

DIGITAL PRODUCT PG

# ABB Ability™ Marine Remote Diagnostic System Release 5.2

Software and hardware technology upgrade, new functionality, simplified commissioning, scalable infrastructure for IT service centres.

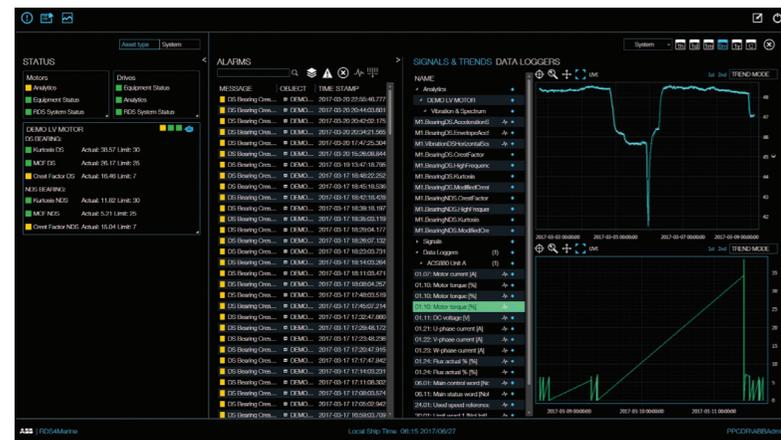
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After fundamental improvements and changes in the back-end and server side functionality, in 2016 the RDS system has been subject to major modifications related to its presentation layer. In order to fulfill requirements of 'common ABB Marine Onboard User Interface' look and feel, a totally new design of the RDS main view was introduced. ABB Marine graphical designers worked closely with system users to create a visual design that will inherit the best functionalities from the previous RDS release and deploy them according to the new philosophy of user-machine interaction that is to be common for all types of onboard systems delivered from ABB (e.g. automation, voyage optimisation and diagnostics). The iterative process of discussions, specification and

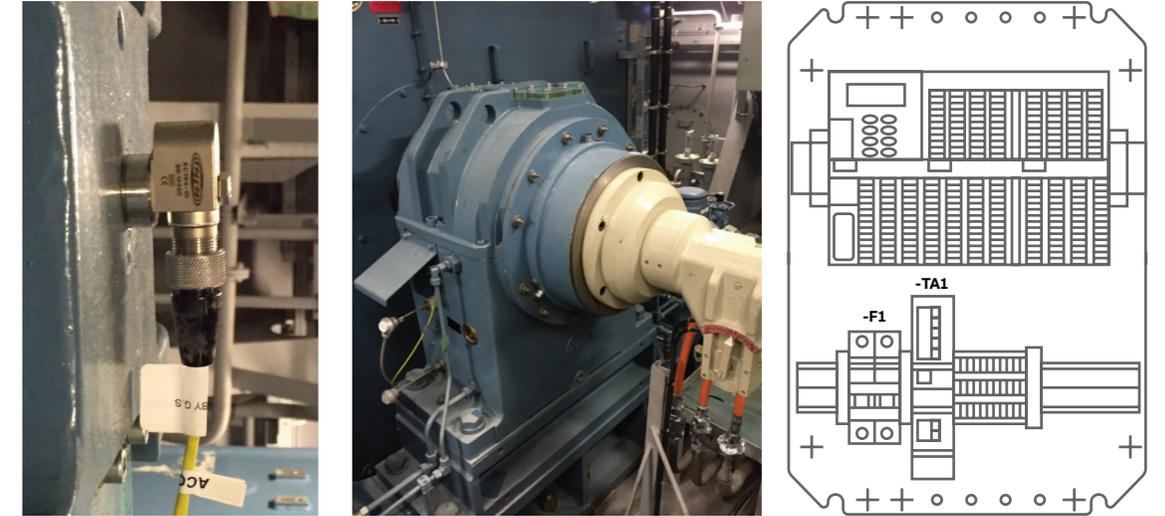
incremental implementation allowed building the new RDS UI with focus on user satisfaction and ergonomics. On the technology side, communication between data server and presentation layer has been improved drastically by introducing fast and ultra-light messaging protocol. Graphical elements are based on world's best UI frameworks such as Telerik and SCICART. Main features of new RDS User Interface are as follows:

- Consistent presentation of information from the level of equipment status and analytics results through detailed alarm and event description, to the level of time series trends and high frequency sampled signal transients and loggers
- Two different ways of aggregating information, e.g. by asset types (drives, motors, generators) and system types (e.g. portside drive train, power system, etc.)
- Status Panel with three levels of drill-down navigation allows user to quickly assess the condition of monitored equipment in real time
- Alarm Panel and Trend Panel with detailed alarm list and advanced plotting controls facilities fast fault tracing – a core feature for internal, ABB users of the system
- Embedded roles-based mechanism governs presentation of certain information only to privileged users
- No software engineering required to redesign the content of Status, Alarm and Trend panels



New RDS UI

Condition monitoring



- Optimised for wide screen displays
- Information presented onboard in the Status Panel is replicated on the RDS section of ABB Fleet Portal to provide consistent notification to both offshore and onshore customer teams.
- The status panel is only visible onboard for customers with Service Level 3 – RDS Prediction

**Condition monitoring of rotating equipment**

The Diagnostics for Machine (D4Machines) package has been greatly improved with two main areas of development:

1. Introduction of a new data acquisition hardware solution for online condition monitoring of critical rotating machinery.
2. Piloting a new concept of Modular Tool – multi-sensor data acquisition tool for condition monitoring of LV rotating equipment

Ad (1) The online solution for condition monitoring of critical machinery received a new hardware platform for signals acquisition. Proven and widely tested in various industries and application, the ABB AC500 based, highly specialised data acquisition components have been chosen and integrated with the RDS system. With its pilot deployment onboard PGS Ramform Hyperion, the new concept proved to be fully operational. Similar to previous release of D4Machines concept, measurements from AC500 CMS system are triggered by RDS under precisely defined operating conditions to normalise the calculation results. Some of the raw readings

and end results are automatically sent to our Service Center databases to feed periodic reports. The main highlights of the new release are as follows:

- AC500 Condition Monitoring Package consisting of PM592 CPU and FM502 input module form new RDS data acquisition unit
- The system facilitates signals collection from up to 16 I/O channels acquired simultaneously with maximum 50 kHz sampling frequency
- Input channels re-configured 'on-the-fly' by RDS systems typically read signals from accelerometers (IEPE) and +/- 10V voltage signal out from current clamps and voltage probes
- Extendable with standard, 16-channel AI module for additional hard-wired input signals such as temperatures
- Installed inside the RDS marine cabinet forms a portfolio of four different options fitted for normal and extreme condition of installation, depending on the vibration level of the machine and the installation location of the cabinet

Ad (2) Year 2016 brought significant effort in further product development and market introduction of ModularTool – a cost effective hand-held solution for RDS condition monitoring of LV rotating equipment. Conceptualised and researched in previous years, the tool was successfully integrated with the RDS system in 2016. All analytics provided with the tool are deployed in the onboard RDS system and launched automatically each time it is connected to RDS PC.

Acoustic, vibration, magnetic and tachometer recordings acquired by the tool are processed with the number of specialised algorithms to give high level indication about the condition of the motor bearings, rotor and mechanical installation. Pilot installation of prototype device was done in January 2017 onboard the PGS Ramform Hyperion and received very good feedback from end customer.

**RDS Cyber security enhancements**

- Fully compliant with ABB cyber security requirements
- Encrypted traffic from ship to shore using ABB's technology Remote Access Platform (RAP)
- DSAC and hardening for onboard RDS infrastructure
- Firewallled from ship network - the vessel's network is secured from outside (Internet) by a firewall which is by default configured only to allow for traffic required for ABB Remote Access Platform and set up to pass only dedicated predefined data connections and block all other traffic

**Enhanced portfolio of monitored assets and analytics**

- Connector to ACS880 drives
- Turbochargers monitoring and analytics
- Infrared temperature monitoring and diagnostics for MV power systems
- Integration with ABB 800xA and Asset Optimiser
- Prediction algorithms for MV drive water cooling system

**Improved IT serviceability**

For internal users and RDS IT maintenance teams in particular. RDS version 5.2 comes with new

functionalities that simplify and accelerate the process of RDS software upgrade and reconfiguration. With several years of experience on remote troubleshooting and maintenance of RDS, what proved to be particularly troublesome for our IT team were 2 types of operations:

1. Update of software typically requiring transfer of the entire RDS installer, reaching more than 100MB in size
2. Reconfiguration of RDS using configuration screens

Both above activities, perhaps trivial tasks when working on a local desktop computer, become a challenge if the remote connection to onboard RDS stations is using a very weak satellite connection with very limited broadband capacity. In those cases, a single click of mouse to change the configuration may take dozens of seconds and the transfer of installation files, if possible at all, may take several days.

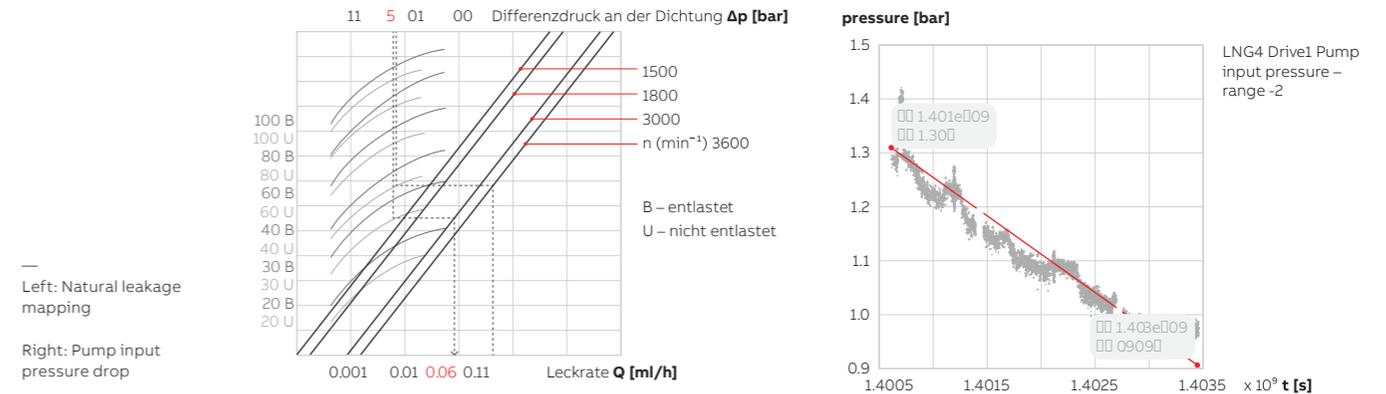
The first problem was solved by changing the release and build philosophy of RDS. From version 5.2, each and every maintenance or production release of the software comes with the pair of full .msi installer .msp patch files. As a result, in order to upgrade the software version between minor versions, transfer of a maximum 2MB file onto the site is needed, or 50 times less than previously required.

**New diagnostics functionalities in RDS 5.2**

Continuous innovation on existing solutions and newer products delivered to customers requires RDS to constantly adapt to market needs and

Enhanced portfolio of monitored assets and analytics

TunnelThruster01 Inverter:MarineACS800 'InverterTemperatureStatus' Condition Details	
Condition Details	Asset Monitor Status
<b>Condition: InverterTemperatureStatus</b>	
Condition: SubCondition:	[good] InverterTemperatureStatus: Warning
TimeStamp:	Wednesday, June 21, 2017 15:32:42
Severity:	450
Description:	IGBT overtemperature
Possible Cause:	Drive IGBT temperature is excessive
Suggested Action:	Check ambient conditions. Check air flow and fan operation. Check heatsink fins for dust pick-up. Check motor power against unit power.
Corrective Action Taken:	



Left: Natural leakage mapping  
Right: Pump input pressure drop

provide state-of-the-art monitoring solutions that match equipment installed onboard the most sophisticated vessels. Additional drives have been incorporated into the already existing D4Propulsion diagnostics package, including ACS1000, ACS800, ACS880 and DCS800 used in DC grid projects. In order to provide better condition monitoring of circuit breakers and contactors, a new client library based on IEC61850 MMS protocol is being developed to interface RELION protection relays installed in MV switchboards, which will significantly increase the volume of signals being recorded, and will enable further advanced analytics. For example, monitoring the total number of opening/closing cycles, load of operations, short circuits and faults, etc., will help to determine the life expectancy of a circuit breaker.

Thanks to the modular approach of standardised modules connected to different equipment, RDS is able to expand its diagnostics portfolio

and regularly adapt to brand-new equipment. With currently >45 different diagnostics solutions installed in about 600 automation PCs, ABB is able to remotely monitor approximately 100 vessels with service contracts.

**Hardware and platform upgrade**

The increasing amount of assets being monitored, and higher-end diagnostics solutions with onboard edge analytics, require more resources from the automation PCs and panel PCs running RDS software. Within 2017, all computers will be delivered with an increased 8GB RAM memory (previously 4GB RAM) with 64-bit Windows 10 operating system. These upgrades not only contribute for better performance and user experience, but also extend the serviceability of the equipment and eliminate hardware constraints that could limit future software development activities.

RDS modular concept of diagnostic solutions

