CPC Engineering

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Products and Services Portfolio

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Proprietary Compressor Control and Protection Products

Engineering Services

Proprietary Products for Compressor Control and Protection

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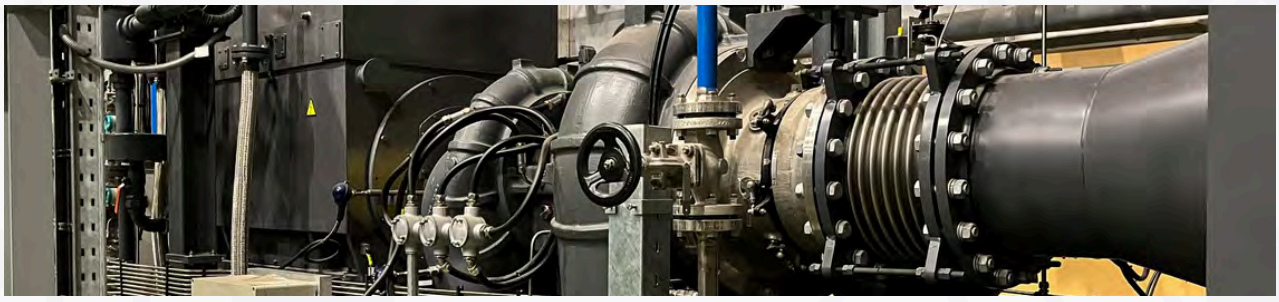
CPC Engineering Antisurge Package

CPC Engineering Antisurge Control Package is a comprehensive Solution designed to protect and maximize the operating efficiency of centrifugal and axial compressors.
This Solution consists of three independent systems that can be implemented individually or combined for **advanced compressor protection**. The three systems are:

- **Antisurge Control System** - ASC
- **Surge Detector System** - SD
- **Performance Controller System** - PRC

Main Objective

Ensure effective compressor protection and control, preventing surge events and improving operational stability through a modular control and protection system.



Main Features

- **Modular Protection:** Three integrated Solutions for surge event protection and detection, combined with effective operational control.
- **Continuous Monitoring:** Ultra-fast measurement cycles (<50ms) of compressor status and operating variables to ensure traceability and generate alarms when conditions fall outside the safe range.
- **Flexibility:** Algorithms can be implemented on any existing equipment, whether PLC or DCS, to reduce the number of devices and spare parts required.
- **Compatibility with Other Systems:** The modular architecture enables easy integration with other control systems, maximizing interoperability.
- **Operational Benefits:** Minimizes downtime, reduces the risk of mechanical failures, and maximizes compressor lifecycle, ensuring long-term sustainable production.

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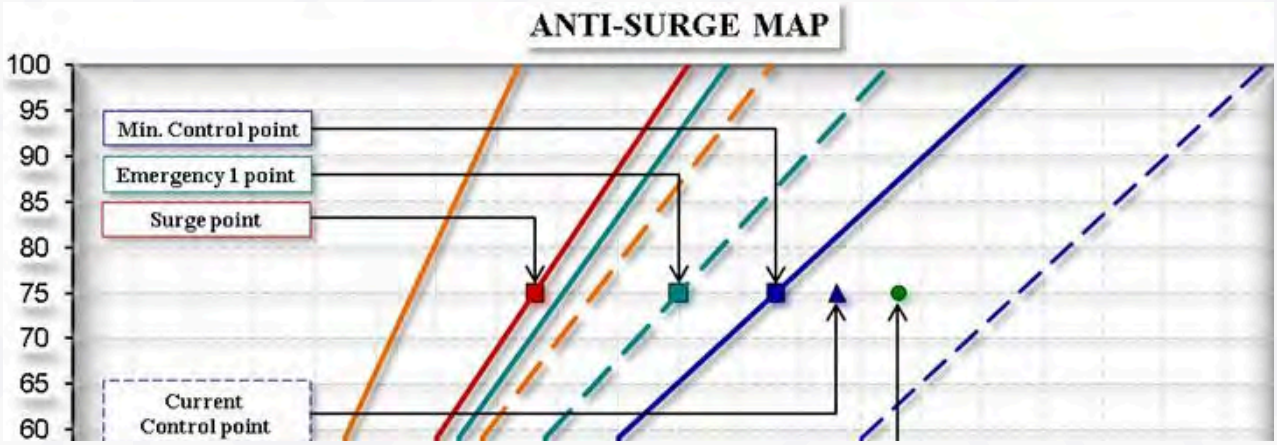
CPC Engineering Antisurge Package

Antisurge Control System - ASC

The Antisurge Control System - ASC is an **Advanced Solution** developed to maintain minimum flow in centrifugal and axial compressors.
Our Solution **combines robust control algorithms, reliable industrial hardware and a customized integration** with the existing automation system.

Main Objective

Prevent surge events through automatic and precise adjustment of the antisurge valve, keeping compressor operation within safe limits and minimizing operational risks.



Main Features

- **Compressor Protection:** Maintains a constant minimum flow, preventing fluctuations that could trigger surge.
- **Precise Control:** Utilizes advanced algorithms to prevent surge and progressively adjust the anti-surge valve.
- **Fast Variable Reading:** Acquires flow measurement readings with 100 ms cycle times.
- **Energy Optimization:** Fast and precise control helps minimize energy consumption by reducing safety margins.

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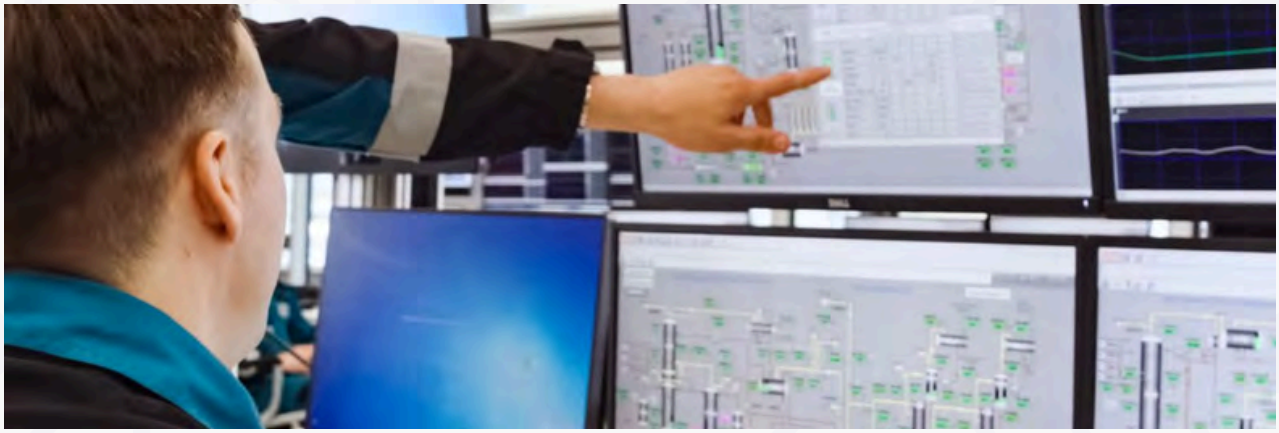
Surge Detector System - SD

Sometimes protection measures through controllers are not enough if it is not possible to mitigate the surge through actions on the protection valve.

The Surge Detector - SD is an advanced continuous monitoring system designed to detect surge events in centrifugal and axial compressors, taking ultimate action and alerting operating personnel to take action.

Main Objective

Monitor critical compressor parameters in real time, taking effective actions to avoid equipment damage.



Main Features

- **Continuous Monitoring:** Ultra-fast (50 ms) and constant reading of critical compressor variables (flow and current), ensuring early detection of surge events.
- **Preventive Alarms:** Automatic alerts are triggered when surge conditions are detected, allowing personnel to act before damage occurs.
- **Equipment Protection:** Minimizes the risk of mechanical failure through effective actions such as triggering solenoids or directly stopping the compressor.
- **Integration with ASC:** Works in conjunction with the Anti-Surge Control System (ASC) to ensure comprehensive compressor protection.

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Performance Controller System - PRC

The Performance Controller - PRC is an advanced control system developed by CPC Engineering, focused on optimizing compressor performance at any operating point.
Unlike the ASC, the PRC manages multiple operating parameters to maximize energy efficiency and process stability.

Main Objective

Optimize compressor performance by fine-tuning operating variables, maintaining process stability and avoiding critical conditions.

Main Features

- **Performance Optimization:** Adjusts valve alignment based on a Load parameter (% of total flow) to ensure optimal operation point tuning.
- **Integration with ASC:** Works jointly with the Anti-Surge Control (ASC) to prevent surge events while maintaining optimal compressor performance, allowing for reduced safety margins.
- **Plant Safety:** Integrates safety controllers to prevent overpressure or overcurrent scenarios that could endanger the installation.
- **Safe Startups and Shutdowns:** The load-based control concept allows for gradual integration into the process without overshooting or instability.

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CPC Controller Retrofit and Migration Package

Our CPC Compact Solution

Our **CPC Compact Solution** is a Solution designed to replace obsolete controllers, **guaranteeing a complete 1-to-1 migration of functionality** and full integration with the existing infrastructure, taking advantage of the volume occupied by the controllers to be replaced.

Main Objective

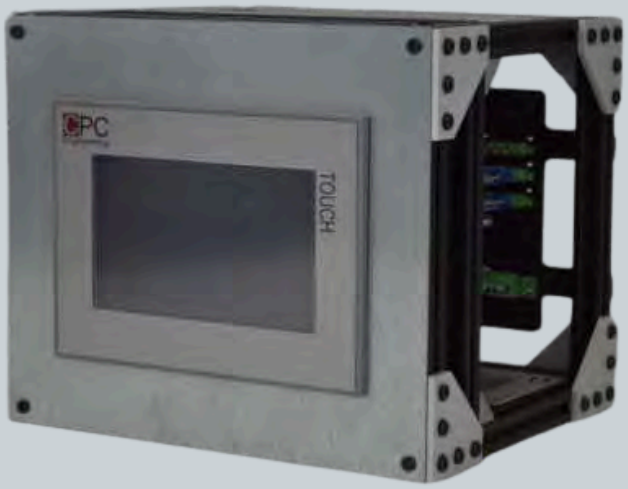
Modernize obsolete control systems through an efficient migration process that minimizes implementation times and ensures a smooth transition.

Main Features

- **Custom Mounting Structure:** Integration of PLC and HMI into a panel adapted to the original controller's space, ensuring a seamless installation.
- **Time and Cost Reduction:** Significant decrease in time and costs associated with migration, optimizing the entire process.
- **Supply**: Spare parts guaranteed for over 10 years.
- **Technological Upgrade:** Leverages the new functionalities of modern technology, including touch-screen HMI, adaptable communications, and remote access from engineering stations.
- **Advanced Compatibility:** Integration with OPC and embedded OPC, facilitating communication with any high-level system.
- **Operational Benefits:** Improved system availability and reduced risk of failures associated with obsolete hardware/software.

Before Migration

After Migration



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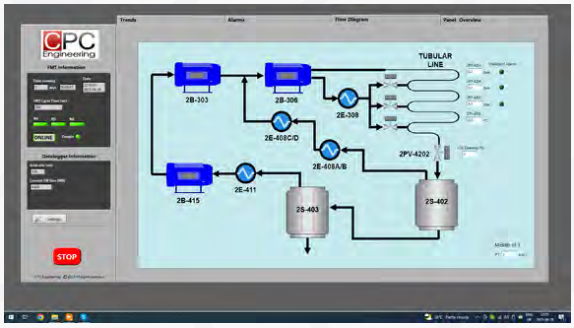
Equipment Monitoring Package - RMP

CPC Engineering's Equipment Monitoring Software - RMP **is an equipment monitoring Solution designed to run on any Windows-based computer or dedicated server**.

Main Objective

To provide a versatile and configurable tool for the visualization, logging, and facilitation of operational data analysis in industrial processes, both during testing phases and normal operation, ensuring accurate and centralized supervision.

Actual screenshot of the RMP



Actual screenshot of the RMP

Main Features

- **Comprehensive Monitoring:** Visualization and tracking of up to 80 variables organized into 10 groups, with capacity to store up to 500 variables.
- **Configurable Logging:** Data logging with customizable settings, allowing adaptation to the specific needs of each application.
- **Customizable Interface:** Configurable screen designs and diagrams for dynamic visualization of process status.
- **Alarm Management:** Integrated alarm panel system displaying all alarm and shutdown events on a single screen, including event history.
- **Ultra-Fast Readings:** With the ability to read process variables every 20ms, enabling precise causality analysis during event investigations.
- **Loop Tuning:** Tool includes graphical methods for loop tuning.
- **Hardware Independence:** Communication via OPC ensures compatibility with any control system in use.

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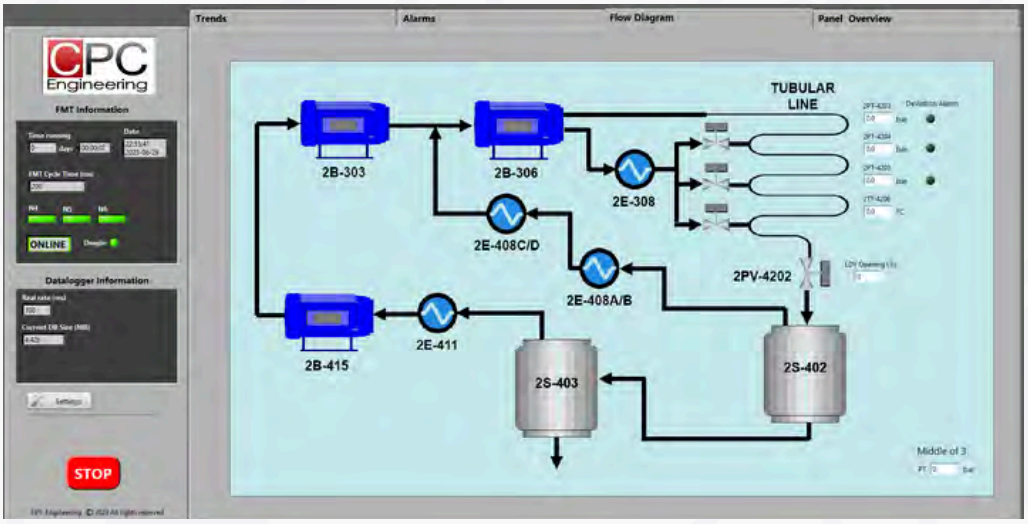
CPC Load Sharing Package

The Load Sharing Package is an Advanced Solution designed to **manage networks of compressors operating in parallel and unloading on a common line**, optimizing operation in processes with multiple generators and consumers in a coordinated manner.

Main Objective

To provide a versatile system that allows multiple compressors (Axial, Centrifugal, Positive Displacement, Screw, Blowers, etc) to be operated in parallel through a common master controller, ensuring centralized and synchronized control.



Main Features

- **Robustness and Versatility:** Efficiently manages compressors of different technologies, adapting to various gases and industrial applications.
- **Innovative Load Management:** Developed as an advanced system for effective load handling in compression networks, maximizing process performance and availability.
- **Performance Optimization:** Maintains precise load balancing among different compressors, reducing operating costs and enhancing system stability.
- **Comprehensive Management of Parallel Equipment:** Integrates not only compressors but also other parallel equipment that connects different pressure levels (let-down valves, throttling systems, etc.) under a single control entity, enabling centralized and simplified supervision.

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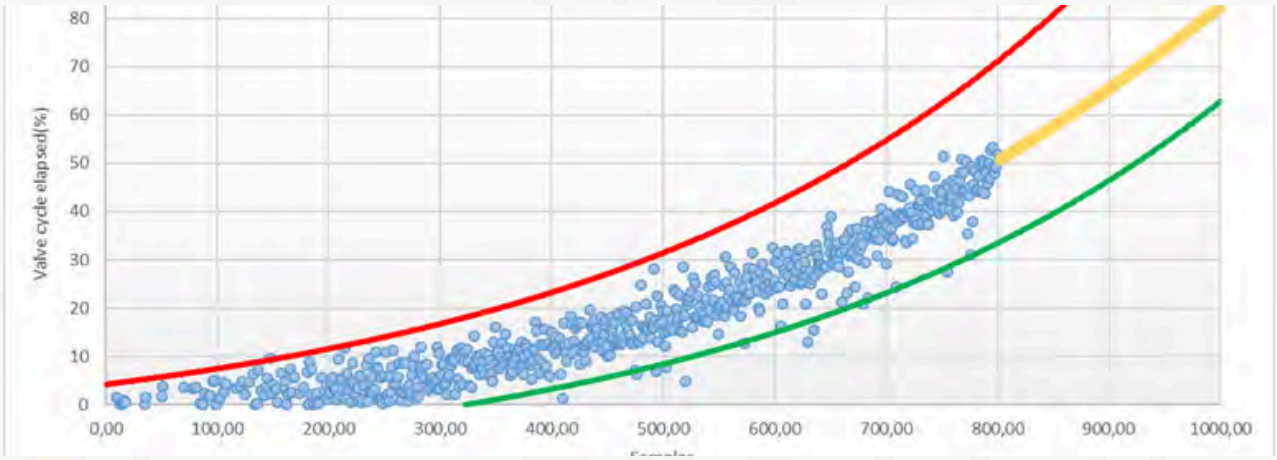
CPC Dynamic Process Simulation Package

The Dynamic Process Simulation Package is an Advanced Solution designed to accurately replicate the behavior of industrial processes, enabling comprehensive analysis and optimization of operations at various stages of the project life cycle.

Main Objective

To provide a versatile tool to validate, analyze and optimize complex industrial processes through accurate dynamic simulations.



Main Features

- **Process Modeling:** Enables improved control system design through an accurate representation of the process, including critical variables such as pressure, flow, and temperature.
- **Simplified Validation:** Allows system functionalities to be confirmed before plant implementation, reducing risks and errors.
- **Smooth Commissioning:** Prior validation accelerates the commissioning process, minimizing time to effective operation.
- **Safe Testing:** Enables safe examination of hazardous scenarios without compromising the integrity of the real system.
- **Process Optimization:** Identifies areas for operational improvement, minimizing risks and optimizing startup times.
- **Training and Skill Development:** Provides training in simulated scenarios without affecting real operations, ensuring effective knowledge transfer.

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CPC Blending Control Package

The Blending Control Package is an Advanced Solution designed to manage the mixing processes of base components and additives with precision, ensuring the quality of the final product, optimizing operational resources, and reducing remixing procedures.

Main Objective

Ensure simple recipe input, accurate mixing process and additive injection according to process specifications. This ensures a high quality end product without having to rework the mix.

Main Features

- **Flexibility and Adaptability:** Design based on standardized package units, adaptable to different blending configurations and easy integration with other control systems.
- **Bottleneck Identification:** Detection of the application flow rate of the most limiting component to ensure proportional input of the remaining components and additives.
- **Ullage Calculation:** Calculation at the beginning of the blending process with real-time checks of available tank volume to avoid limitations during mixing.
- **Pump Safety:** Efficient protection of pump groups through real-time flow monitoring between tanks.
- **Scalability and Expansion:** System prepared for future expansions or component and additive upgrades, ensuring a sustainable investment.
- **Intuitive Interface:** Centralized management with interface modules that facilitate process monitoring.

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CPC Slug Management Package

The Slug Management Package is an Advanced Solution designed to efficiently manage the liquid slugging phenomenon in offshore installations, optimizing the flow rate, use of available tank capacity and avoiding liquid saturation in receiving tanks.

Main Objective

When a sudden level variation is detected in inlet tanks, or when a slug event can be anticipated by operators, its purpose is to automatically redistribute the levels of condensate tanks, mitigating the effects of slugging and maintaining process stability in the platform's condensate system.

Main Features

- **Efficient Flow Management:** Automation of condensate redistribution based on the available ullage in each tank to prevent overloading and fluctuations.
- **Operational Optimization:** Reduction of the impact of slug events, minimizing downtime and improving system efficiency.
- **Adaptability to Critical Conditions:** Robust system designed to increase plant availability during severe slug events.
- **DCS Integration:** Development compatible with the most common DCS systems, enabling fast and effective implementation.

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Services

Engineering Services
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Project Supervision and Integration

In Project Supervision and Integration Services, CPC Engineering accompanies the client throughout the entire project lifecycle, providing senior instrumentation and control personnel to support project management tasks.

Main Objective

Coordinate and supervise each phase of the project to guarantee its correct execution and technical integration, ensuring quality, safety and compliance with deadlines.

Main Features

- **Comprehensive Supervision:** Complete project management from the FEED phase through commissioning, ensuring compliance with deadlines and specifications, including regulatory and client standards adherence.
- **Existing Functionality Analysis:** Thorough review of the current control system functionality and its interaction with auxiliary or higher-level systems.
- **Review of Generated Documentation:** Full review of all new documentation produced by the package unit manufacturer.
- **Document Integration:** Review of existing documentation to update lists, drawings, diagrams, and FDS matrices integrating the new control system.
- **FAT Testing Assistance:** On-site visits to the package unit manufacturer's facilities to verify implemented functionalities.
- **Process Optimization:** Identification of improvement opportunities in existing processes, enhancing process stability and operational efficiency.
- **Multidisciplinary Team Management:** Effective coordination of technical, operational, and engineering teams to ensure project execution aligned with objectives.

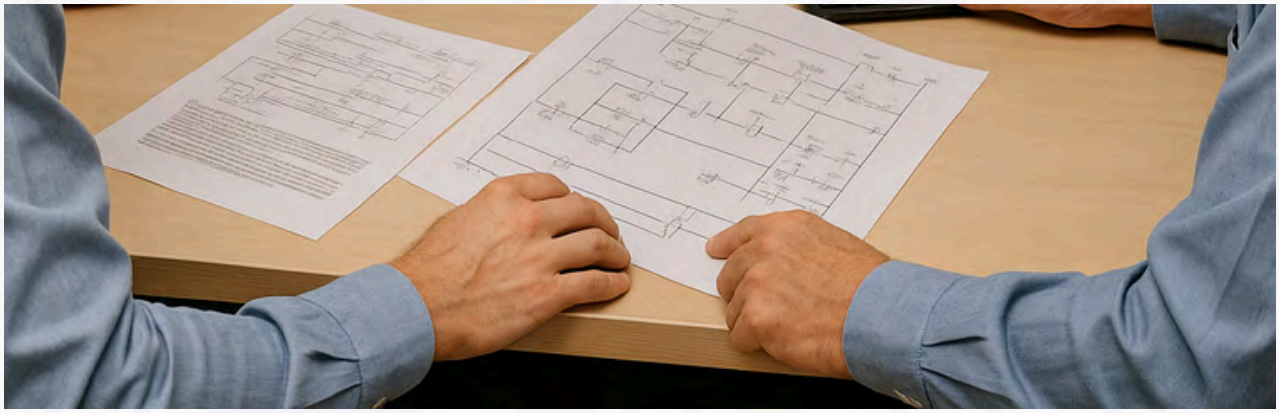
Engineering Services
CPC Engineering

Control Loop Tuning and Optimization

The CPC Engineering Control Loop Tuning and Optimization Service is **a Solution aimed at providing end-client support for the adjustment of all elements involved in a control loop** (instrumentation, valves, control structure, etc.).

Main Objective

Optimize control parameters (P, I, D) to ensure a fast and accurate system response, minimizing oscillations and stabilization times. Apply appropriate structures for each process and maximize the standardization of structures to facilitate maintenance tasks and problem resolution.



Main Features

- **Parameter Tuning:** We optimize PID loop parameters to improve response times and avoid unwanted interactions between controls.
- **Loop Linearization:** Implementation of characterizers and gain schedules to ensure consistent responses at different operating points.
- **Advanced Strategies:** Development of strategies such as split-range controls and feedforward systems to anticipate and correct deviations in systems with multiple valves involved.
- **Critical Event Management:** Application of algorithms and strategies to stabilize processes under variable or high-demand conditions depending on the application.
- **Integrability:** Implementation with the capability to integrate with existing control systems, enabling seamless deployment.
- **Multiplatform:** Loop and structure optimization is extendable to any DCS, PLC, or hybrid platform.

Engineering Services
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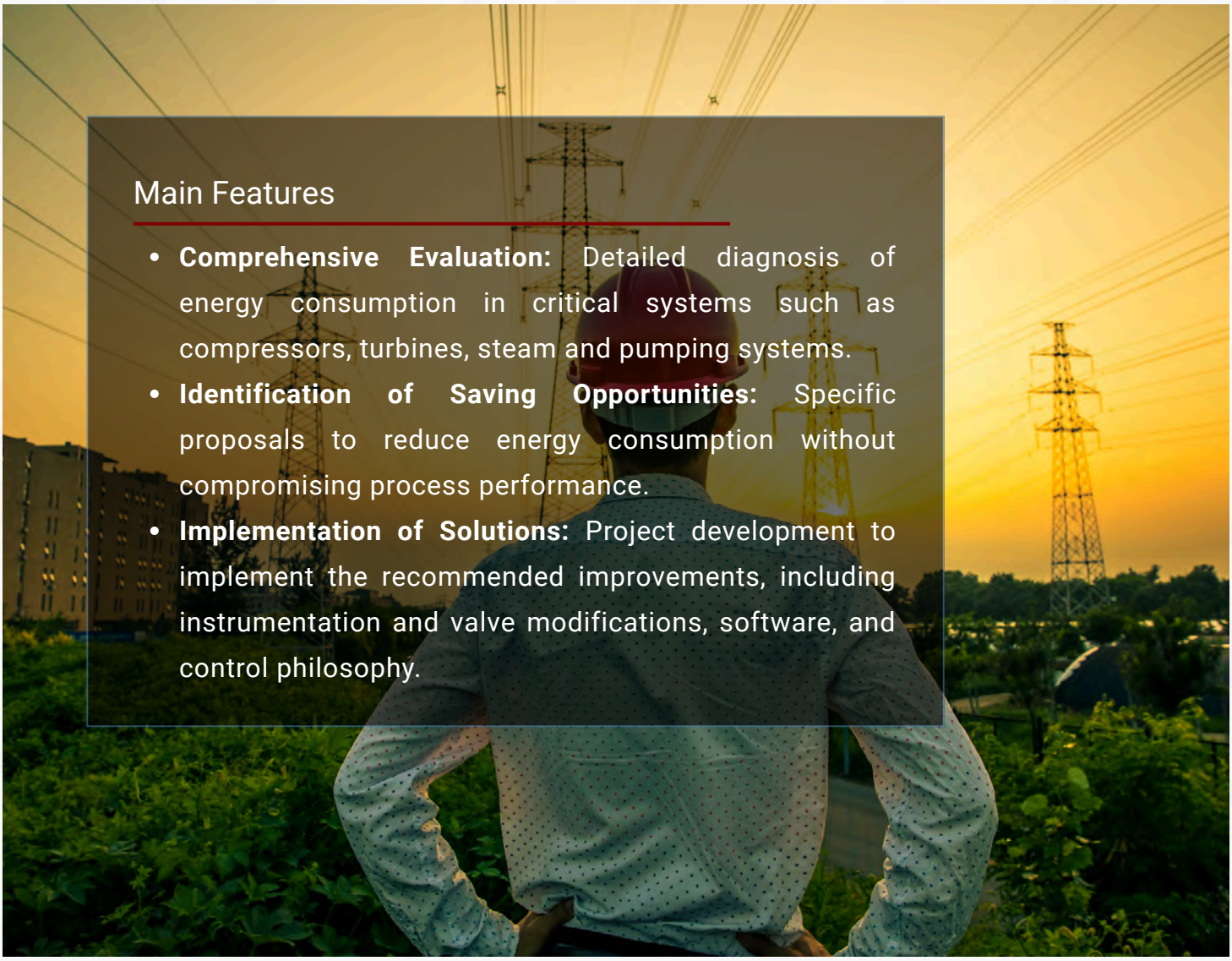
Energy Efficiency Audits and Analysis

The Energy Efficiency Audit and Analysis Service is a specialized service to evaluate the energy consumption of industrial processes, identify savings opportunities and propose solutions that maximize operational efficiency and minimize costs.

Main Objective

Optimize energy consumption through a thorough analysis of the different systems and processes, using datasheets of each involved equipment and historical data, identifying improvement areas and recommending tailored solutions.



Main Features

- **Comprehensive Evaluation:** Detailed diagnosis of energy consumption in critical systems such as compressors, turbines, steam and pumping systems.
- **Identification of Saving Opportunities:** Specific proposals to reduce energy consumption without compromising process performance.
- **Implementation of Solutions:** Project development to implement the recommended improvements, including instrumentation and valve modifications, software, and control philosophy.

Engineering Services
CPC Engineering

Energy Efficiency Analysis Phases

1. **Energy Audit Phase:** Initial assessment of energy consumption in all key systems.
2. **Solution Proposal Phase:** Identification of potential improvements and estimation of energy savings.
3. **Conceptual Development Phase:** Preliminary design of the proposed solutions, specifying the necessary changes.
4. **FEED Phase:** Feasibility study and project scope definition.
5. **Development Phase:** Detailed engineering and implementation planning.
6. **Construction Phase:** Execution of the necessary modifications in the field.
7. **Commissioning Phase:** Validation and testing of the implemented systems.
8. **Start-up Phase:** Commissioning of the optimized system and final parameter tuning.
9. **Training Phase:** Training of operating personnel on the new systems and control philosophies.
10. **Associated Documentation:** Issuance of technical reports, operating manuals, and "as-built" documentation.

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Control Solutions for FPSO Applications

CPC Engineering's Control Solutions for FPSO Applications optimize operational efficiency and process stability on floating production, storage and offloading platforms. These solutions encompass comprehensive process management covering the entire Topsides and Marine area, ensuring safe and cost-effective operation.

Main Objective

Maximize operational efficiency and process stability on FPSOs through initial tuning of control loops (Fresh Feed) and the implementation of tailored control solutions for each application.

Main Features

- **Comprehensive Control of Gas Lines:** Optimization of controls related to extracted gas, lift gas, and export/reinjection.
- **Comprehensive Control of Compressors and Compression Packages:** Optimization of controls related to LPGC, MPGC, HPGC, and/or GIC.
- **Comprehensive Control of Condensate Lines:** Optimization of receiving tanks, water removal, and depressurization up to storage.
- **Comprehensive Control of Water Lines:** Optimization of controls for package units such as lift pumps, water production units, and well water injection systems.
- **Comprehensive Control of Auxiliary Systems:** Optimization of controls related to cooling medium, steam production, fuel gas management, nitrogen, additives management, and flare lines.
- **Comprehensive Control of Water Removal in Gases:** Optimization of controls related to TEG or amine recovery.

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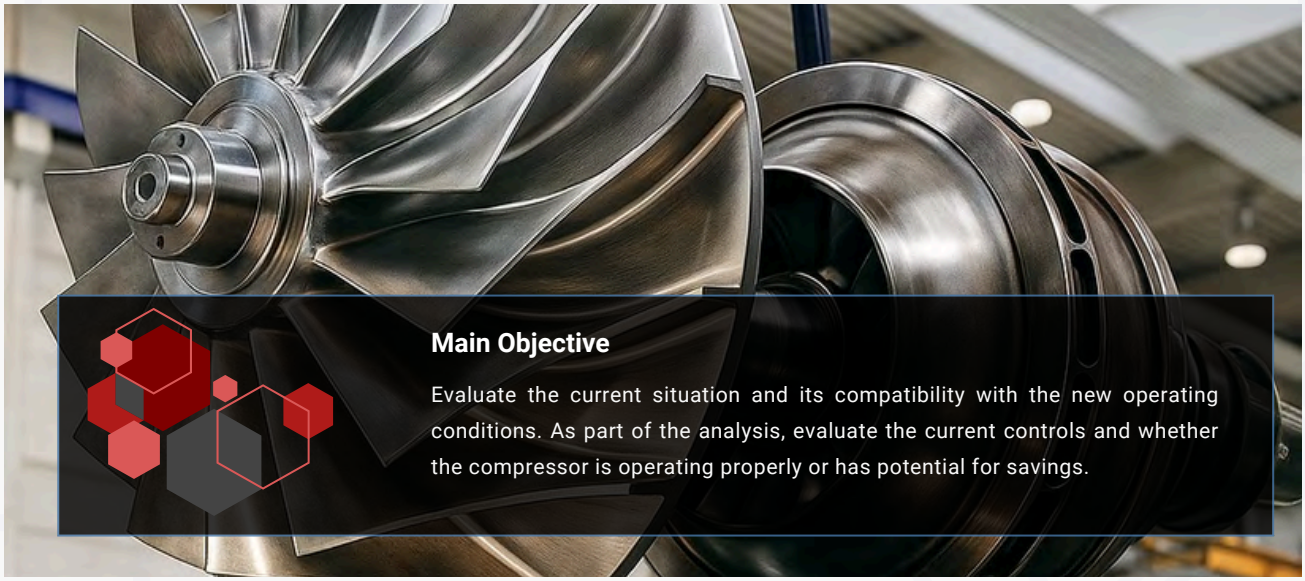
Compressor Operations Analysis

The Compressor Operations Analysis service by CPC Engineering aims to **support clients in evaluating compressors when changes are planned** in their operating points, during reconditioning tasks, modifications in the installation that may affect their operation, or in the equipment purchasing process.



Main Objective

Evaluate the current situation and its compatibility with the new operating conditions. As part of the analysis, evaluate the current controls and whether the compressor is operating properly or has potential for savings.

Main Features

- **Scope Evaluation:** Definition of the battery limit to which the study will be restricted.
- **Data Sheet Collection:** Gathering data sheets for the compressor, motor/turbine, valves, and instrumentation.
- **Operating Points Collection:** Obtaining operating points under different scenarios to verify and/or adjust the manufacturer's curves.
- **Control Systems Analysis:** Evaluation of existing controls and their allowed operating modes.
- **Model Construction:** Development of a steady-state mathematical model to assess the new operating point.
- **New Scenario Analysis:** Evaluation of the equipment's response in the new operating scenario, whether due to internal modifications or changes in the operating point.
- **Results Report Generation:** Preparation of a detailed report covering all study steps, conclusions, and recommendations for implementing proposed improvements.

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Advanced Regulatory Process Control Solutions

CPC Engineering's Advanced Regulatory Process Control Service is **designed to optimize complex industrial processes by managing multiple variables and simultaneous interactions** involving production and consumption of compressible fluids.
The key to managing complex applications and processes encompasses:

- **Instrument and Plant Air Systems:** Comprised of compressed air networks arranged in line or ring configurations.
- **Steam Management:** Analysis of steam production by process or boilers, efficient control of steam generation/consumption, and definition of strategies for efficient production.
- **Gas Compression Networks:** Series, parallel, or mixed configurations applying advanced algorithms to enhance process stability, efficiency, and controllability.

Flexibility, Scalability and Expansion

Its design allows a flexible use of the existing installation allowing:

- Flexible Use of Equipment Comprising the Installation.
- Priority Use of More Efficient Equipment or Those Utilizing Residual Energies.
- Depreciated Use of Older Equipment or That Requires Extra Resources.
- Allows Future Technological Integrations or System Expansions.

Technical Support and Recruitment

- Possibility to Contract Hour Packages for Maintenance Support with Specialized Technical Assistance.
- Training of Operational Staff to Maximize the Use of Advanced Control Systems.

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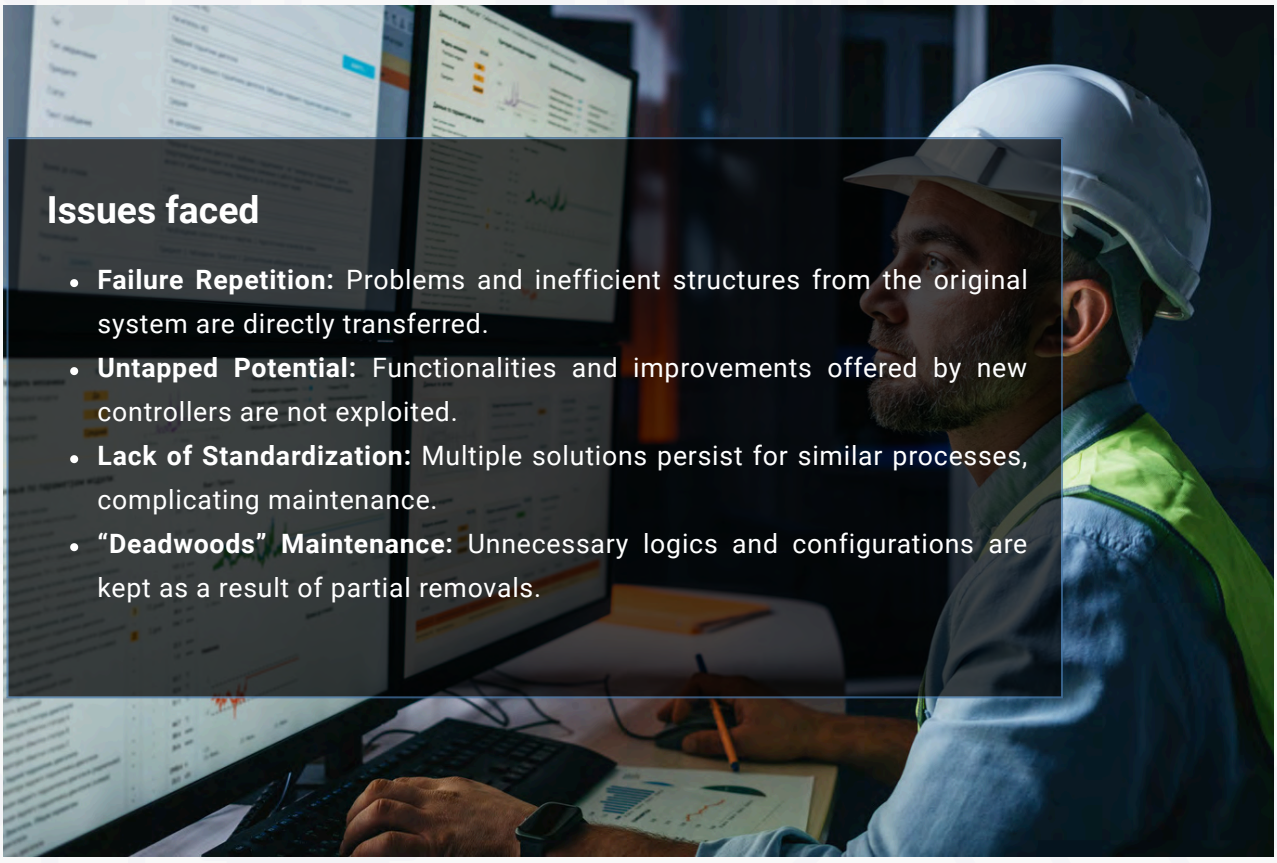
DCS System Migration Services

DCS Migration services, often from obsolete controllers to new ranges from the same manufacturer, is usually performed by a direct translation of existing logics. This 1-to-1 approach, while seemingly straightforward, presents significant problems that limit the potential of the new technology.



Issues faced

- **Failure Repetition:** Problems and inefficient structures from the original system are directly transferred.
- **Untapped Potential:** Functionalities and improvements offered by new controllers are not exploited.
- **Lack of Standardization:** Multiple solutions persist for similar processes, complicating maintenance.
- **"Deadwoods" Maintenance:** Unnecessary logics and configurations are kept as a result of partial removals.

At CPC Engineering, we support the DCS Migration through a detailed analysis of the structures to be implemented:

- **Comprehensive Architecture Review:** We adapt the control structure to optimize its performance according to the type of process.
- **New DCS Functionality Analysis:** We ensure maximum utilization of the advantages offered by the new platform.
- **Structure Standardization:** We implement uniform solutions for identical processes, simplifying operation and maintenance.
- **"Deadwoods" Analysis and Removal:** We identify and remove obsolete and unnecessary logics and configurations.

Engineering Services
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Maintenance contract for our products

CPC Engineering's Product and Service Maintenance Contracts are designed to ensure operational continuity and maximum efficiency of the implemented systems, covering both preventive and corrective maintenance of equipment and integrated solutions.

Main Objective

Ensure the optimal operation of the implemented systems, minimizing downtime and extending the useful life of the equipment through structured maintenance.

Main Features

- **24/7 Customer Support:** Specialized assistance to resolve doubts, faults, or breakdowns in implemented products.
- **Preventive Maintenance:** Periodic inspection of equipment and systems to prevent operational failures and ensure optimal performance.
- **Corrective Maintenance:** Rapid resolution of faults and breakdowns, minimizing operational impact and ensuring process continuity.
- **Updates and Optimization:** Implementation of technological improvements and updates to keep systems aligned with the latest innovations.
- **Documentation and Reporting:** Delivery of detailed technical reports on equipment status and actions taken during maintenance.

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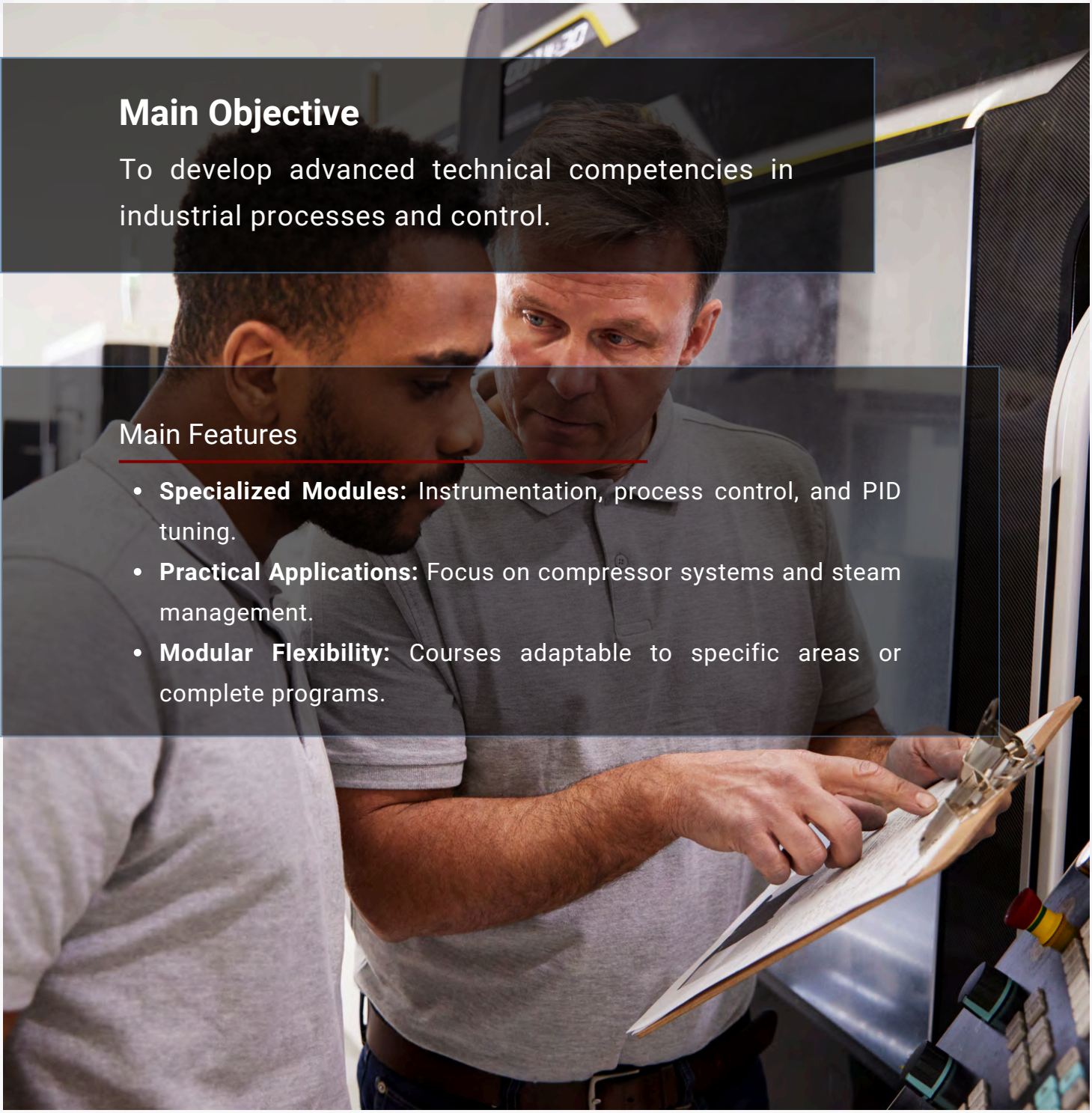
Training in Process and Control Courses

CPC Engineering's Process and Control Training Courses are **designed to train professionals in advanced process control techniques**, ranging from the fundamentals to specific industrial applications.



Main Objective

To develop advanced technical competencies in industrial processes and control.

Main Features

- **Specialized Modules:** Instrumentation, process control, and PID tuning.
- **Practical Applications:** Focus on compressor systems and steam management.
- **Modular Flexibility:** Courses adaptable to specific areas or complete programs.

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Thanks for your time

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