Introduction
Since 2002 Honeywell has been providing Turbomachinery controls to our customers on the Experion® PKS platform, meeting basic and advanced control requirements in the Refining, Pulp & Paper, Oil & Gas and the process industries. The control platform has since evolved whereby Experion® today is a powerful and attractive alternative to proprietary OEM and purpose-built Black Box turbine and compressor control solutions.

From the beginning the Experion® PKS Turbomachinery Control Solution was designed and built specifically to meet the unique and demanding requirements of Turbomachinery equipment. Experion® PKS Turbomachinery Control Solution can today be found on hydroelectric turbines, utility grade gas and steam turbines, and gas and steam turbine-driven mechanical loads such as centrifugal compressor trains. Not only is Experion® controlling the turbines, but it also handles all turbine, generator, and compressor auxiliaries as well as the balance of plant controls in a single easy to use, easy to maintain system. Some systems are even controlling turbines remotely from a central location.

Turbomachinery Control Solution
Experion® Turbomachinery Control Solution (TCS) has a dedicated controller and specialized I/O to handle the application-specific field devices found on turbines including speed probes, valve feedback from rotational or linear differential transformers and outputs to servo valves. This specialized I/O is designed for signal conditioning requirements only found on Turbomachinery equipment. With Experion® PKS Series C I/O, SPM and Servo Valve Positioning Modules, these signals can be brought directly into the control system without the need and cost for separate signal converters and additional excitation power supplies.

SPM
Experion® SPM (Speed Protection or Surge Prevention Module) performs two different functions depending upon its use for Turbomachinery control. SPM performs protection of the turbine via the speed inputs which are then voted upon for over-speed protection. SPM can also performs surge prevention (anti-surge) by utilizing the high-speed scanning of the SPM on-board I/O. This high-speed processing of all the on-board I/O is unlike our standard Series C I/O. The SPM has a mix of analog inputs and outputs, digital inputs and outputs, and speed probe inputs. The SPM module includes (4) speed / pulse inputs, (8) analog inputs, (1) analog output, (8) digital inputs, and (5) digital outputs. The on-board (4) speed inputs can use both active and / or passive probes. This module also performs a 2oo3 voting logic of the speed inputs to protect the turbine from an over-speed event while the additional inputs and outputs are for equipment monitoring and interlocking. Wire terminations are made on the Input / Output Termination Assembly (IOTA) which can handle redundant SPM modules for increased control availability and safety.

Servo Valve Positioning Module
Experion® Servo Valve Positioning Module (SVPM), like the SPM has high speed processing of the on-board I/O. This I/O includes (2) analog inputs, (2) digital inputs, (2) analog outputs, and (2) Linear/Rotational Variable Differential Transformer (LVDT/RVDT) inputs. Signals from the valve positioning LVDT/RVDT inputs and the servo valve outputs can be connected directly to the SVPM without the need for signal conditioners thus eliminating a point of failure. The SVPM on-board PID algorithm allows precise positioning of the turbine valves which in turn allows precise speed control of the turbine. Wires are terminated on the Input/Output Termination Assembly (IOTA) which handles
redundant SVPM modules for increased control availability and safety.

**Integrated Speed and Anti-surge Compressor Control**

This application of Experion® PKS utilizes the Turbomachinery Control Solution for the control of steam turbine driven centrifugal compressor train control. Whether your application is a single or multi-valve steam turbine configuration driving a single or multi-stage multi-body compressor train, Experion can handle your application. The totally integrated Experion PKS solution combines turbine speed control, compressor anti-surge control and performance control into a single control system. Experion provides operators with all the information they need without having to logging into another system to view data not available on the DCS.

From start/stop commands to compressor curves, from steam valve calibration to testing of the trip systems, all the information operations and maintenance personnel need is available at the click of a button.

Turbine speed is important and prevention of an over-speed condition of the turbine is as vital to the application as is the prevention of reverse flow into the compressor (compressor surge). As process conditions change Experion provides real-time displays of the turbine parameters and compressor maps available from Experion making operator decision making process easier and faster.

Experion PKS is a totally integrated turbine and compressor control solution in a single easy to use, easy to maintain system. Operators can readily access the information they need via Experion displays without the distraction of multiple control systems.

**Turbine Control Features**

Honeywell’s Turbomachinery Control Solution addresses two broad functional categories: turbine regulation and turbine protection. In addition to the standard requirement of fuel control and electronic over-speed protection, the following functionalities are included:

- Speed and load control mode of operation
- Automatic turbine startup and shutdown sequence
- Turbine stress evaluator
- Online testing of valves and trip devices
- Load sharing and unit islanding operation
- Frequency correction for generated load
- Automatic synchronization

**Automatic Turbine Startup and Shutdown Sequences**

The automatic turbine startup sequence (ATS) is developed to roll the turbine from barring speed to synchronization with minimum or no operator intervention. The startup sequence takes care of minimum acceleration requirements to avoid critical speeds and other safety criteria during turbine rolling. Similarly the automatic shutdown sequence is developed for safe coasting down of the turbine after tripping/shutdown. These sequences can be run in automatic, semiautomatic or operator guided mode. Customized graphics are provided to support proper operation and monitoring of these sequences.

**Example Experion ATS**

**Compressor Control Features**

Honeywell’s Turbomachinery Control Solution provides complete compressor train control while addressing two functional categories: Compressor control and compressor surge prevention. In addition to the standard requirements of compressor control and compressor protection, the following functionalities are included:

- Surge Detection
- Anti-surge Control
- Unit / Station Control
- Pressure and Load Control
- Initial and Limit Pressure Control
- Automatic Compressor Startup and Shutdown Sequencing
Operator Stations and Local Operator Panel (LCP)
Operational views to the process are an absolute must. With Experion® those views can be configured in a variety of ways from sophisticated displays on Console Stations or Flex Stations to simple push buttons and indicators on a Local Control Panel (LCP).

Graphics on these stations can present a variety of information to the operator. From controller faceplates to trending of the process variables and recycle valve position, all are available via Experion.

Benefits
Honeywell’s Experion PKS Turbomachinery Control Solution provides a totally integrated turbine and balance of plant controls solution on a single control system platform. Customer benefits include:

- Integrated Turbine / Compressor Control
- Automatic Turbine / Compressor Start-up and Shut Down
- Better Coordination of various plant subsystems
- Common hardware / software platforms
- Common pool of maintenance spares
- Common engineering, diagnostic, and documentation tools
- Common operator interface for the entire plant
- Ease of operation and training
- Effective and consolidated data reporting and archiving
- Online Testing of valves and trip devices
- Over-speed Protection
- Turbine Interlocks

The Experion PKS Turbomachinery Control Solution facilitates the complete, effective and seamless integration of turbine and/or generator control functions and eliminates the need for proprietary “black box” solutions. The control performance and cost and efficiency improvements enabled by Experion result in enhanced Return on Investment for your operation.

For More Information
Learn more about how Honeywell’s Solutions visit our website www.honeywellprocess.com or contact your Honeywell account manager.

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