



**Honeywell's Solution
for LNG Vessels**

Integrated automation systems for LNG vessels.

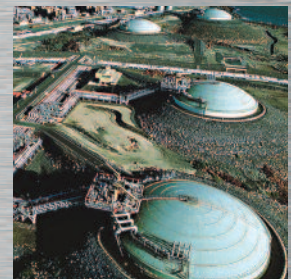
Honeywell is the leading supplier of Integrated Automation Systems (IAS) for LNG carriers and new generation, flexible LNG vessels.



Honeywell has the experience and expertise in LNG transportation, along with proven IAS technology, to keep ships running safely under harsh conditions.



Honeywell was the first company to achieve the internationally recognized quality standards of ISO 17894 certification in IAS. This certification assures the quality and dependability of Honeywell systems.





Integrated automation solutions from Honeywell.



Honeywell offers solutions that span the entire spectrum of LNG operations, from liquefaction, shipping, regasification and beyond. Honeywell solutions integrate production, processing and transportation operations, and link them with security, safety, commercial, regulatory and environmental functions. As a result, customers can improve productivity, lower operating costs, capitalize on key business opportunities, improve asset utilization and boost profitability.



Honeywell's IAS is powered by the Experion® Process Knowledge System (PKS) which embeds three decades of Honeywell process control, business management and domain expertise, combined with Six Sigma methodologies, into a unified architecture.

Honeywell's IAS provides a single system to automate and integrate vessel subsystems for efficient, safe and reliable operation. Honeywell's IAS goes beyond traditional control systems in how it

optimizes operations and maintenance, and automates routine activities.

Honeywell's UniSim® simulation technology offers dynamic high-fidelity modeling capabilities. This software is used by process design engineers for the design of onboard gas management systems and validation, and by Honeywell engineers to enhance the design, validate the approach and confirm control strategy functions in a closed loop environment.

Honeywell's Marine IAS Helps Manage Vessel Functions Such as:

- Propulsion systems—traditional steam boilers, Dual Fuel Electric (DFE) and slow speed diesel
- Onboard gasification systems
- Onboard liquefaction systems for BOG pressure control and floating LNG production
- Power management
- Integrated boiler control/burner management system
- Broad scope of instrumentation including traditional and wireless devices
- Machinery monitoring and control
- Cargo and ballast control including cargo ESD
- Extension alarm system
- Digital video security/motion detection
- Maintenance systems
- Remote service systems
- Fire and gas system including detectors and ancillary devices
- Diagnostic systems
- Control for all vessel subsystems
- Full integration with field instruments including wireless
- Integration of all vessel subsystems to provide a single operator interface window
- Data logging of all instrument measurements, alarms, operator actions and events
- Software applications that capture and share process knowledge for better decision making
- Cargo and ship systems reporting, and data hand-off to head office
- Safety and security management unified with the control system
- Ships classification type approval (ABS, DNV, LR, BV, NKK, & KR)
- Ships clock synchronization
- Full function extension video display units (VDU)
- Fleet management via satellite communication
- Systems that fully integrate with each other, legacy products and third-party suppliers

Implementation expertise.

Honeywell's global project management methodologies ensure high quality, consistent engineering and professional documentation. Honeywell's implementation locations in Korea, Japan and Norway have extensive LNG vessel application knowledge and work closely with the shipyards and major equipment suppliers such as engine, boiler, reliquefaction and GCU manufacturers to ensure the maximum benefit is realized from automation. Global resources are mobilized to address the toughest challenges. Some of the latest vessel control systems engineered by Honeywell, for example, incorporate regasification controls transferred from extensive LNG terminal experience. Honeywell's worldwide expertise in base-load LNG liquefaction and FPSOs is poised to engineer the newer floating LNG solutions.

Onboard Liquefaction and Dual Fuel Electric (DFE)

Honeywell has ongoing projects in LNG ships with onboard reliquefaction and regasification, Dual Fuel Electric and traditional steam type ships, with development work underway for Main Engine with Gas Injection (ME-GI) vessels. Honeywell is the only supplier to be working on both QFlex and QMax size ships for Qatar projects.

Honeywell's integrated solution for onboard liquefaction systems helps ship owners to realize savings by adopting alternative propulsion systems. The ability to control liquefaction of the gas given off by the cargo increases the amount of LNG delivered to the discharge port and prevents emissions to the environment.

Honeywell has strong and extensive experience in liquefaction, working closely with major manufacturers of LNG reliquefaction systems and manufacturers of base-load liquefaction systems for application to the LNG FPSO.



Complex LNG Storage and Gasification Vessels

These new generation vessels, also called LNG Regasification Vessels (LNG RV) are a proven alternative for onshore LNG terminals. Honeywell provided the IAS for the first LNG RVs to market including one LNG RV that successfully served an area devastated by a natural disaster while all refineries, platforms and terminals in the area were closed. This proved the reliability and robustness of Honeywell systems under any circumstances.

Honeywell's scope of automation includes the regasification process, for example the suction drums, pumps, vaporizers, heaters and gas send out systems. Also included are important systems such as compressor management, turret mooring, positioning, ballast control, emergency shutdown, and fire and gas systems.

Compressor Management

Honeywell's compressor automation integration includes suction flow control, lube and seal oil control, anti-surge control and more. Honeywell has worked with many compressor manufacturers to integrate specific compressor maps and control algorithms to provide the best efficiency and high availability in a low footprint architecture.

Power Management

Honeywell's integration solution for power management systems controls the diesel generators and handles the power generation for the vessel. Honeywell's integration of power management systems with the balance of the engine, utility and supervisory control systems is the key to optimizing LNG carriers' power system performance. The power management system is tightly integrated into the IAS architecture providing one common window for simplified operations.

Honeywell's IAS offers network communications protocols that connect systems together from every location in LNG carriers.

Security Systems

Honeywell Digital Video Manager goes well beyond CCTV, integrating with system security and event subsystems – establishing video as a new type of plant sensor and helping to comply with the ISPS code.

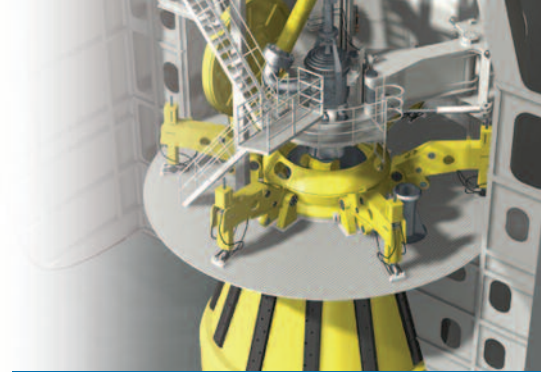
Along with easy integration with Experion, it enables sophisticated event and alarm-activated video. It can schedule video recording on a designated camera at specified times, automatically when a movement is detected (using sophisticated motion detection algorithms), or when an alarm is received from critical process equipment. Recorded images include not only the incident, but video showing what happened immediately before and after

Established Global Marine Support Network

Professionally managed automation support includes:

- 24/365 emergency call center with customer-accessible call management software
- Central coordination and global availability for spares, services and training
- Parts management to reduce onboard spares
- Remote system diagnostics and technical support via satellite link
- LNG-specific training courses
- Worldwide service personnel have access to electronic copies of ship documentation
- 30 years of support for IAS without replacing hardware

an event – providing a complete picture to enhance an investigation process and root cause analysis. The solution offers seamless integration of IP cameras and existing analog cameras into a progressive digital video management solution protecting the existing CCTV investment while taking advantage of the latest digital video technologies.



Honeywell Service and Training

Assurance of support through the life of the vessel is of utmost importance. This becomes even more critical as technology advances and vessels begin to trade in spot cargos, visiting ports not on established routes. Honeywell's demonstrated commitment to lifetime support is unmatched in the industry, providing global resources in 95 countries due to an installed base of over 6,000 onshore installations and in excess of 100 LNG carriers.

Equipment Health Monitoring (EHM) Systems

The Honeywell Equipment Health Monitoring (EHM) System is designed to monitor the steady state physical characteristics of equipment and provide visual and electrical alarm output which is simple to integrate and makes current equipment status easy to monitor. It offers enhanced reliability by providing early warning fault detection which may help to correct the fault before it becomes serious. The EHM detectors are delivered ready to be attached directly to the equipment which leads to an easy installation and calibration allowing immediate use of equipment.

For More Information

To learn more about Honeywell's LNG carrier solutions, contact your Honeywell account manager and visit www.honeywellprocess.com.

Honeywell Process Solutions

Honeywell

1250 West Sam Houston Parkway South
Houston, TX 77042

Lovelace Road, Southern Industrial Estate
Bracknell, Berkshire, England RG12 8WD

Shanghai City Centre, 100 Junyi Road
Shanghai, China 20051

www.honeywellprocess.com

IAS Training Center

The ship owners and crews are trained on Honeywell IAS in various locations including the U.S., Norway, Korea, China and Japan. The centers are located near shipbuilding yards for easier access. Customized courses are offered upon request.



Honeywell