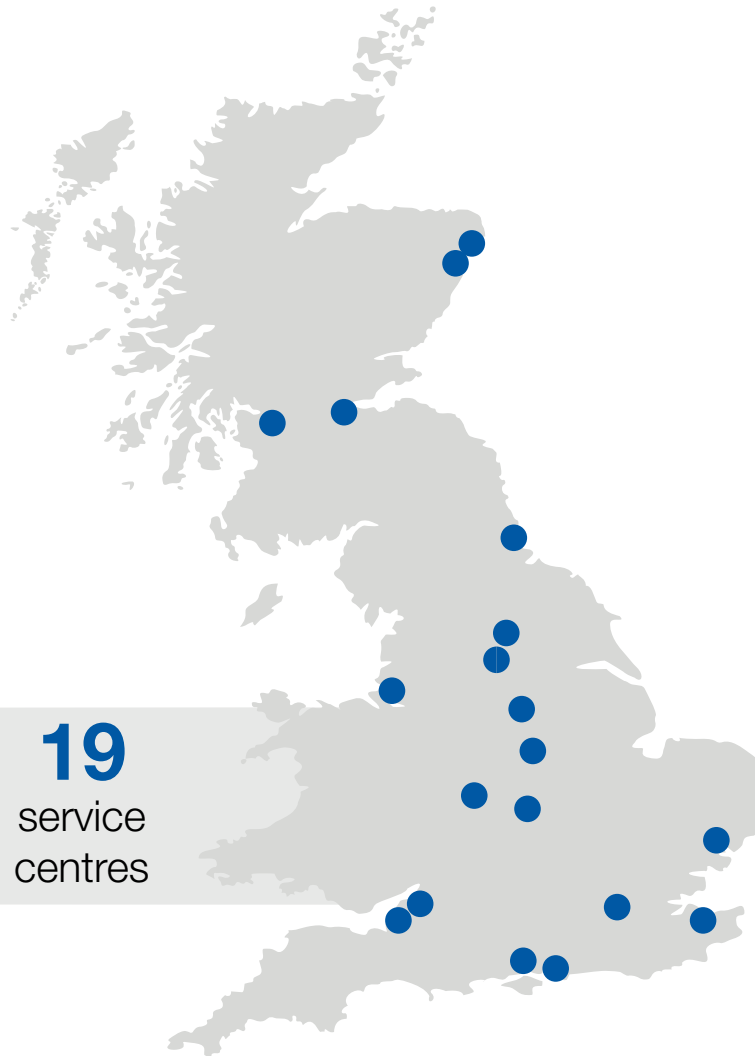
- Electrical
- Mechanical
- Pumps
- Reverse engineering

Sulzer is perfectly placed to improve the performance of your plant through responsive, technical solutions for your key equipment.

**1**  
access  
point



**19**  
service  
centres



At the heart of our network is our dedicated rail competence centre in Nottingham. The facility is operated by rail experts who understand that safety and quality is crucial to running failure-free, efficient, full capacity, on-time journeys.

As a RISAS accredited facility, our experts work to rigorous processes and certifications. You benefit from supporting documentation, often bespoke to your projects, to evidence the quality measures we have worked within.



# Heating, ventilation and air conditioning

**SULZER**

Heating and ventilation systems constantly recirculate air, which contains dust and debris that gradually builds up on the fans' impellers. Typically, there are six fans per carriage to keep air flowing for passenger comfort and safety.

To evidence each procedure, a certificate is issued with each impeller, recording its unique identifier and the details of the balancing procedure.

Reverse engineering services - in some cases, the impellers can be damaged beyond repair, during the disassembly process. Sulzer's in-house machining centers have the capability to manufacture almost any metal component, to include specialist features, and specific to these impellers rivet to ensure they can be refitted to service perfectly.

## Service solutions

When in continuous service, the impellers will go out of balance and start to vibrate. Aside from the nuisance to passengers, the vibration also affects the bearings and fixings inside the heating matrix, which can cause further operational issues.

Sulzer supply you with a range of service options including:

- Supply of replacement ventilation assemblies
- Specialist overhaul
- Preparation for refurbishment – cataloguing and cleaning: removal of lint and dust, steam cleaning, hot-washing
- Welding and grinding repairs
- Dynamic balancing
- Tight tolerance and accuracy adherence
- Full dismantle, detailing, testing and reporting
- Clean and paint all component parts to specification
- Dynamically balance all rotating components to British Standards of G2.5
- Manufacture a new set of stator coils using Grade '3' enamel covered wire, double dipping in impregnating varnish and stove
- Drill, tap and peg the stator core to the casing to secure against movement of the stator core in service
- Supply and fit new sealed bearings complete with high temperature grease
- Assembly and final testing certification
- External painting and finishing



## Research and development

Working closely with the customer at all times, the entire refurbishment process has been designed to meet their requirements. From the specification of a specially designed fire retardant powder coating, to prevent the build-up of dust and debris, to the balancing procedure and certification – every stage of your repair program will be bespoke to you.

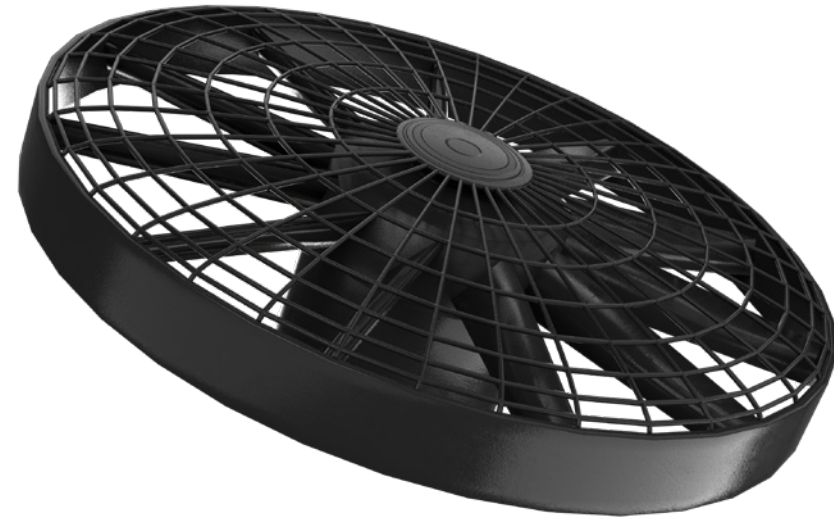
# Radiator fan repairs

**SULZER**

## Service solutions

There are many elements of maintenance that Sulzer offers you, to prevent the early failure of your equipment and to extend its service life, including:

- Fan unit clean, inspect and static electrical testing
- Clean and prepare fan housing for repair
- Overspeed testing to prove repair
- Stator rewind to the required specification
- Dynamic balancing to the required British Standard BSI specification, as a minimum
- In-house non-destructive testing on fan blades
- Vibration analysis, bearing temperatures checked with thermal sensor
- Supply of replacement new parts: fittings, new cable assemblies, new OEM specification bearings to rail industry required specifications and blades
- Mechanical repairs, delivered to you through fully capable machining centers



## Vibration analysis

Each piece of equipment is made up of many components, every part will vibrate in different ways, frequencies and amplitudes. When a failure is imminent, generally, the overall amplitude of vibration increases.

Protection systems do not evaluate specific problems – this is why regular review and analysis of the waveform is required. Understanding danger output signals, peak values and their comparison to pre-programmed limits is key to identifying specific problems in advance of failure.

# Bogie frame refurbishments

All railway carriages have a frame that works to support and connect the main carriage to the wheelsets and their motors. The bogie frame also contains suspension systems and ancillaries. All of which due to strict repair regulations in passenger and freight rail need to be serviced regularly to ensure they are fit for purpose.

- In-house machining center services for cutting, reverse engineering, milling, slotting, grinding and more
- Replacement of key components, wear plates, trunnions, etc.
- Dimension checks
- Painting and finishing services
- Sulzer offers you a flexible approach to suit your repair schedule and requirements.
- We understand that often the repair of your bogie frames is time critical so we factor this in, having consistently achieved 14-day repair cycles on three bogies in one go.

## Service solutions

In prolonged service bogie frame fabrications can start to show signs of wear, including cracking, corrosion, etc. In order to maintain their condition and extend their original service life, Sulzer is experienced in dealing with leading operators to deliver specified, quality assured repairs and refurbishments.

Access expert mechanical service solutions:

- Large capacity in-house steam cleaning and shot blasting
- MPI crack testing
- Faro arm twist measuring and twist analysis
- Bespoke jig design and manufacturing to aid straightening process
- Localised welding through fully coded welders for light and heavy repairs



## Quality matters

With each bogie frame we supply you with quality documentation of all of the inspection processes, repair processes and photographs of every single bogie at each stage. All of the processes and repairs are detailed on a weld 'map' which is a key part of the quality reporting.

# Brake caliper refurbishments

**SULZER**

## Service solutions

Sulzer offer you a bespoke service package including:

- Process cleaning
- Manufacture of bespoke fixtures and jigs to aid the strip and re-assembly
- Full dismantle and inspect to component level
- Supply and / or manufacture of all spares parts: sourcing of oilite bushes and in-house machining of all other components, including the reverse engineered of obsolete parts
- Complete final re-assembly



## In-house machining

Machining is of major importance in any reclamation process. This technique is used in various situations such as turning a shaft to size after welding or metal spraying, grinding a roller after hard chromium plating, or manufacturing a new component manually or from a set of CNC codes created from a computer-aided-design ready for milling.

# Line filter inspections and repairs

**SULZER**

Power lines transport the energy required to operate all of the systems aboard trains and railway vehicles. However, the energy coming in from the lines in many applications needs to be filtered as high levels of harmonics in the supply can affect the quality and smooth running of your operations.

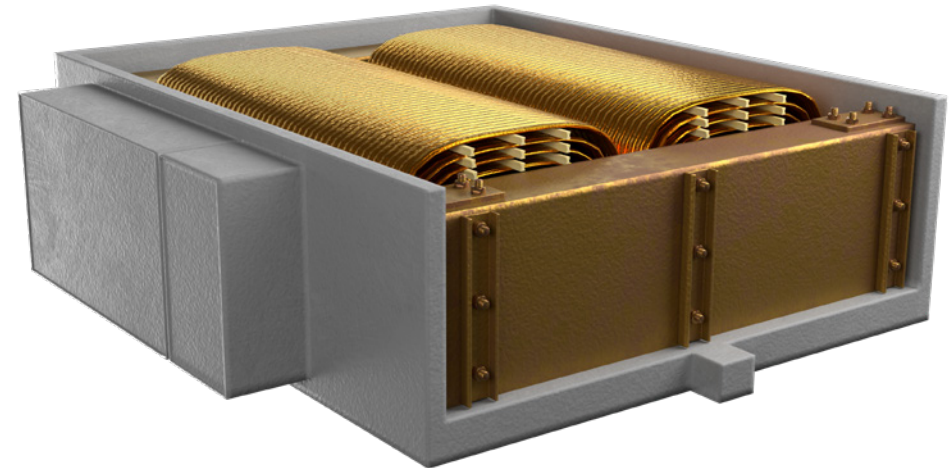
- In-house dynamic balancing of cooling fans
- Main choke inspections and repairs, including the dismantle, careful removal of top and bottom laminations, and full rebuild
- Manufacturing of support frames to facilitate the removal of damaged windings
- Strip of existing windings, along with cleaning of the laminations and packers
- Complete capability to re-insulate lamination pack
- Experts in full coil rewind
- Full finishing and varnishing of all units and components including ingress protection upgrades
- Final full diagnostic test capabilities to validate repairs
- Sulzer is close to you

## Service solutions

In order to power movement, motors, lighting, heating, ventilation and welfare facilities on-board a train energy sources are required. With varying inputs for each piece of equipment the systems often integrate AC and DC components. This is the case with the line filter modules, which incorporate an AC cooling fan and two DC coil windings.

With electrical expertise at the heart of the services we offer, you can confidently rely on our knowledge of:

- Coil, capacitor and component condition reporting
- Full testing to include dry dielectric, impedance, fan motor IR & PT100
- Cleaning, inspection and replacement of components



## Smooth operator

Integrated systems need a service partner who has the knowledge and expertise to facilitate all of the repairs under one roof. Understanding your every need is our speciality, that is exactly why our teams are experienced in repairs that help you to gain efficiencies, ensuring you longer periods of operation.

# Air receiver pressure testing

**SULZER**

## Service solutions

The condition of the air receivers is extremely important. Regular testing and remedial works are often required to ensure the tanks are working as they should.

Life extension and maintenance are a growing demand of our rail customers, offering you significant longer term savings.

Our detailed service package includes:

- De-scaled process cleaning
- External visual examination for damage
- Internal endoscopic examination for damage and excessive rusting
- Hydrostatic pressure testing, is a non-destructive test where the tanks are pressurized up to 1.5 times the working pressure – testing is required to understand the strength and search for any areas of weakness or leakage, we hold the pressure for a specified period of time in order to understand the condition
- Every air receiver tank is issued with a full and unique test certificate

Where required Sulzer offers you access to mechanical repairs, offering re-welding of threads and full machining centers – with re-testing services to prove these additional repairs and full paint finish.



## In-house shot blasting

Investing in the future, we are continually adding to our capability portfolio to ensure we are optimizing our processes and keeping in line with our customers expectations. Equipped with shot recycling equipment and extensive filtration our in-house system works to improve and maintain a safe working environment.



# Traction motor repairs and rewinds

**SULZER**

## Service solutions

At Sulzer, our team of time-served experts work with your aging machines to repair, rewind or develop enhancements to resolve recurring issues, which in turn extend the life of your motors. Sulzer offer expert repair services to all classes of traction motor, both AC or DC to WOSS standards.

You can trust that we understand your need to repair to set specification standards to meet the regulated rail requirements. With clear communication and a consultative partnership, we work with your needs in mind.

Sulzer supply you with a range of service options including:

- Full inspection, overhaul and reporting
- In-house steam cleaning and stoving of rotor and stator
- Cleaning and painting
- Rotor reconditioning and dynamic balancing
- Bearing, seals and gasket changes
- Reverse engineering of components
- Commutator refurbishments and manufacture
- Specialist copper sourcing
- Full coil burnout
- Complete rewind
- Run testing
- Final paint and finishing

Ensuring that your machines are back in service and on time, Sulzer offer you a collection and delivery service.

Time is often critical to ensure that operations are running on time so we do everything we can to make sure of this



## Winding experts

With over 100 years of coil manufacturing and winding expertise you tap in to years and years of knowledge. Whatever your issues, big or small, we will offer you a range of solutions so you are fully prepared to make the best decision for you.

# Coil and commutator refurbishment and new manufacture

**SULZER**

Sulzer can supply complete sets of coils in the shortest lead times minimising impact on your productivity. Sulzer has optimised the coil manufacturing process with a purpose-built, fully equipped coil manufacturing facility at the Birmingham service centre. This ensures complete control of quality guaranteeing each coil passes the stringent checks throughout the complete process. Customers can depend on Sulzer to supply high voltage coils using the latest technology and insulation systems on time, every time.

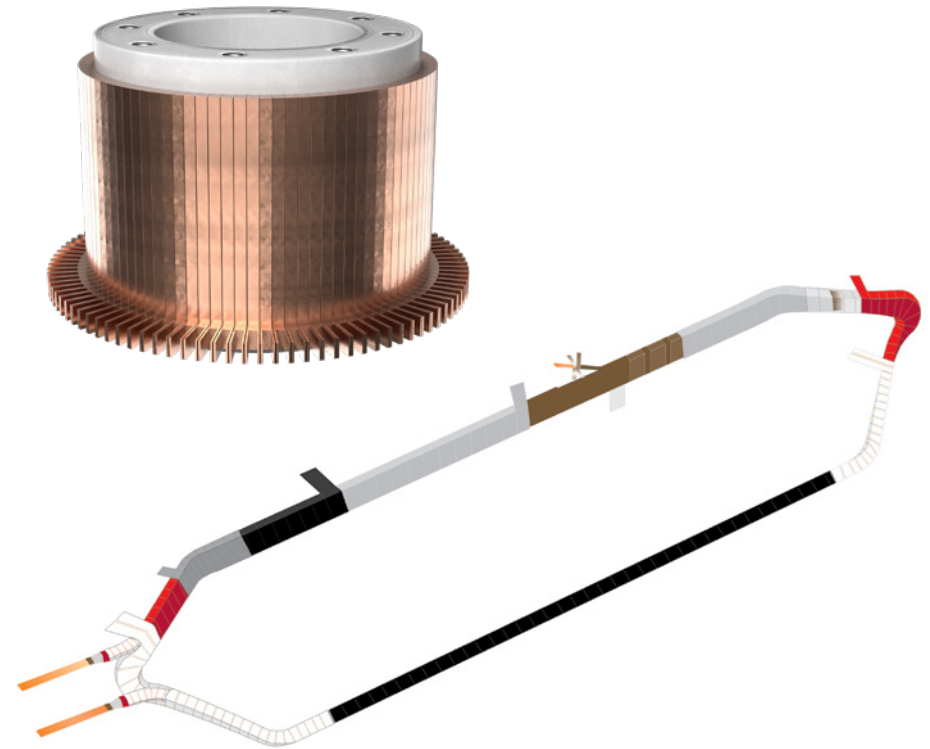
Commutators are integral parts of DC armatures, with a sole purpose of converting DC to AC and vice versa. Set of brushes sit in a static position on the face of the commutator which rotates when the machine is in operation.

The commutators are found on the armature of a DC motor or generator.

## Service solutions

Depending on the history of the commutator and the signs of wear, the repair includes different processes:

- Visual inspect for signs of damage and make an assessment on the level of work required
- Evaluate the current brush grade
- Light polish
- Re-machining is the easy way to deal with renewing the surface and creating a uniform contact area
- Re-insulation is required if the insulation system is starting to show signs of break down
- New manufacture and refurbishment of individual copper segments
- Rebuild in jig with insulation material spaced between each copper segment
- Consolidation in jigs to tighten ready for stoving
- Machining services to finish the final face exterior and internal faces
- Final testing: high voltages, insulation resistance and bar-to-bar resistance
- Commutator profiling
- Auto tig welding
- Auto skimming
- Undercutting machine



## Precision engineering

The variety of individual commutators, therefore, is vast, ranging from custom-made one-off creations to more mass-produced products such as those used in traction equipment. Each application has a prescribed specification that must be followed carefully when the time comes for any maintenance work.

# AVR boards electronics

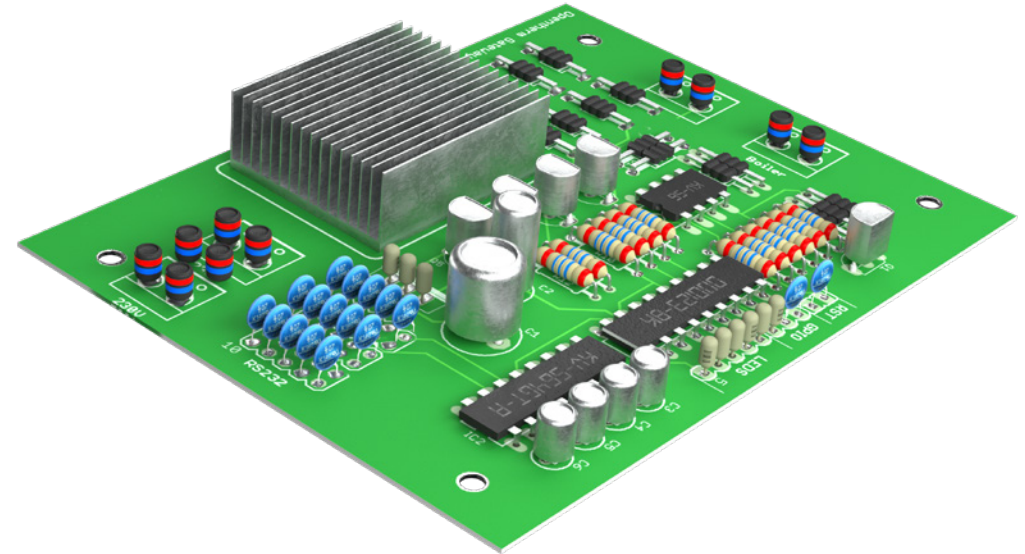
Electronics can be found in most systems, helping to power, control or integrate. Automatic voltage regulator (AVR) boards work to maintain the output terminal voltage at a set level, under operating conditions where temperature and load can regularly change. These can be found within the main terminal box on a generator.

Sulzer have the design expertise to take a standard generic board and incorporate systems in line with customer requirements, relating to voltage control, frequency, and fluctuating loading demands. Bringing generator control up to date, reducing components, and removing generic functions not required for application, thus reducing component failure.

## Service solutions

Existing AVR boards over time begin to fail and with obsolescence becoming more wide spread, Sulzer has dedicated teams in-house who work to reverse engineer modern, and more durable, solutions. We offer you:

- Design capability of completely new AVRs
- Redesign to replace obsolete or unreliable boards
- Surface-mount technology
- Knowledge and know-how to support all types of generator AVRs
- Modifications and stability improvements
- General repairs
- Connection readjustments
- Full load testing



## Design and development

Experts within Sulzer have years of information and experience working on, and developing, some of the first AVR boards for generators.

By harnessing this technical know-how and with a complete understanding of generator repairs, delivering reliable solutions to you is our goal.

# Auxiliary generator refurbishments

**SULZER**

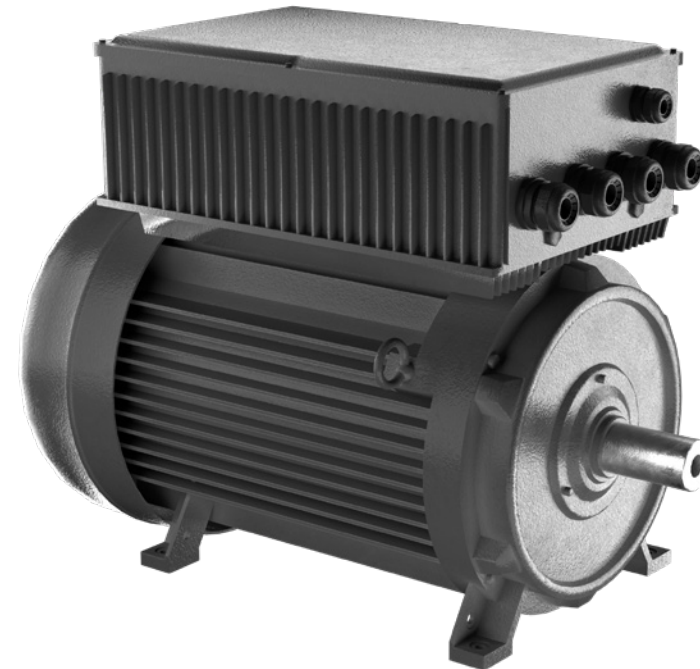
## Service solutions

With many machines having been originally designed and built over twenty years ago, many are now seeing an increased load, especially after the trains are refurbished. Increased demand for more electrical equipment, such as outlet sockets, buffet cars and air conditioning, has increased the load on the generators and they are now required to operate close to maximum capacity.

Sulzer offers you rapid turnkey repairs, to industry specifications as follows:

- Identify faults on initial light load electrical testing
- Full dismantle and inspection
- Initial inspection reporting
- Clean and paint of all component parts
- Process cleaning, stoving and varnishing of rotor and field windings
- Dynamic balancing of rotor
- Repair worn bearing housings
- Complete reassembly, fitting replacement parts, including the seals and bearings
- Terminal box repairs
- Rotating diode board supply and fitting
- Complete set of final tests including full load testing

When a train carriage is taken out of service the operator has a very short maintenance window in which to complete the repairs and return the carriage to service. Failing to achieve the turnaround in a prompt time will result in a reduced passenger service and potentially lost operator revenue. It is therefore crucial to complete every maintenance project on time and this emphasis is passed on to every supplier involved in the servicing program.



## Contracts for service

The rail industry requires its equipment to operate on a four-year period between servicing. To guarantee this service life, operators pay a fixed contract fee that will include any repairs that are required during the four-year period. With such contracts, high quality repairs are essential in order to avoid additional costs outside of the expected operating period.

# Pump repairs and overhauls

**SULZER**

In every operation you are guaranteed to find a range of pumps helping to transfer fluids for cooling, lubrication and more. In order for equipment to keep running smoothly the upkeep maintenance and repair of pumps from a range of applications is crucial.

Take advantage of a full work scope:

- Dismantle, inspect and report, including full investigation, measurement and visual checks for wear and tear
- Clean and paint all internal component parts, that are still fit for purpose
- Supply and fit new parts e.g. mechanical seals, lip seal and spacer arrangements specific to material requirements
- Specialist sourcing of bespoke parts and bearings
- Non-destructive testing
- Mechanical repairs and reclamation of seal seating's and housing – metal spraying, machining and reverse engineering of replacement parts
- Complete pump reassembly
- Final paint and pressure testing
- Full service offering completed in-house and to customer or OEM specifications

## Service solutions

As liquids move through their systems wear is produced in the form of corrosion, blockages and components fail. This in turn can mean that equipment overheats or stops working, resulting in downtime that has huge cost implications on your operation.

Sulzer is recognized worldwide as an advanced OEM of pumps, delivering innovative products to market. We understand that many of the pumps in rail need minor repairs and replacements. However, with a vast wealth of technical knowledge on complex pumping solutions we apply this to ensuring you receive high quality repairs on your pump specifications.



# Main generator repairs and refurbishments

**SULZER**

As one of the largest independent service providers of electrical and mechanical equipment, we have heavily invested in our facilities and services.

Our in-house facilities include:

- Dynamic and a bespoke high-speed balancing bunker
- In-house coil manufacturing and testing and development laboratory
- Workshop and site engineers

## Service solutions

Sulzer offers a unique and complete range of services to make your generators run safely and reliably. Electrical machines need to be monitored, maintained, and regularly inspected and repaired to ensure they are fit for purpose.

You benefit from the following:

- Complete dismantle
- Inspection and detailing services
- Reporting of findings to your requirements
- Stator repairs, winding re-insulation and/or replacement
- Coil manufacture, supply and rewind
- Component repairs, reverse engineering, industrial machining and finishing
- Complete electrical testing



## Fault finding

Every operation has areas of the system that either cause frequent problems or directly impact the failure of the auxiliary equipment supporting your processes.

With over 100 years of experience you can rest assured that Sulzer has encountered your problem before. Our knowledge is applied constantly to offer you solutions that resolve and prevent reoccurrence.

# Wheelsets

**SULZER**

## Service solutions

Sulzer provides balancing solutions for all types of wheelsets. Balancing is essential as it enables reductions in vibration, which in turn minimizes damage to the component and surroundings.

In order to accurately balance your components our team of engineers design and manufacture bespoke jigs, tailored to support all types of wheelset, to allow rotation in workshop balancing machines.

Balancing wheelsets to railway industry standards, following internal and customers process specifications Sulzer have a in house proven design cradle that allows wheelsets to be dynamically balanced retaining the bearing assembly. This reduces the time taken on strip and rebuild of axles that require dynamic only, saving you time and cost.



### Dynamic balancing helps to:

- Reduce bearing load
- Reduce running noise
- Increase lifetime
- Improve quality
- Increase efficiency