# TURBOMACHINERY CONTROL FOR EFFICIENT, SAFE, AND RELIABLE OPERATIONS.

# TABLE OF CONTENTS


3 Introduction

4 Today's Operating Demands

5 Need for Turbomachinery

6 Importance of Control Performance

7 Challenges for End Users

8 How Can Honeywell Help?

9 Implement Proven Technology

10 Deploy an Integrated Platform

11 Put the Solution to Work

12 Benefits to Plant Operators

13 Conclusion

# INTRODUCTION



**Around the world, utilities and industrial companies must find ways to increase plant availability and get the most out of assets, while also dealing with smaller workforces and lower budgets. Plant safety and productivity depend on turbomachinery performance; failures and unplanned outages with this equipment can result in lost production and costly repairs.**

For many decades, turbomachinery controls companies have manufactured their own proprietary controllers to handle the millisecond changes required for demanding compressor and turbine control applications. This technology was difficult to interface with other system components and challenging to repair or upgrade. As the systems aged and parts became obsolete, performance could become compromised, limiting the view of plant personnel into the process and machinery.

The utility industry and other industrial fields are now moving away from the monopoly of "proprietary black box" providers in favor of innovative solutions that enable plant operators to understand and maintain a single, integrated control solution, as opposed to several disparate systems.

Today's turbomachinery control technology for turbine governor and anti-surge applications provides faster system response, higher availability, and full standardization. Systems like Honeywell's Experion® PKS Turbomachinery Control Solution allow end users to increase asset reliability, improve energy efficiency, and enhance machine safety by changing how turbines, compressors, generators and other equipment are managed with process automation systems to address crucial operational challenges.

# TODAY'S OPERATING DEMANDS



> **In today's demanding environment, with increased operational costs, limited on-site resources, and strict regulatory requirements, industrial organizations are seeking to improve reliability, efficiency, and safety within their facility.**

The way in which industrial companies operate and manage equipment assets has changed a lot over the years. There has been an ongoing evolution in thinking about performance, reliability and safety, and the resulting technological investments to optimize plant operations.

Industrial organizations of all sizes require solutions to:

- Integrate controls for boilers, turbines, generators, and compressors
- Improve coordination among various plant and equipment subsystems
- Implement a common operator interface for the entire plant
- Extend their ROI from existing control platforms
- Ensure effective and consolidated data reporting and archiving

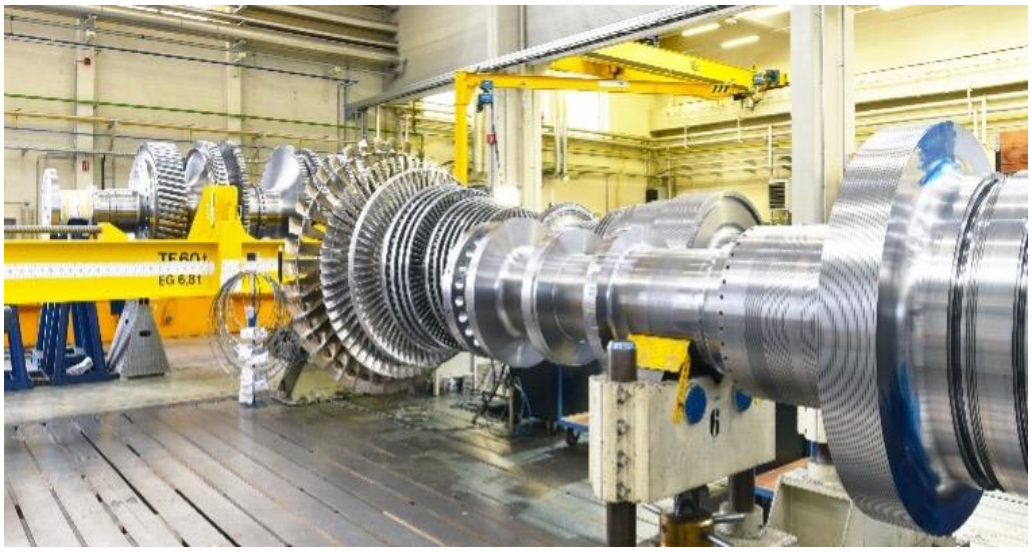
Rotating equipment in process industry facilities is frequently managed as a separate asset from the adjacent processes and automation strategies. The control strategies for this equipment are often obscured by suppliers, which makes integration both difficult and time-consuming. Increasingly, the industry is moving toward increased visibility of all plant equipment.

# NEED FOR TURBOMACHINERY



**Around the world, every oil refinery, chemical plant, pulp & paper mill, steel mill and utility site employs turbomachinery. The operators of this critical equipment are faced with ever-increasing demands with regards to efficiency, emissions, and performance.**

Turbomachinery plays a key role in many aspects of the global industrial sector. It is commonly used in the field of power generation and is an important component of the process industries.



The applications for turbomachinery typically found in the plant environment include:

- Steam turbines in industrial and utility power plants
- Steam turbines driving auxiliaries equipment such as blowers, pumps, fans, and compressors
- Hydro turbines
- Heavy Industrial gas turbines
- Centrifugal and Axial compressors
- Expander turbines

For example, steam turbines in oil refineries drive centrifugal compressors in the various process units. The typical operations are the Fluid Catalytic Cracking (FCC) unit, which includes the wet gas compressor and plant main air blower; the hydrotreater, which includes the hydrogen recycle; and the Alkylation (Alky) unit, which includes the refrigeration compressor. All of these compressors can be driven by either a steam turbine or electric motor and, in some cases, even by a heavy industrial gas turbine or turboexpanders. Steam turbines and compressors are also employed in chemical industry operations such as Olefins and Ammonia plants. Olefins units commonly utilize Propylene, Polypropylene, Ethylene and Polyethylene compressor trains.

# IMPORTANCE OF CONTROL PERFORMANCE



> **In process and power industry facilities, turbomachinery control solutions are required to address turbine governor and compressor surge conditions while preventing over-speed and surge events in various plant equipment and processing units.**

Throughout the process industries, precise control of turbomachinery is needed to maximize the life value from installed assets and ensure safety and compliance in plant operations.

Common requirements include:

- Governor control to maintain normal operational speed while preventing over-speed conditions, which can result in catastrophic machine speeds
- Turbine temperature control to ensure turbines are brought up to normal operating conditions
- Surge protection for operating machinery to remain within the surge safety line
- Load control to balance work between compressors for optimal efficiency
- Sequencing of valves and motors to enable safe startup and shutdown
- Protection functions to address instances when critical parameters exceed safe ranges
- Standard operating interface to manage alarms and variables

# CHALLENGES FOR END USERS



> **For end users of plant turbomachinery, the proprietary black box technology commonly employed for turbine and compressor controls can present challenges in terms of operational effectiveness and availability, asset support and maintenance, and total cost of ownership.**

For many types of industrial operations, the time has come to replace black boxes and obsolete, proprietary turbomachinery equipment and control systems.

Although purpose-built solutions are widely used in turbomachinery applications, their disadvantages include:

- Difficulty in interfacing with other control system components
- Problems with repairs due to technology obsolescence
- Costly and disruptive upgrades in a “rip and replace” scenario
- Limitation of the view into the process and machinery
- Dedicated spare parts requirement
- Need for specialized training for plant workers

A growing number of utility and industrial companies are seeking to deploy a unified control platform delivering boiler control, balance of plant control, turbine control and protection, compressor automation, compressor anti-surge and protection, and general plant and safety controls from a single platform. They also require a modernized solution offering custom displays and faceplates for ease of process monitoring and enhanced operator effectiveness.

# HOW CAN HONEYWELL HELP?



> **For almost 20 years, Honeywell has leveraged its global industrial automation domain expertise to provide customers with advanced turbomachinery controls based on the open, familiar, and easily maintained Experion® PKS platform.**

With Honeywell's completely integrated solution for turbomachinery control, utility and industrial companies can achieve improved control performance and better information visualization and asset condition monitoring, as well as establishing a seamless interface with process control and information systems.

Honeywell's holistic approach has key advantages for plant operating companies:

- Offers superior alternative to purpose-built proprietary turbine and compressor control solutions
- Includes unique integration capabilities for turbomachinery applications requiring very fast response times
- Eliminates risk of obsolescence due to easy migration path to the latest technology

Honeywell has Master Services Agreements with several best-in-class turbomachinery application engineering partners to leverage their independent expertise in turbomachinery control, in order to offer complete solutions to customers.

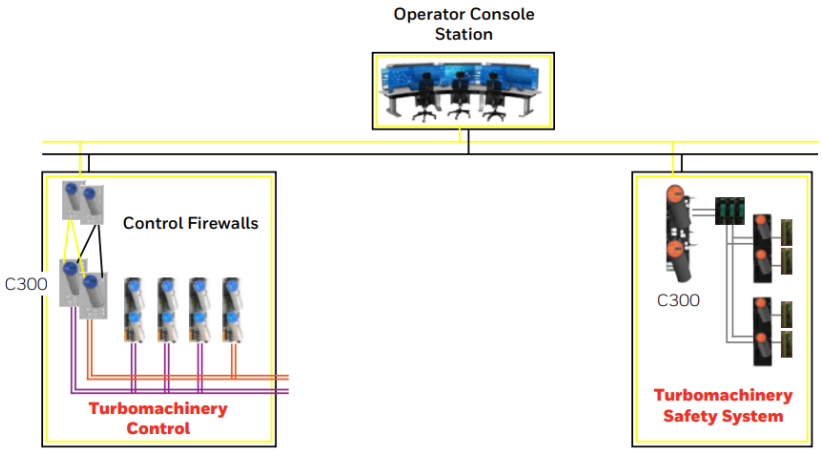
# IMPLEMENT PROVEN TECHNOLOGY

9

**Unlike generic Distributed Control System (DCS) or Programmable Logic Controller (PLC)-based solutions, Honeywell's Experion PKS Turbomachinery Control Solution is purpose-designed and embedded within an advanced and highly capable industrial control system.**

Experience has shown that proprietary turbomachinery control solutions can make life more difficult for end users in several ways. They require maintenance technicians to learn and service a wider range of systems or outsource maintenance to multiple vendors. In addition, operators have to learn and work with different Human-Machine Interfaces (HMIs), and companies must purchase and manage more spare parts.

**HONEYWELL TURBOMACHINERY CONTROL ARCHITECTURE**




With Honeywell's proven control technology, industrial firms can:

- Implement regulatory control while meeting the demands of the API-670/IEC-61508 standards
- Ensure optimized production and reliability along with simplified system operations and support
- Achieve the benefits of a specialized control package without the large footprint or high cost

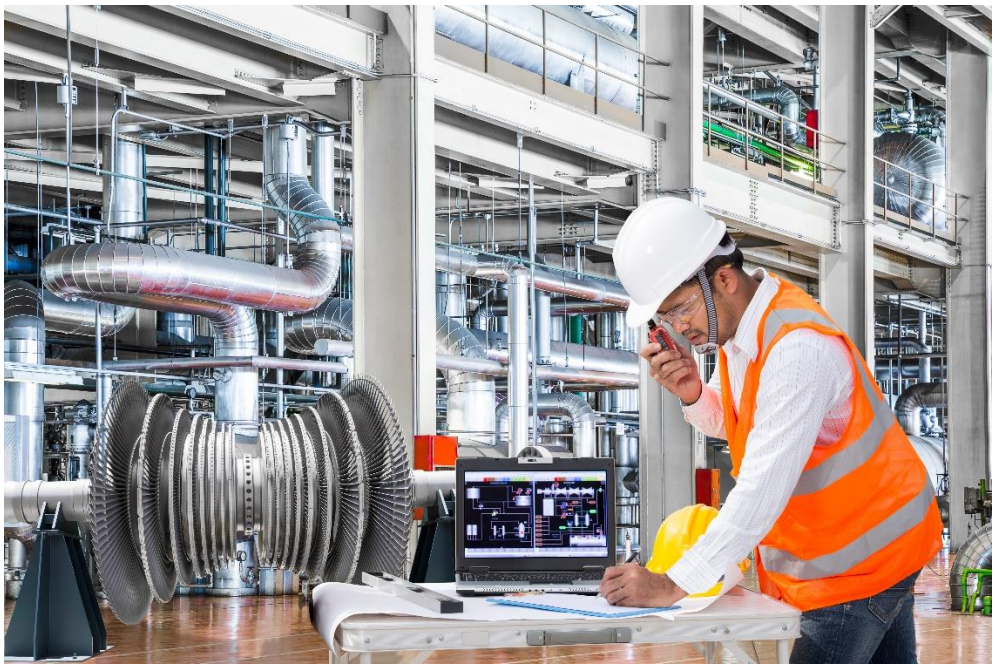
The Experion PKS Turbomachinery Control Solution is specifically designed for control environments requiring very fast response times. Multiple versions of the solution are available for different applications, including utility steam turbines, industrial steam turbines, heavy industrial gas turbines, hydroelectric turbines, and compressors (centrifugal and axial)

# DEPLOY AN INTEGRATED PLATFORM

10

**Incorporating Honeywell's innovative technologies, the Experion PKS Turbomachinery Control Solution includes all the key components and sub-systems needed to provide a complete, integrated platform for turbomachinery control applications.**

Industrial and utility facility owners can avoid black box challenges by relying on a single, qualified vendor to combine advanced turbomachinery control functionality into an integrated solution using open-architecture, industry-standard technology.



Honeywell's Experion PKS Turbomachinery Control Solution is comprised of:

- **C300 controller** running at 20 mS, utilizing the Control Execution Environment (CEE), and supporting full controller and I/O redundancy
- **Safety Manager S300 safety system** built to shut down turbines and/or compressors and offering TÜV SIL3, ISA Secure certification and tight Experion integration
- **Speed Protection Module (SPM)** accepting four speed inputs and providing independent speed control and initial over-speed protection
- **Servo Valve Positioning Module (SVPM)** providing fast performance for closed-loop valve positioning
- **Universal I/O module** featuring reduced IOTA size, accepting 4-channel pulse inputs with a single HART modem per channel, and including 32 configurable channels for AI/AO/DI/DO

The Experion PKS Turbomachinery Control Solution employs Honeywell's robust C300 controller and Series C I/O modules, which are designed specifically for turbomachinery control. The solution provides direct interfacing with field devices such as magnetic speed probes, and linear variable differential transformer, without the need for proprietary hardware or signal converters. As such, it eliminates the reliance on traditional black box controllers. Integration with the Experion system provides unified control and a common set of engineering and maintenance tools for ease of use and a reduced need for training.

# PUT THE SOLUTION TO WORK



> **The Experion PKS Turbomachinery Control Solution has the dedicated controller and specialized I/O to handle field devices found on turbine generators and turbine-driven compressor trains such as speed probes, valve feedback, and outputs to servo valves.**

By deploying the tightly integrated Experion PKS Turbomachinery Control Solution, utilities and other industrial firms can take advantage of common spare parts, common I/O, and common operating systems with their native DCS.

Rather than impose the high cost and inflexibility of a proprietary system, Honeywell's solution is designed to:

- Ensure tighter control over the speed range of the steam, hydro, and gas turbines while ensuring the protection of the turbine in the event of an over-speed condition
- Perform load balancing between compressors or generators for more efficient use of resources
- Allow signals to be brought directly into the control system without the need for signal conditioners and additional excitation power supplies
- Enable controllers to track closer to the speed control to maintain mega-watts
- Allow controllers to track closer to the surge curve for better compressor efficiency resulting in better energy savings

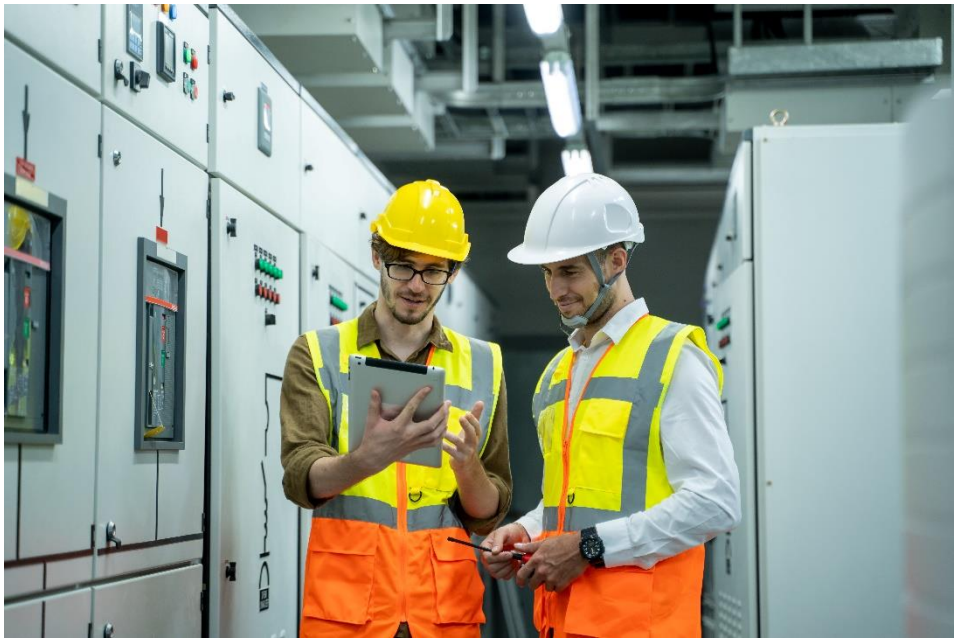
With the Experion PKS Turbomachinery Control Solution, utilities and industrial facilities benefit from an open control solution that delivers turbine control, compressor automation, compressor surge protection, and general plant and safety controls — all on a single, unified platform.

# BENEFITS TO PLANT OPERATORS



**With Honeywell's approach to turbomachinery controls, power companies and other end users can realize valuable benefits from a fully integrated turbine/generator, turbine/compressor, or boiler/turbine control solution that makes their operations more efficient, reliable, and cost-effective.**

Honeywell is recognized for providing the next generation of technology enabling reliable, high-quality control for industrial turbomachinery applications.



There are numerous benefits associated with Honeywell's control solution:

- Enables better coordination among various plant subsystems
- Provides a common operator interface for the entire plant
- Improves ROI from existing Experion PKS technology investments
- Allows for self-sufficient support in a familiar system environment
- Incorporates a common hardware and software platform
- Allows for a common pool of maintenance spares
- Ensures effective and consolidated data reporting and archiving

Unlike other solutions, such as the gas/steam turbine control or compressor control systems provided by Proprietary Black Box turbine or compressor solutions, the turbomachinery control applications provided by Honeywell can be seamlessly paired with an existing Experion DCS. The solution makes specialized training for operations and maintenance personnel unnecessary and does away with the need to stock specialized spares.

# CONCLUSION



**As demonstrated by customers around the world, Honeywell's Experion PKS Turbomachinery Control Solution expands the view of both critical and non-critical plant equipment and improves ROI by having all turbomachinery controls located on a common platform for improved control, historization, maintenance and safety.**

By using the Experion PKS Turbomachinery Control Solution, end users throughout the utility and process industries gain a robust, tightly integrated control capability that will optimize control and visibility into plant assets. It will also maximize their automation technology investment by having all their turbomachinery controls based on the best-in-class Experion PKS platform.

As a global automation leader, Honeywell can help customers plan their technology roadmap and stay current with the latest solutions. Furthermore, our turnkey project capabilities deliver the successful outcomes they need.

**Honeywell Process Solutions**

2101 CityWest Blvd, Houston, TX 77042

Honeywell House, Arlington Business Park
Bracknell, Berkshire, England RG12 1EB UK

Shanghai City Centre, 100 Zunyi Road
Shanghai, China 200051

*Experion® is a registered trademark of Honeywell International Inc. All other trademarks are the property of their respective owners.*

**WP-21-15-ENG**
**Copyright © 2021**
**Honeywell International Inc.**

THE FUTURE IS WHAT WE MAKE IT

Honeywell