DNV-GL



SOFTWARE

SYNERGITH PLANT

Next generation plant integrity management solution



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DNV GL is the world-leading provider of software for a safer, smarter and greener future in the energy, process and maritime industries

Our solutions support a variety of business critical activities including design and engineering, risk assessment, asset integrity and optimization, QHSE, and ship management. Our worldwide presence facilitates a strong customer focus and efficient sharing of industry best practice and standards.

Nearly 50 years of developing quality software

In providing your business with the best software solutions we are always striving to live up to our values: • We build trust and confidence • We never compromise on quality or integrity • We care for our customers and each other • We are committed to teamwork and innovation • We embrace change and deliver results

SYNERGI PLANT - A PROVEN SOLUTION

Synergi Plant software has been an accepted solution for leading operators in more than 20 countries in Europe, America, Africa, the Middle East, and Asia. Synergi Plant was designed by engineers working onsite, built to remove engineering and management concerns in managing asset integrity for sites.

Recent accidents demonstrate the need for stricter regulatory requirements and more practical systems regarding risk management of onshore plants and offshore processes. Although breaches in plant integrity happen infrequently, they are high impact accidents and may have devastating consequences.

DNV GL - Software's plant integrity management software solution, Synergi Plant, allows operators to take full control of operation assets and identify equipment that needs to be inspected, repaired or replaced. The risk assessment modules allow our customers to establish integrity management standards and practices efficiently and accurately.

Since the first version, we have been able to continuously improve our Synergi Plant solution. The many global customer projects and continuous enhancements from DNV GL engineers have been the main contributors in this process. With our web-based solution, flexible rule engine and integration for qualitative and quantitative RBI, add-on RCM, inspection and maintenance management, the risk management dashboards, and the rich integration capability, we can proudly present a solution that is built for today, and ready for the future. Our goal is to be one step ahead, offering the best possible tools to improve safety and business performance. We are happy to welcome you to our growing next-generation asset integrity management community.

Are Føllesdal Tjønn, Managing Director, DNV GL Software

SYNERGI PLANT



IMPROVE SAFETY AND PERFORMANCE

As the focus on plant safety increases, stricter regulations and safety awareness demand better solutions for integrity management. In addition to full compliance, operators are also looking for practical systems that can cater to their day-to-day needs and overcome practical issues.

Synergi Plant is a scalable risk and integrity management system for onshore and offshore process operation - a complete and user-friendly solution. It features support for international standards (e.g. ASME, API), qualitative, semi-qualitative, and quantitative risk assessment, time and risk-based planning, execution, reporting, with a management dashboard and comprehensive system integrations. At DNV GL - Software, our ambition is to fully support our customers in all stages of the integrity lifecycle, from assessing the plant's risk to managing and analysing inspection data, to predicting asset conditions and planning for follow-up, anomaly tracking, and mitigation actions. Over the years our close working relationships with our customers have led to continuous improvements and value-adding functionality.

10 GOOD REASONS FOR CHOOSING SYNERGI PLANT

- 1. Complete solution supporting a full PDCA AIM process
- 2. Easy web user interface
- 3. Options to integrate with SAP and Maximo
- 4. Option to integrate with other Synergi asset solutions to get the risk dashboard in wider range
- 5. Understanding and mitigation of risk in a continuous and efficient approach
- 6. Reduction of unplanned shutdowns, improvement of asset life extension
- 7. Configurable qualitative and semi-quantitative RBI and add-ons for fully quantitative RBI and RCM, saving time and creating accurate standard practices for the company
- 8. KPI and dashboard support decision-making
- 9. Rich in functionality and easy in use
- 10. Fully configurable to meet your requirements, for today and for the future



MANAGE, TRACK, ACT AND IMPROVE CONTINUOUSLY

Integrity decision makers use Synergi Plant to manage, track and act, basing their actions on a real time KPI and a traffic light dashboard. Track all damage mechanisms and risk factors, predict corrosion, plan inspections and manage anomaly and follow-up maintenance activities. Track schedules and work packages, taking into account any operational impact. Do RBI with design, operating, inspection, measurement and monitoring data with standard or configurable methodology. Perform calculations and propose new plans continuously. Synergi Plant offers an evergreening risk reduction solution with full traceability of integrity decisions.



The executive

Synergi Plant gives instant oversight of all process units and outstanding risk and works through its practical overview and KPI views, making it easy for executives to focus on outstanding high-risk assets and associated works.

The integrity manager

With Synergi Plant integrity managers can manage overall planning and scheduling of proposed, planned, current, and prior activities, including optimization of time-based and risk-based inspections and maintenances. They can review and approve inspection and maintenance engineers' work and oversee the trend of asset conditions.

The inspection engineer

With Synergi Plant the inspection engineers have the optimal solution for inspection planning, execution, reporting, and follow-up management in one place. They can have everything they need before visiting the site, recording onsite, and creating reports and

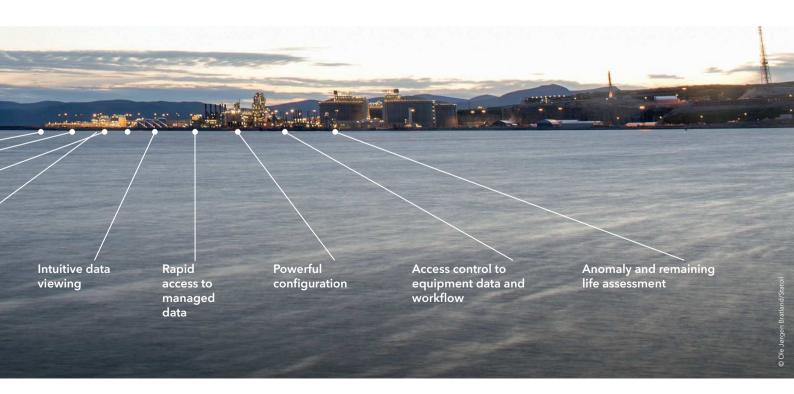
analyses after inspections. Carrying out the inspection and contributing to risk re-assessment is convenient and easy.

The operation and maintenance manager

Synergi Plant makes it easy for operation and maintenance managers concerned about the impact of the integrity activities to see proposed and planned activities such as inspections waiting for shutdown, recommended changes of facility, critical safety equipment performance, proposed maintenance schedules and works, and thereby make quality decisions in tuning the asset operations.

IT staff

Synergi Plant software is fully web-based and easily deployed and maintained by your IT staff. Rich configuration capability allows system administrators to adapt to organizational changes and changes in practice. DNV GL - Software implementation and technical support provides support during installation and operation of the software.







Synergi Plant covers all stages of the integrity lifecycle: assessing the asset risk, managing and analysing inspection data, planning mitigation actions and follow-ups, re-assessing risk based on inspection and measurement results, taking in operating data and comparing with integrity operating windows.

Data management

Synergi Plant is an integrated system platform, designed using the robust STEP data model to host static and dynamic data of all assets. It supports the overview of asset performance indicators under the management KPI views, as well as process and technical data needs.

- Stores configurable asset hierarchy, facility and equipment data, technical details, inspections, maintenance, RBI, RCM, and other activities for all levels of assets
- Classifies equipment by type and group for data storage and analysis
- Specifies equipment design and operation parameters using configurable data sheet templates
- Builds in static equipment types including vessel, piping, heater, heat exchanger, PSV, crane, flare, storage tank, and rotating equipment types
- Allows user-configurable new equipment types, technical forms and inspection forms
- Allows user-definable calculation rules and look-up tables using rule-based formula engine
- Enables user reporting including data sheets, inspection reports and other listing and summary reports
- Allows generic searches for specific equipment by keyword or technical attributes

Plan-do-check-act

At the heart of the plant integrity lifecycle is a robust and configurable system with seamless movement of data between lifecycle stages. Synergi Plant is webbased, allowing you to work from anywhere at any time.







Synergi Plant has a configurable and flexible data storage mechanism and rule engine, which allows users to define and keep all the standards, calculation formulas, corrosion manuals, failure details, piping classes, etc. It supports calculations from ASME, BS, and other formulas. Users can change or define new formulas for calculations, together with input and output fields.

- Includes standard industrial references,
 e.g. corrosion types, damage mechanism,
 inspection types, etc.
- Allows for local site data and references adding to the data bank
- Enables users to store and accumulate site corrosion manuals
- Computes remaining life, short term and long term corrosion rate, and next inspection date based on standard international formula or user defined formula
- System computes T-min values and conditional levels based on standard international or user defined formula
- Allows definition of corrosion loops and associated measured positions and position types
- Links inspection sketches and SOP to the equipment and their inspection tasks

Inspection programme and schedule

Synergi Plant supports all kinds of scheduling, including time-based, quantum-based, condition-based, risk-based, and mixed scheduling. The condition-based scheduling can be used with configurable formulas, and the risk-based scheduling works seamlessly with different RBI modules.

- Register routine inspection schedules for facilities or tags for on-stream and off-stream inspection programmes, including multi-dimensional schedule code classification
- Schedule time-based, quantum-based, conditionbased and risk-based inspection
- Allow forecast and automatic generation of one or multiple scheduled inspection works

- Update risk-based inspection scheduling automatically when RBI is completed
- Use master plan work packaging for site planning and execution plans for contractors

Inspection work management and measurement recording

Synergi Plant can manage all kinds of inspection works, including visual test (GVI, CVI or VT), NDT inspections (UT, PT, LT, RT), and other user-definable inspection tasks. Inspection workflow helps an organization to adjust to working practices. User-definable monitor data recording is also available. Inspection and measurement results can be used by the RBI module to achieve evergreening risk reduction.

- Use built-in inspection workflow, inspection task forms, and reports with configurable extensions
- Capture and record monitored data, calculate corrosion rate and remaining life based on configurable formula
- Input and store associated inspection measured points, including ultrasonic and radiography thickness points, corrosion monitoring points, magnetic flux leakage records, vessel and storage tank inspection records, and check points, etc.
- Utilize standard NDT inspection tasks and reports available, including Ultrasonic Test (UT), Magnetic Particle Test (PT), Liquid Penetrant Test (LT), and Radiographic Test (RT) - additional inspection or testing tasks are configurable
- Capture measured data both online and via batch loading or via standard data logger integration
- Use inspection and measurement results automatically in the RBI re-assessment process

Document sharing

Synergi Plant has a built-in module for document sharing. This includes all types of documents, drawings, photos, and videos. Users can create physical documents stored in Synergi Plant as a reference to equipment, inspection, or RBI study, or can create a virtual document with hyperlinks to external document management systems.

- Technical and inspection files in various formats, such as documents, pictures, or videos can be linked to and accessed via facility or work items online
- Inspection photographs and videos can be attached to the inspection tasks
- URL-type documents and hyperlinks for integration with external EDMS are supported

Risk-based inspection (RBI) and Reliability-centred maintenance (RCM)

Synergi Plant RBI modules can be either configured to fit custom qualitative or semi-quantitative RBI methodologies, or works seamlessly with advanced quantitative RBI Onshore (API 581) and RBI Offshore (DNVGL-RP-G101) add-ons. The Synergi Plant RBI module enables a configurable RBI workflow for users to perform 'what-if' studies, approval, and revise the RBI result before it affects the final inspection scheduling. It can also integrate with other RBI systems or spread-sheets. The quantitative RBI addons have calculation for probability of failure, including thinning, SCC, external damage, HTHA, Liner, PRV fail to open, etc, and calculation for consequence of failure, including leaking, explosion, fire, and other consequence models from DNV GL's QRA models.

The Synergi Plant RCM tool is a new module to perform RCM study for mass data in a process plant. It provides functionalities to do FMEA analysis, tag type mapping, and risk-based maintenance planning. With the integrated maintenance records, it also provides a framework to accumulate maintenance history and knowledge for improving maintenance strategy.

- Rule-based or bespoke RBI for custom qualitative and semi-quantitative RBI can be implemented by the Synergi Plant rule and formula engine, which supports decision tree, table look-up, ifthen-else, and many other types of user-definable logic. Complex custom RBI methodology can be implemented by configuration and customization
- The quantitative RBI add-ons include modules for risk screening, detailed consequence analysis, detailed likelihood of failure assessment, risk summation, and risk-based inspection recommendation

- Additional integrity assessment for selected assets
- Acceptance of probability and consequence of failures and recommended inspection frequency or next inspection date from RBI for updating the inspection schedules and criticality ranking
- Support of 'what-if' RBI analysis with definable workflow for risk and plan approval procedure
- Combination and optimization of time-based and risk-based inspection plans
- RCM add-ons to support FMEA analysis, tag type mapping, and risk-based maintenance planning
- Two-way evergreening process between RBI/ RCM and inspection/maintenance management. Inspection and measurement results can be used for RBI reassessment, while maintenance history can be used for RCM reassessment.

Two-way integration with SAP

Synergi Plant has its two-way integration with the latest SAP version ECC 6.0, with ready-made direct interfaces to SAP PM and QM modules without any third-party component or any plug-in on the SAP side. This enables the inspection and integrity team to create and monitor follow-up activities, creating maintenance work notification in SAP and get work status back.

- Two-way evergreening process between inspection, follow-ups and maintenance through the integration with SAP
- Synchronization of assets data with SAP
- Flexible integration adaptors for creating work notifications and work orders in SAP
- Flexible integration adaptors for synchronizing work order status and details from SAP
- Options to use Synergi Plant as the risk assessment and risk-based planning system to a complete the integrity work management with the SAP integration
- Options to perform all asset integrity management in Synergi Plant and use SAP PM and QM modules as resource planning and cost recording tool.





Synergi Plant has many built-in reports for data listing, analysis, and inspection reporting purposes. Users can customize the reports using Excel to design layout or set up extra data columns.

- Functionality for making long term and short term integrity plans
- Asset profile report, tag and risk element report, and piping list report
- Tag corrosion rate report and corrosion analysis report
- Facility service overview report and inspection schedule report
- Equipment thickness report and material loss report
- Inspection task reports including VT, UT, PT, LT, RT
- User reporting using configurable data source and Excel as the template design tool

Traffic lights and KPI

Synergi Plant has a management dashboard with risk and job traffic lights and KPI graphical views. The risk traffic lights can aggregate risk from either RBI or critical safety equipment performance standards, and the job traffic lights can aggregate status of jobs in different facility hierarchies. Online KPI graphical views provide an overview of the risk and status in the plant.

- Online traffic lights address management concerns and reflect the risk profile of the operating facilities
- Asset status traffic lights for static and rotating equipment
- Traffic lights rollup along the facility hierarchy to reflect the status of the plant and each production unit
- Job status traffic light to track overdue and outstanding jobs and their responsible unit or person
- KPI widgets to support decision-making
- Risk accumulation and risk trending
- Thinning trend and thinning history
- Job overview, work package completion status and Gantt chart
- Unplanned shutdown improvement

Rich system configuration

Synergi Plant is a configurable platform that can be used not only for inspection and integrity management but also extended for other asset integrity needs.

- Configurable asset hierarchy, facility and equipment types, forms, columns, profiles, classifications, organizations and user roles
- Configurable risk assessment methodology, forms and columns for risk evaluation and calculation, formula and rules to derive results, workflow with organizations and user roles to control risk assessment process
- Configurable activity hierarchy, types, forms, columns, profiles, working contents, recording sheets, reference assets, workflow, work branch-out and combinations





RBI: Efficient and configurable risk-based inspection planning to move optimize inspection and ensure asset integrity



Asset trending and re-assessment: Industry standards and configurable formula for calculating KPI and condition traffic lights Facility databank

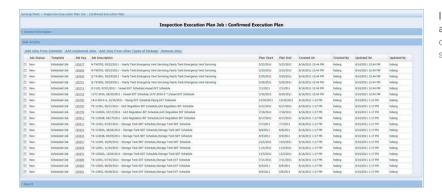
Follow-up action

ACT

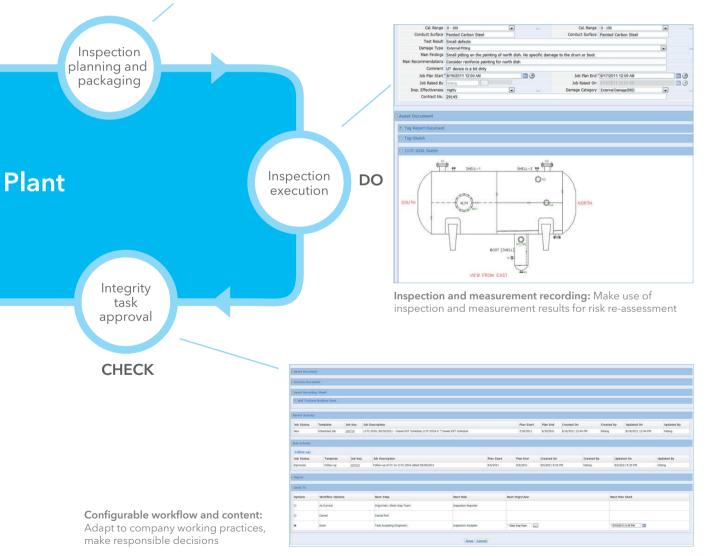
Security Security County Count

Follow-up with maintenance works:

Two-way integration with SAP to manage follow-ups and mitigation activities



Inspection scheduling and planning: Combining and optimizing time-based and risk-based scheduling into packaged works



DNV GL is continuously focusing on your potential for increased efficiency, accelerated growth and well-managed risk.

We take pride in delivering professional service and in giving you access to the domain knowledge and experience of DNV GL. Our team of IT and integrity management experts has many years of experience in making Synergi Plant work for the specific circumstances and environments of each client. We can take care of everything from implementation and installation to configuration, support and assistance.

and receive valuable feedback. Our training catalogue includes open courses in all regions, and customers can request customized training. Many of the courses are held jointly by our own software support team and by DNV GL engineers, who bring essential domain expertise.

Customer support

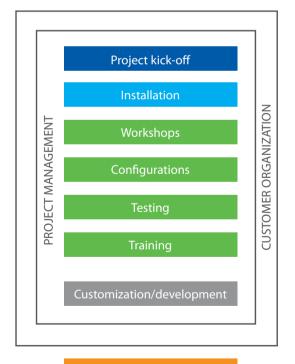
Experience the benefits of the service level agreement with DNV GL - Software, providing easy access to support, new product releases and technical knowledge. As a global organization with regional support centres, we can ensure expert support when you most critically need it, so that you can complete and meet your project demands.

Implementation services

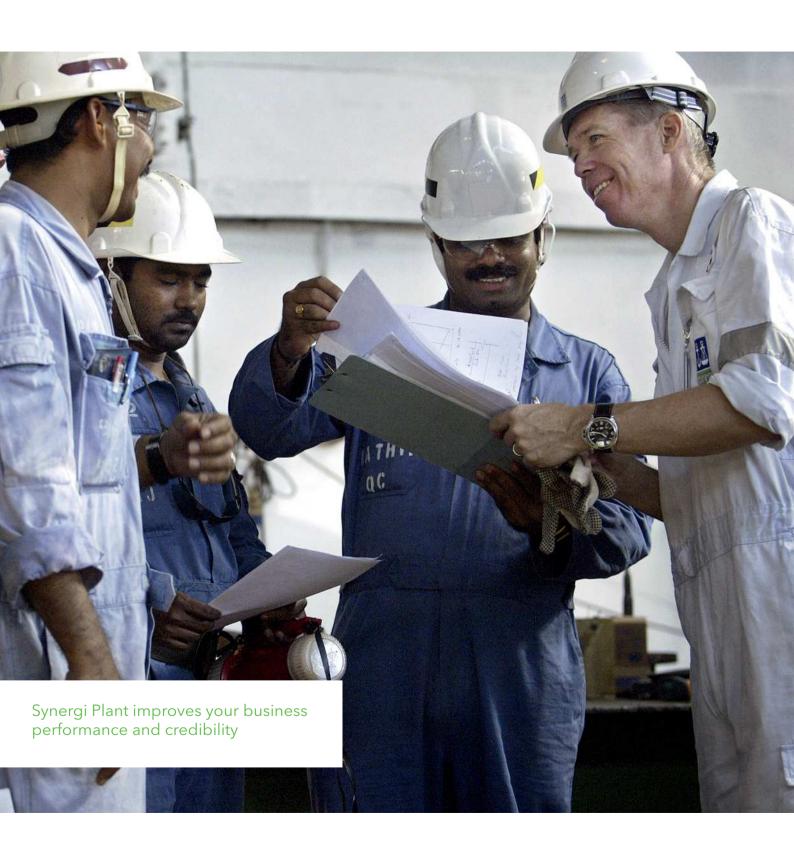
- Product experts who understand your challenges
- Project management for implementation projects
- Pipeline data and survey configuration
- Customized training
- Installation assistance
- Data import assistance
- Best practice and experience transfer in the field of pipeline integrity management
- Assistance in technical engineering services

Training, conferences, seminars and workshops

DNV GL - Software organizes user conferences, seminars and workshops worldwide, providing a unique opportunity to communicate with our users



Maintenance and support



THE SYNERGI PORTFOLIO

DNV GL is the global leader in enterprise software used for managing operational risk and performance.

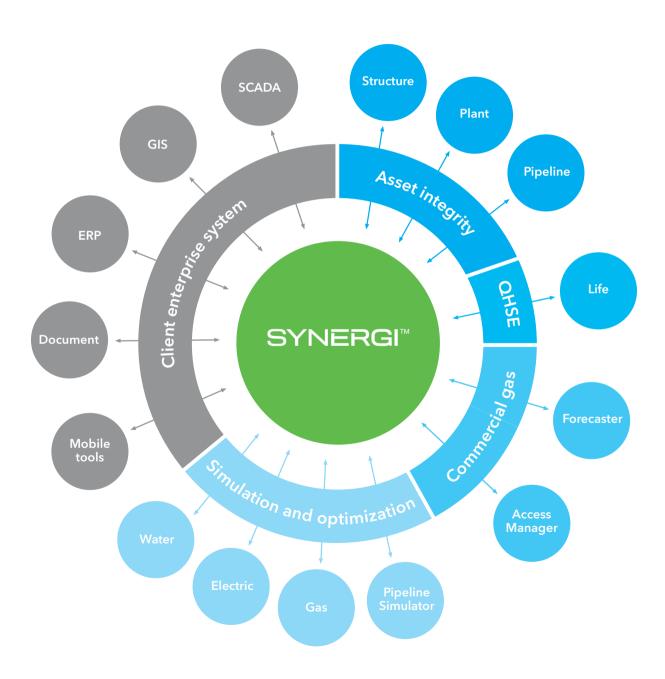
The Synergi software product portfolio helps the oil & gas and utility sectors design and operate their assets for optimal performance and best practice risk management. With Synergi you can ensure the safety of people and property and reduce environmental impact.

Our consultancy team helps clients identify and implement Synergi product solutions that are right for them and that help them better manage operational risk and increase asset performance.

The combination of software and services supports customers in making the right decisions for their business, their stakeholders and the communities in which they exist.

Learn more about our enterprise software for managing operational risk and performance on dnvgl.com/synergi

Synergi enables your business to become safer, smarter and greener





100 countries

400 offices

16,000 employees



SAFER, SMARTER, GREENER



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DNV GL

Driven by our purpose of safeguarding life, property and the environment, DNV GL enables organizations to advance the safety and sustainability of their business. We provide classification and technical assurance along with software and independent expert advisory services to the maritime, oil and gas, and energy industries. We also provide certification services to customers across a wide range of industries.

Combining leading technical and operational expertise, risk methodology and in-depth industry knowledge, we empower our customers' decisions and actions with trust and confidence. We continuously invest in research and collaborative innovation to provide customers and society with operational and technological foresight. With our origins stretching back to 1864, our reach today is global. Operating in more than 100 countries, our 16,000 professionals are dedicated to helping customers make the world safer, smarter and greener.