



# **SERVING THE** **LNG SUPPLY CHAIN**

**Honeywell**

# INTEGRATING YOUR BUSINESS WITH THE MARKET

The ability to respond to changing markets and growing spot markets for natural gas requires responsive systems that link your production capacity to market information.

To meet this need, Honeywell offers a wide range of service capabilities—including full business consulting and integration of your information and financial systems with production. For new LNG projects, such as regasification terminals or liquefaction plants, significant benefits can be captured by an early delivery of IT systems in parallel with plant facilities.

## AUTOMATION AND INTEGRATED BUSINESS SOLUTIONS FOR YOUR ENTIRE BUSINESS

- Liquefaction plants
- LNG carriers
- Import and regasification terminals

## BENEFITS MEET REQUIREMENTS FOR YOUR BUSINESS SUCCESS



### RELIABILITY

producing and on-time delivery of the promised, contracted amounts of gas



### SAFETY AND RISK MANAGEMENT

keeping your facilities operating safely and efficiently



### MAXIMIZED CAPITAL RETURN

optimizing uptime and production



### COST MANAGEMENT AND COST AVOIDANCE

maximizing operating margins against pre-negotiated gas contracts



### ENHANCED PROFITABILITY

capitalizing on opportunities for improving margins and return on investments in support of corporate objectives



### ENVIRONMENTAL COMPLIANCE

being a good corporate citizen and avoiding noncompliance penalties



### SECURITY

protecting human resources, operating assets, and product



### BUSINESS PROCESS IMPROVEMENT

understanding required work process changes and planning support system modifications required to keep pace with the shifting business environment

# HONEYWELL OFFERS THE LNG EXPERTISE AND COMMITMENT YOUR BUSINESS REQUIRES

The global need for cleaner energy has resulted in a growing demand for natural gas as the fuel of choice. As a participant in this expanding and vital industry, your company faces many complex challenges.

Honeywell, as the leading supplier of comprehensive Automation and Integrated Business Solutions for LNG, has a long and successful history of serving the industry and stands ready to help you meet these challenges. Our Process Knowledge Solutions™ tie the key elements of your business together to achieve maximum effectiveness and performance. Our solutions integrate production, processing, and transportation operations, and link them with security,

safety, commercial, regulatory, and environmental functions. As a result, you can improve productivity, lower operating costs, capitalize on key business opportunities, improve asset utilization, and boost profitability across the spectrum of your LNG operations.

Working with our customers for over 100 years, and LNG customers for over 30 years, Honeywell has developed unique expertise that qualifies us to be your supplier for all of your LNG projects—whether

they are greenfield, expansion, or modernization. Our experience bridges the entire automation and information scope of supply. We can effectively handle each stage of your project, and we will support you during operation. Our global presence, with unmatched engineering and service resources, means we can go with you wherever your business takes you.

## NATURAL GAS SUPPLY CHAIN



GAS PRODUCTION



GAS PROCESSING &  
EXPORT



GAS TRANSPORT



GAS IMPORT



GAS POWER (IPPS)

# LIQUEFACTION PLANTS

Experion PKS offers complete distributed control system (DCS) functionality with fully redundant controllers—ensuring consistent reliability for your LNG plant processes. It delivers the rock-solid robustness for which Honeywell is famous.



## Reliable, efficient plant processes

Honeywell's state-of-the-art Experion PKS™ Process Knowledge System™ provides automation and monitoring of all LNG plant processes with superior performance and reliability. The system incorporates proven process control technologies, advanced measurement and fieldbus technologies, digital video, plant-wide historian, advanced control, business applications, and full communications that include local wireless, satellite, and Internet.

Experion PKS offers complete distributed control system (DCS) functionality with fully redundant controllers—ensuring consistent reliability for your LNG plant processes. It delivers the rock-solid robustness for which Honeywell is famous.

## Instant visibility for understanding your LNG business

Honeywell's Integrated Business Solutions provide you with the operating and business systems, as well as the supporting computing and networking infrastructure, that are necessary for your LNG business to run efficiently and profitably.

All required business and information management systems (ERP, MIS, SCM), as well as major packaged subsystems, can be specified and deployed by Honeywell. Examples of integrated subsystems include:

- Compressors and turbo-expanders
- Turbo-generators
- Turbines
- LNG transfer pumps
- Custody transfer
- Tank gauging
- Marine export loading arms.

Operating and business information generated by these systems and subsystems can be accessed worldwide using secure Internet access. And Honeywell's business solutions have the same high-quality user training and lifecycle support for which Honeywell's automation and control systems are famous.

## Realizing improved profit opportunities

Honeywell Profit® Suite advanced process control (APC) and optimization provides an important opportunity for maximizing profitability. Application of APC and optimization can improve your LNG plant's performance in the stabilization, fractionation, CO2 removal, and liquefaction units. With these improvements, plant throughput can be increased by as much as 2-to-3 percent.

Additionally, advanced control can further contribute to your plant's profits by increasing sulfur recovery with current capital equipment, optimizing the composition of fractionated products subject to market conditions, and maximizing the volume and value of co-produced gas liquids.



### **Integrated safety, fire/gas protection, and plant security**

Honeywell solutions provide for seamless integration of emergency shutdown, fire and gas, and security subsystems with the plant production control system—giving the operator a unified view while avoiding multiple system displays.

The solutions provide operators with the best tools for preventing abnormal situations and for enabling best responses to changing conditions. In addition, the unification of these systems results in a lower overall cost of ownership (implementation, maintenance, training, and support).

Honeywell's field-proven Fail Safe Controller (FSC®) safety system features unique quadruple-redundant CPU and diagnostic technology. When connected with Experion PKS, multiple FSC safety systems at different locations are unified into single-system architecture. The integration delivers required measurements with reduced instrumentation, while adding to increased operator understanding during critical times—improving response time and minimizing the chance for operator error.

Honeywell's Enterprise Building Integrator® (EBI) provides comprehensive gas leak detection, fire and smoke alerts, access control and security surveillance, plus support for appropriate response actions. The security system includes video monitoring, access control, and perimeter protection.

### **Optimum liquefaction unit performance**

Honeywell Profit Suite advanced process controls optimize processes—tracking disturbances and pushing constraints better than the best operator, 24 hours a day, by making simultaneous de-coupled moves sooner and more often.

For example, the light and heavy refrigerant component flows affect the circulating refrigerant composition as well as the compressor power that is required, and they are adjusted to track ambient disturbances. In most plants without APC, the standard cascade control is not enabled because the interactions make manual adjustments very difficult, while APC avoids that problem.

### **Minimizing energy use with multiple units**

For each LNG train, the differences in efficiency versus throughput at a particular time provide an opportunity for energy savings. At a given throughput, energy consumption can be minimized by optimally sharing the production across the trains.

Even in plants that are normally in maximum throughput mode, there are instances—for example, at tank tops—when this kind of optimization is of benefit.

Use of Honeywell's on-line optimizer for setting the throughput for each train—based on an optimized model of all the trains—is useful for two reasons. First, it ensures that the models are being continually updated from plant data. Second, significant benefits can be lost while waiting for a manual update to the optimum. The models used can be based either on data regressions corrected for known relationships or on the first-principles, steady-state model developed for unit optimization.



### **Reliable, efficient instrumentation**

Honeywell smart field instruments provide high reliability and accuracy for improved performance and asset availability.

Honeywell can also help you realize significant cost savings through instrumentation rationalization—reducing the number of instruments, the frequency of failures, and related maintenance costs. For example, duplicate, redundant measurements are often required to support non-integrated systems such as emergency shutdown and process control systems. Integration of these types of subsystems with the Experion PKS system allows elimination of unnecessary measurements.

### **Abnormal situation avoidance**

Honeywell offers a series of Operator Effectiveness and Abnormal Situation Management® (ASM®) solutions that significantly improve operators' ability to detect developing problems early, enabling rapid implementation of corrective action in order to avoid incidents or to minimize their impact.

Additionally, Honeywell's Shadow Plant® dynamic simulation adds significant incident-avoidance protection. Shadow Plant is the industry's most comprehensive dynamic simulation software, providing superior operator training on Honeywell regulatory and logic control, advanced process control, and plant information systems. It is also the most widely used plant-training simulator.

By providing a mirror of plant processes, the simulator enables operators to practice handling normal operations as well as process malfunctions. Honeywell provides custom training programs that include student monitoring and operator certification. Besides operator training, Shadow Plant is also ideally suited for other uses such as validation of plant design, verification of control configuration, and testing "What If" scenarios by engineers and operators.

### **Optimized maintenance**

Honeywell Equipment Health Management (EHM) solutions help optimize equipment maintenance by detecting emerging problems at an early stage and alerting the

appropriate maintenance personnel for corrective action. As a result, maintenance resources can be focused on priority activities where they have the greatest benefit—maximizing the availability of plant assets and lowering maintenance costs.

The DocuMint® maintenance documentation solution automates calibration, test, and documentation procedures—ensuring traceable, efficient documentation of all plant and field equipment, and optimizing maintenance costs.

Additional maintenance offerings include:

- Mobile PKS,™ which provides remote access from handheld devices via wireless communication
- Service programs, such as LifeCycle Management, Solution Enhancement Support Program (SESP), Migration and Support Services, and Parts Management
- Full-scale computerized maintenance management systems (CMMS), including business process reviews, implementation, and project management.

### **Improved visibility for more effective decision making**

Companies making and implementing effective, timely business decisions are also the companies gaining the competitive advantage. To achieve this level of decision making in your organization, you need increased visibility to information in your LNG plant as well as across the supply chain. Honeywell provides precisely that kind of improvement-enabling visibility through:

- Business.FLEX PKS solutions that unify supply chain planning with business and production automation
- Uniformance® database system that integrates all business applications and functions
- Workcenter PKS™ data visualization application that uses the Internet to facilitate information sharing and collaboration across your company and with key partners.

### **Cost reduction and performance improvement**

Automation master planning is one of the best opportunities for cost reduction and performance improvement. Master plans are developed following detailed studies by Honeywell experts of virtually every element of your LNG operation. They present recommendations for improvement in the areas of process control, advanced process control opportunities, instrumentation, information technology, control room layout, and staffing recommendations.

### **Complying with environmental regulations**

Honeywell's PAI Cirrus™ environmental management applications integrate with the plant automation system to ensure regulatory compliance and risk reduction. They provide data acquisition and handling to meet real-time monitoring, record keeping, and reporting requirements for facilities operating under a variety of air emissions permits.

**HONEYWELL'S PAI CIRRUS™ ENVIRONMENTAL MANAGEMENT APPLICATIONS INTEGRATE WITH THE PLANT AUTOMATION SYSTEM TO ENSURE REGULATORY COMPLIANCE AND RISK REDUCTION.**



# LNG CARRIERS

Keeping gas in its liquid state below  $-161.5^{\circ}\text{C}$  demands a great deal of the onboard automation system. Safety and monitoring of the cargo are paramount, so the system must be highly effective and reliable.



Shipboard automation system requirements include:

- Ultra-high availability
- Ship-wide human interface and access to information
- Approval by shipping regulatory boards
- Alarm scanning within two seconds and high-speed sequence of events
- Built-in ship-wide history
- Intrinsic safety
- Time synchronization
- Subsystem integration
- Optimized scheduling of offloading
- Complete information systems including Internet links to other enterprise systems
- Access security and monitoring solutions

Honeywell offers a comprehensive Integrated Automation Solution for LNG carriers that fulfills these requirements, and incorporates the same or similar technologies provided for LNG plants. The solution is designed around the marine industry's stringent safety and reliability requirements. It is technically and economically efficient, and it provides the advantage of single-source supply to both the carrier owner and the shipyard.

The Honeywell solution delivers full capabilities including seamless integration of third-party packages, including:

- Machinery control
- Ship loading and unloading, cargo management
- Custody transfer
- Boil-off gas and fuel management
- Ballast management
- Ship's clock
- Extension alarm panels.

The solution provides an open, industrial-strength ship-wide intranet that links supervisory and advanced applications. It connects to user desktop PCs—providing access to information throughout the ship.

Solution components have been rigorously tested and approved by the class authorities for use on LNG carriers, and the Honeywell system is field proven. Over 1,000 ships rely on Honeywell automation solutions.

Honeywell provides extensive global marine support including design and engineering, installation, and maintenance. We have trained technical service personnel, as well as replacement parts, available around the world. We can provide at-sea technical support via satellite phone link and remote diagnostics, dramatically reducing response and resolution times. We also offer sea trial support, and service of third-party instruments and systems.



# IMPORT AND REGASIFICATION TERMINALS

As part of a profitable natural gas supply chain, terminals used for unloading and regasifying LNG also require advanced automation and integrated business solutions to operate effectively.

Terminal business objectives focus on safely meeting contract schedule commitments with a stable natural gas supply and capturing available spot-market sales opportunities, all while maintaining low production costs. Accomplishing these objectives requires:

- Minimum terminal development cost with fast startup
- Minimum turnaround time for carriers
- Stable vaporizer and send-out control for varying LNG grades
- Minimum energy use
- Complete integrated business and information management solutions
- Safety for personnel, equipment, and the environment
- Security of the facility
- Minimum manning
- Minimum lifecycle costs of terminal assets
- Expandability.

Honeywell provides an advanced automation and integrated business solution for serving these business objectives and operational requirements. It integrates for LNG terminals the technologies applied to LNG plants and carriers, and major packaged subsystems such as:

- Unloading arm units
- Submerged combustion vaporizers (SMV)
- Compressors
- Seawater intake pumps
- Fire fighting pumps
- Gas metering system
- Tank gauging system.

The solution enables simultaneous carrier unloading and gas send-out operations, with gas send out normally being continuous. Under normal circumstances, the operations are fully automatic with programmed starting/stopping and sequence control, as well as remote monitoring—including digital video capability. Local manual action is required only for non-routine functions such as planned and non-planned downtime.

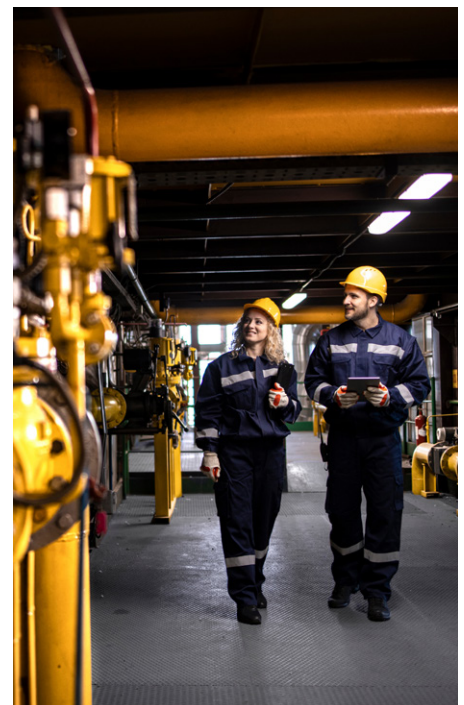
Equipment is optimized for gas demand, based on gas demand forecasting. Safety provision includes comprehensive gas leak detection, fire, and security systems.

Security features include allowing only authorized personnel and vehicles inside the terminal, ensuring correct products and quantities are received, and monitoring all stock movements. Accurate data on terminal operations can be available

and maintained at any desired location for access on demand and for reporting requirements.

Data can be automatically exchanged with ERP systems.

Honeywell's solution also includes business integration consulting and implementation services, and software supply from both Honeywell and third parties. This comprehensive integration capability links up demand forecasting, gas nominations, gas trading operations, and risk management—enabling maximum terminal operational flexibility.



# TEAM WITH THE LEADER IN LNG AUTOMATION SOLUTIONS

Successfully integrating your LNG supply chain operations into a cohesive, information-driven operation requires a teaming relationship with a supplier that intimately understands your business goals, challenges, and process requirements.

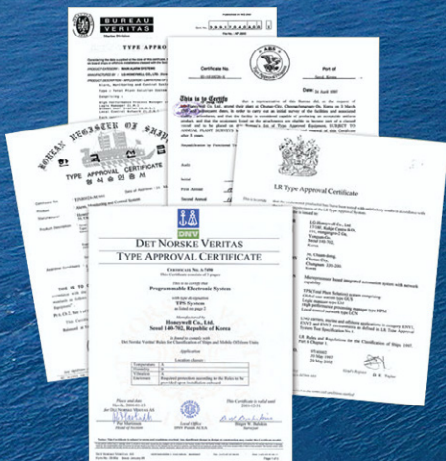
As a result of our more than 30 years

LNG experience, plus the application of Six Sigma Plus processes, we employ tools and project methodologies designed to enable project completion faster and ensure your success.

Our technical experts and solution consultants are deployed globally, all employing the same proven methodologies. We can help you locate, prioritize, and exploit opportunities that can most quickly increase your efficiencies, competitiveness, and profitability. And our life-cycle services ensure continuous improvement and ongoing realization of benefits.

Choose the supplier with the experience, the presence, and the vision to optimize your LNG operations today

and bring you the technological advances of the future. Choose the solutions that create substantial results—helping your planners, engineers, operators, and managers perform effectively and improve the measurable profitability and productivity of your business. Choose Honeywell.





**For more information**

[pmt.honeywell.com/us/en/solutions/Ing](http://pmt.honeywell.com/us/en/solutions/Ing)

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