

# Driving Innovation in Operational Technology without Compromising Cybersecurity

Add value through technology, drive innovation and manage cybersecurity risks more effectively in process industries. As IT and OT systems become more connected, they also become more vulnerable. Especially to the threat of cybersecurity risks. Digital transformation in the process industry is accelerating. The adoption of digital technology and IIoT in the process control systems and plant information systems (the domain of ISA Levels 0-3) is expected to contribute significantly to factory productivity and profitability. Due to this ongoing digitalization, the number of operational technology (OT) devices in use and the manufacturers that support them are increasing. In addition, the networks that connect the various OT systems are also diversifying.

As a result of this growing expansion and the ensuing increased complexity of OT, many businesses are increasingly finding themselves at risk of the growing threat of cyberattacks. This puts the safety of both personnel and processes in plant operation at considerable risk. Faced with this reality, there is great demand for OT integrity to counter cyberattacks while maintaining plant security and reliability.

In November of 2020, Hexagon acquired PAS, the global leader in OT Integrity solutions. The first half of this document will introduce PAS's OT Integrity solutions, while the second will explain how Hexagon's solutions integrate with theirs.

## **Tasks and Challenges of Operational Technology**

The following are situations that can expose a plant's operational tech to cyberattacks:

- 1. Cyberattacks on IT network domains are increasing in sophistication.
- 2. Management of change in OT assets is insufficient due to the absence of complete OT asset inventories (compiled asset lists).
- 3. Technical standards and policies for cybersecurity are increasing.
- 4. Limited information related to OT Integrity is being provided to operators or engineers, etc.

To address these challenges, PAS proposes an "OT Integrity Strategy" that continuously maintains alertness and vigilance towards process safety, focusing on cybersecurity.



## Introduction to Hexagon's PAS Solutions

### **PAS's OT Integrity Strategy**

In the midst of the uncertainty and volatility surrounding COVID-19, the many differences in OT cybersecurity and IT cybersecurity was fully realized. Not only must data be protected, but plant stoppages must also be prevented. For this reason, countermeasures that focus on process security are essential.

PAS sees that the most effective method for countering sophisticated cyberattacks is to use best practices that combine process

safety with the digitalization of process mechanisms, in addition to cybersecurity measures that focus on IT.

This method not only protects OT from cyberattacks but also improves control performance, alarm performance, human interface device effectiveness and OT system resilience (resilience: the power of recoverability that quickly restores the system to normal). Accordingly, this approach improves plant safety, plant reliability and plant profitability.

Figure 1 shows the OT Integrity strategy that simultaneously realizes cybersecurity, process safety and digitalization of process mechanisms.



# The sections below provide an overview of the 3 PAS solutions that form the OT Integrity strategy: Cyber Integrity™, PlantState Integrity™ and Automation Integrity™.

Cyber Integrity<sup>™</sup> is a solution that prevents, detects and repairs cyber threats. This solution provides inventory management, vulnerability management, configuration management, compliance management, backup and recovery, as well as risk analysis functions.

The OT system comprises an essential aspect of plant infrastructure. To protect that infrastructure, it is necessary to identify and trace a complete inventory of all OT and IT endpoints within the plant. This type of comprehensive inventory protects the plant from unauthorized changes, realizes compliance, reduces risks and ultimately protects the OT assets. It also makes it possible to secure improved process safety.

However, integrating the monitoring and management of OT systems within a plant is not a simple task. The OT system inventory and the data that comprise it are collected and managed manually, but the work requires considerable time and requires excellent engineers.





Furthermore, the conventional security tools used by the IT base have limited access to sensors and field instruments, etc. They are incapable of obtaining the detailed configuration data necessary for creating the inventory. For this reason, inventory management is supported using the Automation Integrity<sup>™</sup> solution (see below). Ensuring the integrity of the process control system is a critical task from a cybersecurity viewpoint. By planning for cyberattacks, monitoring changes to the various DCS or SIS parameters, alarm setting values, SIS bypasses, etc., and reporting these to operators, it becomes possible to restore abnormalities to their original sound state quickly.

#### Automation Integrity™

A variety of OT assets exist within the process industry, including DCS, PLC, SIS, APC, historians, etc. In recent years, OT environments have become incredibly complex, with thousands of endpoints, hundreds of integrated applications, tens of thousands of sensors and more interoperability between OT systems than ever before.

However, the changes made to configurations are often not documented or do not go through a formal approval process. This leads to higher risk as systems become more vulnerable. Automation Integrity<sup>™</sup> gathers the configuration data for OT assets from the sensor to the cloud and contextualizes it (it ascertains the meaning of the data and correlates it) to automate configuration management.

Furthermore, when used together with other PAS solutions, Automation Integrity<sup>™</sup> delivers greater effectiveness in cybersecurity and handling of process safety risk.

> Ensuring the integrity of the process control system is a critical task from a cybersecurity viewpoint.





Figure 3: OT System Connection Map collected using Automation Integrity™

#### **PlantState Integrity**<sup>™</sup>

PlantState Integrity<sup>™</sup> focuses on process control systems such as DCS and SIS, etc., and comprises a set of solutions used to administer the securing of process safety. PAS is a pioneer in this field and is mentioned in the Alarm Management Handbook published by ISA as exhibiting best practices in the industry regarding effective alarm management. Also, PlantState Integrity<sup>™</sup> is the most widely accepted alarm management software in the industry. The following table provides an overview of the four solutions that comprise PlantState Integrity<sup>™</sup> and gives examples of their implementation results.

Solution	Objective	Explanation
Alarm Management	DCS alarm management	Defines alarm management and improves alarm management safety and profitability
inBound™	DCS boundary management Manages current plant status with regards to safe operational limits in order to improve safety and compliance	
ControlWizard™	Control loop tuning	Continuously monitors control loops, identifies potential problems before they occur and corrects them before they can have a negative impact on processes
IPL Assurance™	SIS integrity management	Ensures the availability and performance of Independent Protection Layer (IPL) functions

Results: realization of operational excellence (example of an overseas state-run oil company)

- Near real-time visibility into operational risks allowing decision making based on timely information
- Automated collection of operational data from multi-vendor systems
- Transition to proactive maintenance that utilizes data availability and monitoring functions
- A single platform that reinforces operational risk management, report creation and KPI generation
- Improvement in cost avoidance
- Support for a building plan for an integrated PlantState dashboard
- Short-term ROI

Table 1: Overview of PAS's PlantState Integrity™ Solutions and the Results of

## Hexagon's Digital Transformation (DX) Solutions

Hexagon's PPM division is a global leader in engineering tools for the plant engineering, procurement and construction (EPC) field (EPC: engineering, procurement and construction).

Hexagon also provides a large number of solutions in the operations and maintenance (O&M) field (O&M: operations and maintenance). Representative Hexagon solutions include j5 Operations Management, SDx Asset Information Management, Luciad Situational Awareness, EcoSys Project Management, etc. Since the process industry is asset based, the basis of digitalization is a digital twin that first contextualizes the asset information of the installations, equipment and devices that produce the product and then reproduces the "perfect twin" in the digital space.

Hexagon integrates the engineering data from EPC and the O&M data to provide a DX solution that advances the plant's life cycle.

[Digitalization] Configuration data collection Smart Configuration Management Instrumentation Asset Ledger Intelligent Luciad Equipment Automation Situational Instrumentation management Situational awareness Work Requests EAM / CMMS Awareness Cyber integrity Worker Monitoring Work Instructions [Cyber Security] nventory Management Smart P&ID Change Control Work Records Vulnerability Management **i5** SDx 2D Drawings/ **Event Analysis** Defect Control P&ID Asset i5 Operating Instructions / PAS Engineering Information Operation Notice Board References Management Management PAS Operations Logbook / **3DLaser Scans** Reports **OT** Integrity Work Smart 3D Authorization/PTW Trouble Reports **EYECAD** Isolation/LOTO 3D Equipment Accident Control / Close Calls Models **PlantState** Integrity Work Control EcoSys Operating Connected [Process Safety] Procedures Project Change Alarm Management Worker Control/MOC Management Operator Rounds Boundary Site Worker Management reventive/Predictive Support Control Loop Historian Historians Maintenance Performance Client **IPLAssurance** Data Coordination Process Monitoring HxGN Work External DCS/PLC Process Systems Solution

Figure 4 and Table 2 summarizes an overview of Hexagon's DX solutions.

Solution	Objective	Explanation
j5	Operations management	An integrated operations management system comprised of various applications that support operations management in the process industry. Currently, it has been implemented at some 80 sites within Japan. In recent years, it has been used not only in operations management but also in the area of equipment management, process safety management and fieldwork that utilizes mobile equipment.
SDx	Asset Information management	Integrates and contextualizes various engineering data present in the factory, such as drawings, data sheets, specifications and 3D data with data from external systems such as PI, j5, and SAP, etc., to realize a digital twin related to O&M. For the domestic process industry, coordination of 3D data with Hexagon's Smart P&ID and Smart Instrumentation is also expected to provide great value.
Luciad	Situational awareness	A solution that visualizes to a high degree the operation of external systems, equipment management and worker data in relation to time and space data on a dashboard. It can be used for worker management, construction management, management of operational status of multiple sites, etc.
EcoSys	Project management	A project-wide lifecycle management platform that provides the ultimate solution for high-level project and contract predictability across the enterprise. EcoSys is comprised of three products: portfolio management, project controls and contract management.

Table 2: Overview of DX solutions



## j5 Operations Management

An integrated operations management system comprised of various applications that support operations management in the process industry. Currently, it has been implemented at some 80 sites within Japan. In recent years, it has been used not only in operations management but also in the area of equipment management, process safety management and fieldwork that utilizes mobile equipment.

## SDx

#### **Asset Information Management**

Integrates and contextualizes various engineering data present in the factory, such as drawings, data sheets, specifications and 3D data with data from external systems such as PI, j5 and SAP, etc., to realize a digital twin related to 0&M. For the domestic process industry, coordination of 3D data with Hexagon's Smart P&ID and Smart Instrumentation is also expected to provide great value.

## Luciad

#### **Situational Awareness**

A solution that visualizes to a high degree the operation of external systems, equipment management and worker data in relation to time and space data on a dashboard. It can be used for worker management, construction management, management of operational status of multiple sites, etc.

### EcoSys Project management

A project-wide lifecycle management platform provides the ultimate solution for high-level project and contracts predictability across the enterprise. EcoSys is comprised of three products: portfolio management, project controls and contract management.

## Integrated Solutions combining PAS and Hexagon

This section will use examples to explain the integration of PAS solutions and DX solutions.

#### Integration of PlantState Integrity™ Alarm Management and j5

In the change of shifts in the operations division in the process industry, the DCS alarm status and operation details that occurred during the shift will be handed over to the next shift team. PlantState Integrity™'s alarm management can link automatically-collected alarm occurrence statuses or DCS handling details to a j5 shift handover report in the form of aggregated / analysis content. As a result, the operator can easily receive and then utilize a handover that accurately reflects the plant's operational status.



7. Control values operating deviation variables, etc.

#### Integration of Automation Integrity<sup>™</sup> and Smart Instrumentation

In EPC projects, such as new plant construction or remodelling, instrumentation design deals with vast amounts of data, and revisions frequently occur. Thus, it is typical to use intelligent design tools to streamline the design work. Hexagon's Smart Instrumentation is the global leader in intelligent instrumentation design tools. In the previous pages, we described how the consolidation of an accurate OT asset inventory is vital to cybersecurity countermeasures.

Automation Integrity™ automatically synchronizes the instrumentation design data generated by Smart Instrumentation to provide Cyber Integrity™ with a complete inventory of OT assets. This makes it easy to build a comprehensive inventory that anticipates cyberattacks.



## Conclusion

Hexagon offers a variety of solutions in the fields of EPC and O&M. Over the past year in Asia Pacific, the level of interest in digital transformation (DX) has been unprecedented due to Covid. The utilization of digital technology has begun in earnest, and the business transformation of factories has entered a new phase.

Currently, when proceeding with DX projects with many customers, it is essential to ensure interoperability between multiple systems. Moreover, the more systems increase in complexity, the greater the risk of cyberattack.

In the future, more and more businesses will be required to bring together both OT interoperability and cybersecurity. For our part, we will continue to strive to provide DX solutions that can ensure both cybersecurity on the one hand and plant safety, reliability and profitability on the other.

#### **Reference materials**

(1) How OT Cybersecurity is Improved with Process Safety Best Practices (2020)(2) Hexagon PPM Home Page(3) PAS.com



#### **About Hexagon**

Hexagon is a global leader in sensor, software and autonomous solutions. We are putting data to work to boost efficiency, productivity, and quality across industrial, manufacturing, infrastructure, safety, and mobility applications.

Hexagon's PPM division empowers its clients to transform unstructured information into a smart digital asset to visualize, build and manage structures and facilities of all complexities, ensuring safe and efficient operation throughout the entire lifecycle.

Hexagon (Nasdaq Stockholm: HEXA B) has approximately 21,000 employees in 50 countries and net sales of approximately 3.8b EUR. Learn more at hexagon.com and follow us @HexagonAB.

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