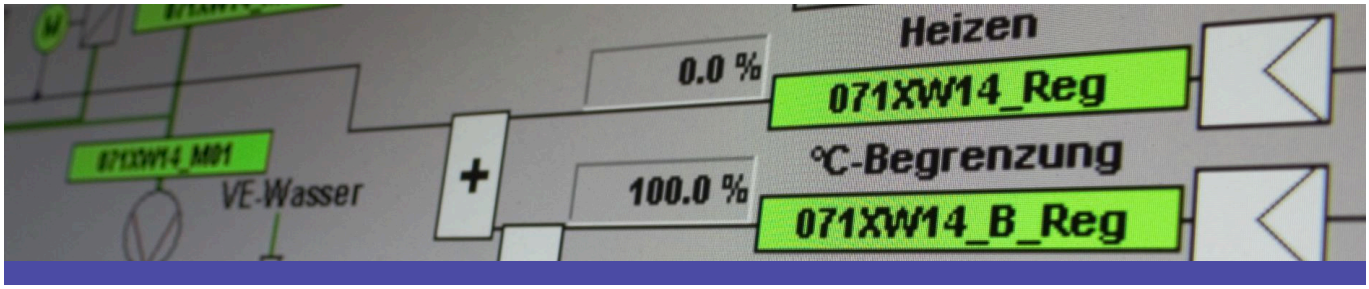
Five Technical Case Studies Demonstrating Our Engineering Practice



1. Resource and Fault Management

Mercedes-Benz AG

2. SCADA QS Tools

Mercedes-Benz AG

3. HMI Toolsets

Mercedes-Benz AG

4. HMI High-bay Car Storage System

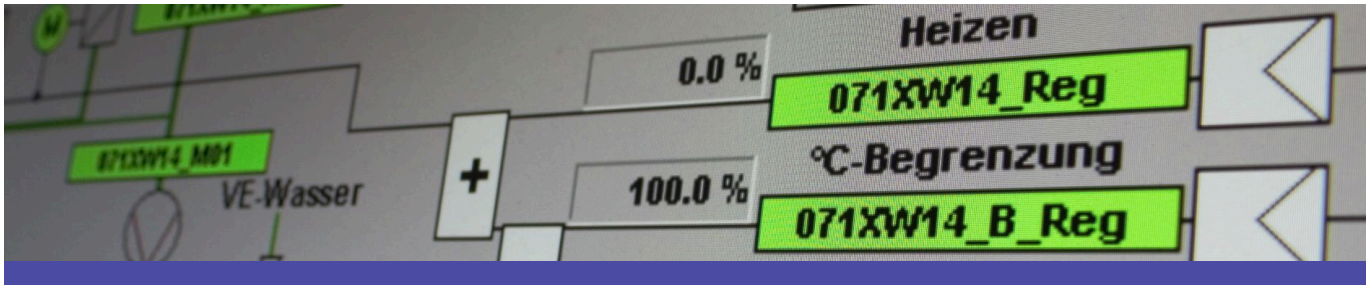
Dürr Systems AG

5. Integra SCADA Control System

INEOS AG

Mercedes-Benz AG

Resource and Fault Management Mercedes-Benz AG



Problem

The Rastatt Mercedes-Benz AG maintenance department required an efficient method to identify and respond to plant downtime and equipment faults. On-site diagnostics and documentation were not possible since fault data was available solely at office workstations. Maintenance staff lacked real-time mobile access to fault information on the shop floor. Task allocation and workforce coordination were largely manual. Supervisors assigned corrective and preventive tasks, tracked personnel, and coordinated activities without a centralised system, making urgent interventions inefficient. Documentation was inconsistent and often completed later in the office, resulting in non-standardised reporting. Shift handovers were hindered by the absence of a centralised system consolidating open tasks and team activities.

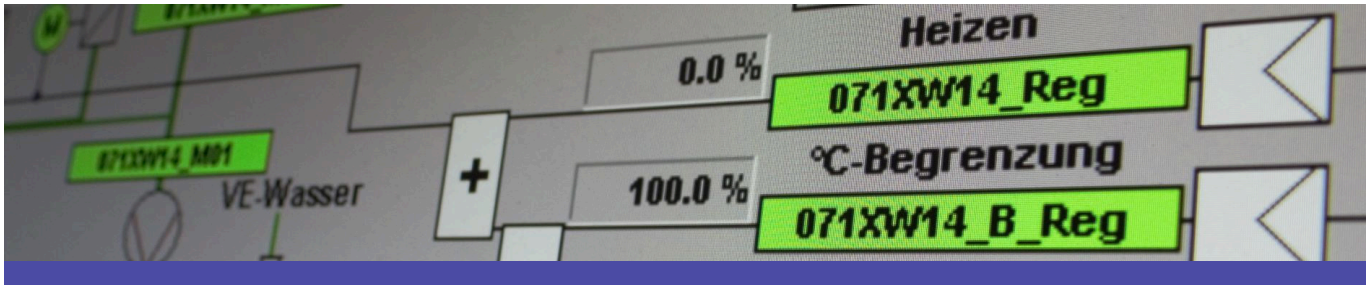
Solution

A resource and fault management system was developed with plant fault detection and reporting infrastructure. The system enabled supervisors to manage teams and assign tasks based on live operational data. A configurable mobile application provided staff with real-time access to fault information and enabled on-site documentation using photos, videos, annotations, and structured text. Task assignment and updates could be performed directly via the mobile interface, ensuring immediate reporting at the fault location. In parallel, a desktop application supported central resource planning and task allocation. Supervisors could monitor staff availability and activities. A dashboard displayed live team data, while built-in diagnostics delivered statistical analysis of recurring faults enabling data-driven improvement measures.

Results

The implementation of this system significantly improved maintenance efficiency and plant reliability. Faster fault identification and direct mobile access to live data reduced response times and overall downtime. Centralised task allocation enhanced transparency and simplified coordination of maintenance staff, replacing manual supervision processes. Real-time, standardised documentation at the fault location improved reporting quality and supported smoother shift handovers through consolidated task visibility. Integrated fault analytics enabled the identification of recurring issues and problematic plant areas, supporting targeted corrective measures. Overall, the solution transformed maintenance operations into a structured, data-driven process with measurable gains in operational performance.

SCADA QS Tool Mercedes-Benz AG



Problem

The maintenance department experienced increasing issues with supplier programming quality across PLC, HMI, and SCADA systems. Although Mercedes-Benz AG defined clear programming standards, delivered software frequently failed to comply with these requirements. Non-conformant PLC code resulted in functional inconsistencies, inefficient diagnostics, and recurring faults propagating into HMI and SCADA systems. Poor structural design, naming conventions, and interface handling created avoidable integration errors and extended commissioning times. The absence of a systematic compliance verification mechanism made it difficult to detect deviations early in the project lifecycle, leading to reactive troubleshooting, reduced system stability, and increased maintenance effort across production systems.

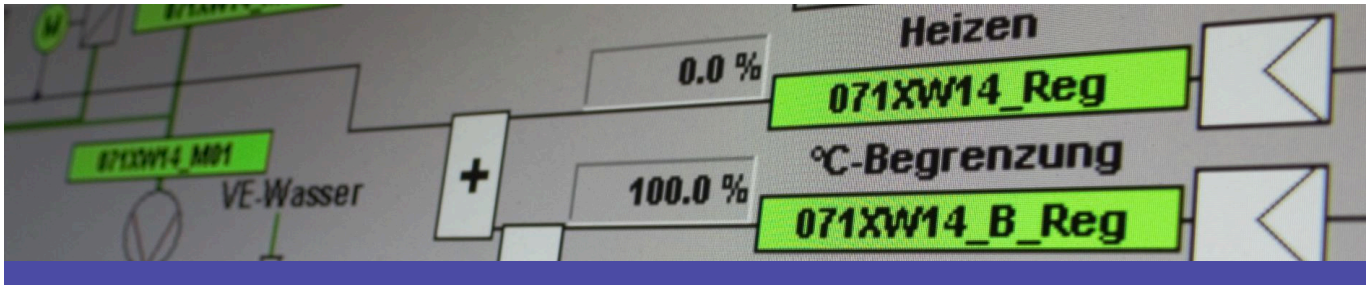
Solution

A Quality Assurance and Quality Control (QA) analysis tool was developed to verify PLC, HMI, and SCADA projects against the customer's defined programming standards. Standard compliance rules were embedded directly into the tool, enabling automated analysis of delivered software. The system identified non-conformities and referenced the affected PLC, HMI, or SCADA components to simplify root-cause evaluation. Results were presented in a tree view to provide clear visibility across system layers. The tool automatically generated detailed non-conformity reports, enabling structured communication with suppliers and supporting systematic corrective actions during development and commissioning phases.

Results

The implementation of the QA/QC tool significantly improved programming quality and reduced integration risks. Automated compliance checks enabled early detection of deviations before commissioning, preventing cascading errors from PLC logic into HMI and SCADA systems. Standardised reporting improved supplier accountability and accelerated corrective cycles. Maintenance teams benefited from more consistent system behaviour, improved diagnostics, and reduced troubleshooting time. By enforcing adherence to defined programming standards, the solution strengthened overall system stability, reduced operational disruptions, and ensured higher long-term reliability of production-critical automation systems.

HMI Toolsets
Mercedes-Benz AG



Problem

HMI development under the stringent corporate standards of Mercedes-Benz AG was time-intensive and error-prone, particularly due to the limitations of the proprietary HMI environment when creating complex graphical layouts such as building plans and large-scale process overviews. The native editor required manual creation of standard-compliant elements, significantly increasing engineering effort and introducing risk of inconsistency. Strict graphical and functional rules further complicated development. In addition, Tag configuration for Trending required a complex and multi-step procedure within the proprietary system, increasing the likelihood of configuration errors and reducing development efficiency. Overall, the HMI engineering process lacked automation, flexibility, and streamlined integration with modern graphical design tools.

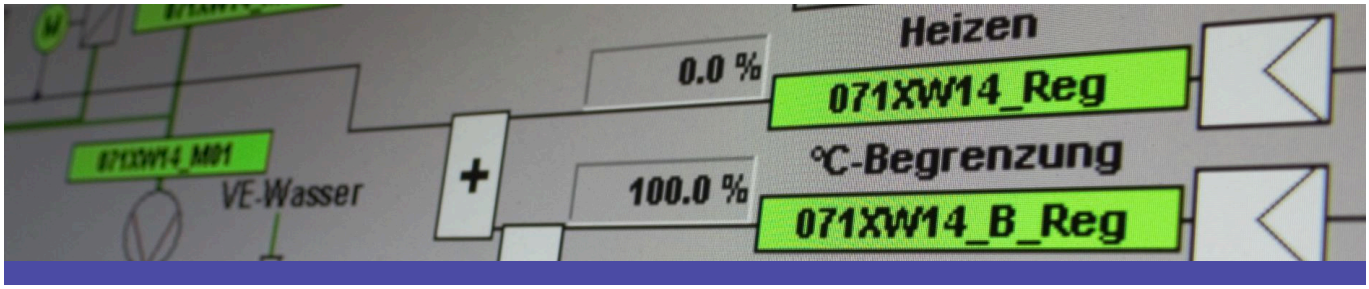
Solution

A dedicated engineering tool was developed to convert proprietary elements embedded in SVG graphics directly into the customer's HMI file format. This enabled the use of established SVG editors for the creation of complex graphics while maintaining full compliance with corporate standards. Tools automatically generated all required proprietary HMI files, including the necessary configuration files for Tag Trending. HMI definitions were parameterised using structured spreadsheet templates, allowing standardised configuration of graphics, templates, and data interfaces. This approach separated graphical design from system-specific implementation and introduced automation into previously manual and error-prone engineering tasks.

Results

The solution significantly reduced HMI development time and improved standard compliance. Complex graphics could be created efficiently using professional SVG editors without manually reconstructing standard elements within the proprietary system. Automated file generation eliminated repetitive configuration steps and minimised implementation errors. The use of centralised spreadsheets simplified project setup and ensured consistent parameterisation across applications. Tag Trending configuration became streamlined through automated generation of required files. Overall, the tool improved engineering productivity, reduced complexity, enhanced graphical quality, and ensured reliable adherence to corporate HMI standards across projects.

HMI High-Bay Car Storage
Dürr Systems AG



Problem

Dürr Systems AG commissioned us to develop the HMI for a high-bay car storage system for an automotive factory. The project represented one of the more complex HMI implementations due to the scale and dynamic behaviour of the storage system. Large parameter sets and extensive operational data had to be processed reliably, while complex graphical visualisations were required to represent storage bays, vehicle movements, and system states. The HMI also needed to manage dataset storage and retrieval, integrate diagnostic routines, and ensure stable performance under high system load. Efficient backend structuring and experienced implementation were critical to meeting operational and scalability requirements.

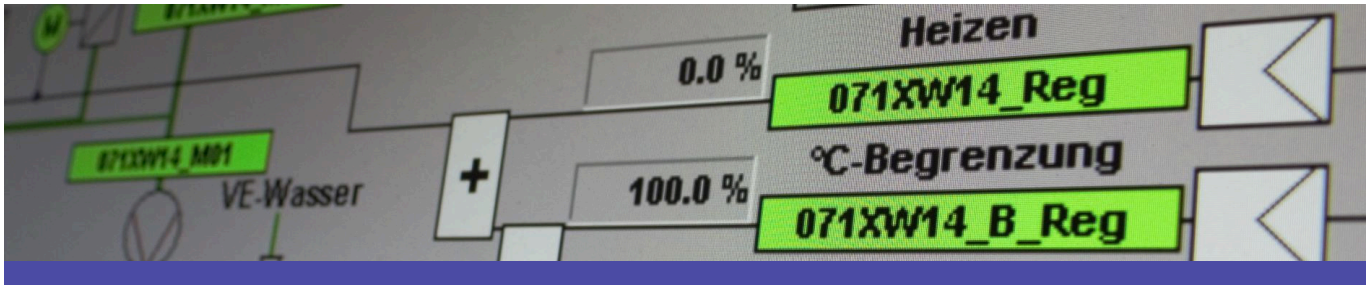
Solution

Our objective was to transfer the majority of system logic into the HMI backend to ensure performance, maintainability, and scalability. The implementation was based on the InTouch platform, with extensive use of scripting to manage data processing, control logic, and dynamic visualisation. Frontend data tags were primarily indirectly addressed through structured scripts, significantly reducing static tag complexity. This architecture enabled modular expansion and simplified parameter handling for large datasets. By separating presentation logic from core processing routines, the system achieved a scalable framework capable of accommodating future extensions of the high-bay storage infrastructure.

Results

The implemented HMI delivered stable and efficient operation despite the high data volume and graphical complexity. Backend-driven scripting reduced frontend dependency and improved maintainability while ensuring consistent system performance. The indirectly addressed tag architecture enabled seamless scalability when the physical storage capacity was expanded by increasing the number of car bays. Dataset handling and integrated diagnostics enhanced operational transparency and troubleshooting capabilities. Overall, the solution provided a robust, extensible HMI platform capable of supporting ongoing system growth while maintaining high reliability and structured system behaviour within the automated storage environment.

Integra SCADA Control System INEOS AG and Mercedes-Benz AG



Problem

Plants implementing the new Integra SCADA Standard required support with the migration of existing control systems and the subsequent expansion of new facilities. This included production systems in Hambach and Kecskemét, as well as building technology systems in Sindelfingen.

Over time, the Integra Standard required new functionality, especially in the area of KPI templates.

The increasing requirements resulting from the implementation of a new standard highlighted the need for Management Information Systems capable of processing and analysing data from PLCs through to the SCADA system, as well as supporting automation tools.

Solution

Building technology systems were implemented for more than 70 buildings, supporting the rollout and expansion of the Integra SCADA Standard across multiple sites.

KPI templates were developed to meet the evolving functional requirements of the standard.

In addition, numerous tools were created to support standardised engineering and Management Information Systems. These included a QA/QC analysis tool for SCADA compliance checks (see SCADA QA/QC Tool case study), log analysis tools and HMI automation tools (see HMI Toolset case study).

Results

The work supported the expanding requirements of the new Integra SCADA Standard across production and building technology environments. The implemented building technology systems and KPI templates helped ensure that new functional requirements could be applied consistently across multiple sites.

The additional MIS and engineering tools reduced manual effort, improved transparency across system data, and supported more structured analysis of logs and HMI and PLC configurations. This enabled more efficient implementation, validation, and expansion of systems aligned with the evolving standard.