MERUS POWER

Merus®

SVC MODERNIZATION CONCEPT

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SVC modernization concept

Merus Power is a Finnish technological company specializing in power quality and energy storage solutions. We are experts at helping our customers migrate their already existing compensation systems to new technology while fully utilizing their existing CAPEX investment.

SVC importance to heavy industry

- **Increased production 7-10%**
- **Reduced energy consumption 7%**
- **Reduced CO_2 generation per ton**
- **Reduced electrode consumption 0.15- 0.18 kg/ton**
- **Production improvements**
- **Prevention of nuisance tripping**
- **Grid Code Compliance**

Why modernize?

- Typically original SVC suppliers do not have old electronics in stock or personnel to support 20 – 30-year-old technology in more complex trouble shooting cases
- Based on our experience, in most cases the best way is to modernise only the active components
  - Reduces CAPEX cost
  - Faster delivery time
  - **Installation and commissioning time 2-3 weeks** can be done during plant's annual maintenance break
- In case plant capacity is increased or grid code has become stricter Merus can offer
  - Complete new SVC or conversion to STATCOM
  - Help customer study new EAF operation points with Merus technology
- On top of economical advantages, modernizing increases **sustainability**
  - In a typical case the passive parts have still lifetime left when the active parts become obsolete
  - Replacing only the active parts allows that the lifetime of the passive parts is fully utilised, increasing the sustainability

Risks of sudden SVC failure

- Typical delivery times for new SVCs due to an unplanned SVC failure are 12-16 months
- In case of a sudden failure, customer is in disadvantageous position towards SVC suppliers
- If an unplanned failure happens, that typically means lengthy discussions with the utility on how operation can continue while the compensator is being repaired

Steel industry

- Sudden loss of the SVC typically leads to a 10-20% production capacity drop
- This will also cause energy consumption per ton to increase typically by 5-7%
- Energy consumption increase means CO_2 emissions (depends on fuel mix)
- Electrode and interior coating consumption increase as well (typically 0.15-0.18kg/ton)
- Less efficient operation and problems caused by harmonics will typically increase OPEX costs immediately by 5-10%
- Utility companies could mandate even higher production decrease due to adverse effects to their grid
- Reactive power penalties increase

Rollings mills

- Sudden loss of the SVC will lead to more severe voltage fluctuations at the factory electric system
- This can lead to nuisance tripping causing production stoppages
- Maximum torque of DOL motors will be reduced meaning negative effects to rolling mill operation
- The plant may use its grid code compliance meaning penalties from the utility
- Reactive power penalties increase

Mining industry

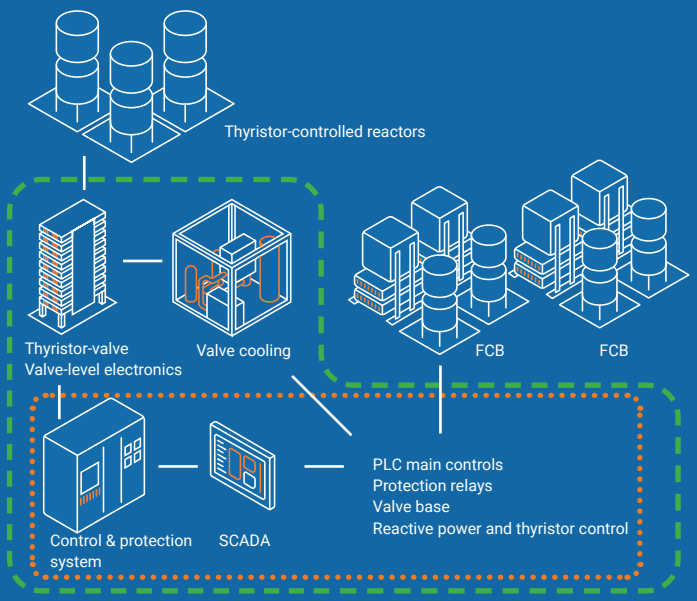
- If the mine has diesel generators or gas turbines their fuel consumption will increase if the SVC is not in operation
- This will also increase CO_2 emissions
- The maximum torque of DOL motors will decrease which affects adversely the mining process

Other heavy industrial loads get similar benefits from a well-working SVC

Different SVC options

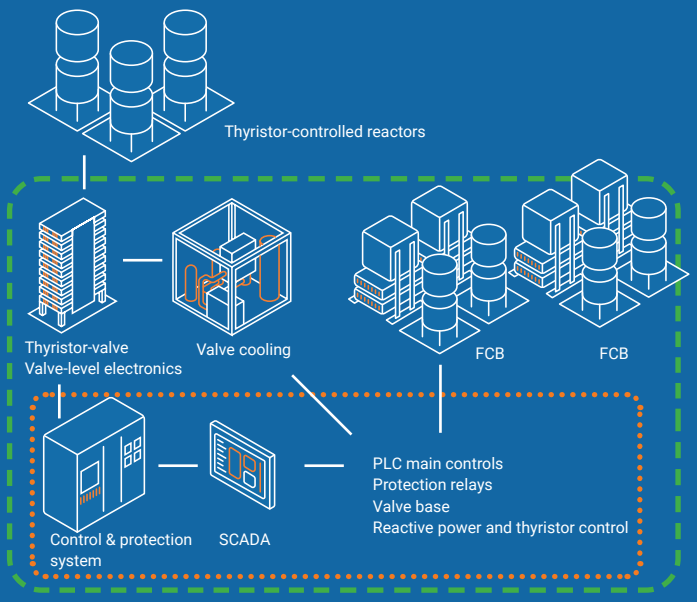
Option 1
Active Part Replacement

- Economical solution with fully updated functionality.
- Passive part is retained if the components are fully functional
- Replacement of active part with minimum downtime. Modern control and protection system with SCADA for easy data monitoring
- Built from state-of-the-art components with high availability of spare parts
- Remote monitoring and analysis
- Performance guarantee
- Annual maintenance contract



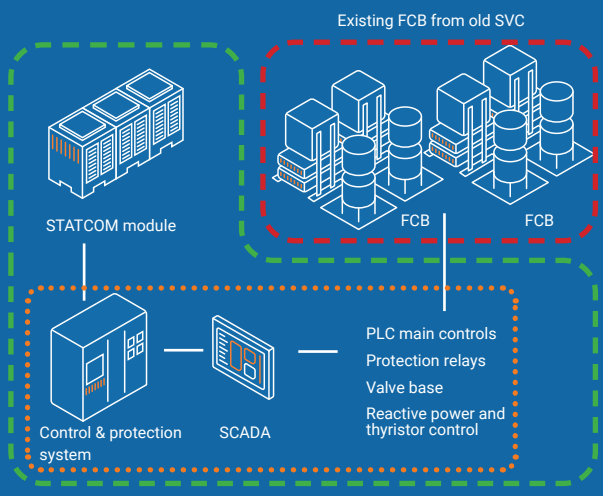
Option 2
Complete SVC Replacement

- Active and passive components are modernized
- Capacity extension possible
- Modern control and protection system with SCADA for easy data monitoring
- Improvement of SVC performance
- Built from state-of-the-art components with high availability of spare parts
- Remote monitoring and analysis
- Performance guarantee
- Operation and maintenance contract



Option 3
SVC replacement with STATCOM

- Cost-efficient transfer to STATCOM level dynamic performance
- Superior flicker reduction performance
- Smaller footprint
- Availability of spare parts
- Remote monitoring and analysis
- Possibility to use existing SVC harmonic filter banks to extend the control range of the STATCOM system, as shown in the figure
- Life-cycle service solution, if complete SVC is replaced by STATCOM



Design data

Connection point (PoC)
- Medium or high-voltage

Installation environment
- Indoor and outdoor
- -40° to +50°

Merus® Control & Protection System
- Manufactured at Merus factory in Finland
- All control software developed in-house by Merus Power

Thyristor valve
- Manufactured at Merus factory in Finland
- Nominal voltage up to 38.5kV
- Nominal current up to 2500A
- Nominal 3-phase power up to 250Mvar
- Efficiency ~ 99.8 %
- Water cooling, max flow 40 m^2 / h
- Two (2) redundant disc levels (more upon request)
- Simple disk replacement
- Small footprint

Merus® STATCOM module
- 2MVAr per unit
- Response time under 1 millisecond
- Independent control
- Independent liquid cooling system

Compliance
- Electrical safety: EN 50178
- Semiconductor converters: IEC 60146-2
- Electromagnetic compatibility: EN/IEC 61000-6-2 (immunity) and EN/IEC 61000-6-4 (emissions)
- IEC 62351: Power systems management and associated information exchange – Data and communications security

Warranty
- Standard 1 year, option up to 10 years
- Optional availability guarantee

Interfacing
- IEC104, Modbus

Merus® MERUSCOPE™
- Real-time monitoring
- Predictive maintenance
- Remote control

SVC modernization process

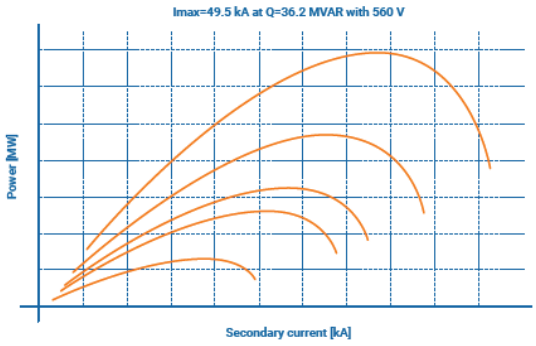
At Merus Power, we guide you effortlessly through complexities, ensuring you find the ideal modernization solution that meets your needs. No prior knowledge needed—our expertise is at your service.

Assessment and analysis > Project specifications and budjetary estimates > Design and system configuration > Implementation and commissioning > Training and transitioning to Merus® O&M Service

Step 1

Assessment and analyses

The process begins with an on-site inspection of the existing SVC, followed by a detailed analysis of the customer's objectives, including system operation, performance needs, and future plans. As experts in designing complex compensator systems, we offer insights on how these enhance productivity, such as in EAFs, positioning us uniquely to create solutions with significant ROI.



Step 2

Project specifications and budgetary estimates

Our specialists will choose the appropriate technology by comparing various options to match the customer's performance expectations and budget. Key considerations include process improvements, lifetime and reliability requirements, and technical constraints that affect system design.

Step 3

Design and system configuration

After developing preliminary designs and budget estimates, and the customer is ready to move forward with the investment, we finalize the investment case and main design specifications. The result is a custom-built business model that exemplifies true collaboration, developed in partnership with the customer.

Step 4

Implementation and commissioning

Once a project begins, our design team collaborates with the customer's engineers to integrate our modernization solutions smoothly with existing systems. Procurement and manufacturing are then efficiently executed to ensure timely readiness. The final stages involve installation and commissioning at the customer's facility, coordinated with the plant's regular annual maintenance to minimize disruptions.

Step 5

Training and transitioning to Merus® O&M Service

We prioritize effective training and thorough maintenance to enhance the longevity and efficiency of our systems. Our comprehensive training program equips our customers' teams with the skills needed for daily operations and system maintenance. Additionally, we offer a tailored multi-year operation and maintenance agreement to ensure long-term reliability and optimal performance of the modernized SVC system. Our proactive maintenance includes our cloud-based IoT service, Merus® MERUSCOPE™, to ensure consistent, high-quality performance.

Merus Power
Electrify your Future

Merus Power is a global technology company headquartered in the city of Ylöjärvi, Finland where we design and manufacture Finnish innovative battery energy storage systems and power quality solutions. Scalable and modular power electronics, intelligent software technologies and electrical engineering expertise are the base of our business.

Merus® Solutions can be easily tailored to a variety of applications and can meet small and large-scale customer needs with their modular structures. Their compact size, design, and scalability allow simple and cost-effective integration into many electrical systems.

Over the years we have worked with various customers in industry, utility, infrastructure, and renewable energy applications in over 70 different countries.

MERUS POWER

Send us an email to sales@meruspower.com.
One of our sales reps will be in touch with you as soon as possible.

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