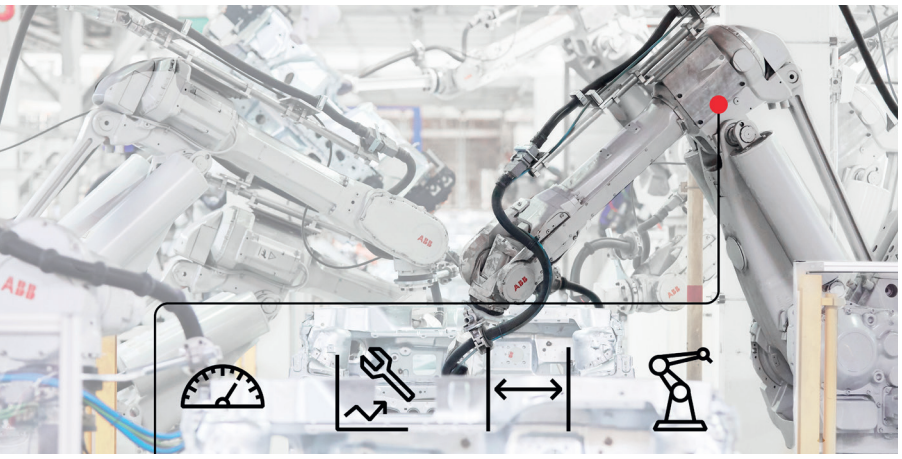
ROBOTICS

Condition Based Maintenance through SIS Analysis

Identify the most highly stressed robot in your factory



Quickly find the most highly stressed robots in your production line to help create a preventive maintenance schedule and avoid unplanned downtime due to mechanical failure.

All robots of a given type in the same production line are not “equal” when it comes to wear and tear. The differences are typically due to the user program which sets the motion cycles and the dynamics for each axis. Usually, highly stressed robots represent only a limited amount of the robots in a production line: these are typically “bottleneck” robots dealing with applications such as part flow.

Just like other industrial components used in complex and intense motion applications, for cost reasons it is not practical for a robot to be solely designed for the worst-case scenario. When it comes to the compact gearboxes used in robots, there are several factors that can impact on their operational lifespan:

Commissioning: Parameters and Programming
- Missing or incorrect load data
- Motion supervision deactivated

Production: Stress due to intense motion cycles
- Very high joint duty factor
- Very high torque and/or speed
- Shocks with high energy due to collisions

Maintenance:
- Oil change not done in time
- Lubrication problem or oil contamination

A gearbox failure always produces the same symptoms:
- Damage of the satellite axis at bearing level
- Very high quantity of metallic particles

A gearbox is considered at the end of life in production when it presents:
- High elasticity
- Backlash
- Motion supervision errors displayed on TPU

Analyzing the SIS file

“SIS” stands for Service Information System. Introduced on the S4Cplus controller for the IRB 6600 & IRB 7600 robots in 2002 the SIS is used to monitor specific mechanical components mainly gearboxes and balancing units.

The robot control processes and stores SIS data real time, gathering motion-related data about the robot joint movements during operation. To help ensure your production privacy, the SIS does not collect any information related to part variants or cycle time. Any details on the robot itself are limited to its type, serial number, RobotWare system name and version number.

The SIS data gathered is used by us to make relative comparisons between robots used in a similar context. ABB manages a global database containing over 14 years of data from robots used in applications worldwide, giving us valuable in-depth knowledge of how our robots are being used. To assess your robot’s performance, we compare your data against the average of the global robot population based on several key criteria. The resulting comparison can then be used to generate a recommended maintenance plan for your robot.

Duty Factor
The duty factor reflects the overall activity of the robot and is a very important measure. The robot duty factor is calculated as the time at least one axis is moving/total production time. The axis duty factor is calculated in the same way on an axis by axis basis. The impact of the duty factor varies according to the application the robot is being used for.

Application	Duty factor	Speed	Acceleration	Wear impact
Arc Welding	High	Low	Low	Low
Guling/ sealing	High	Medium	Medium	Medium
Spot Welding	Low	Medium	High to Very high	High
Material handling	High to Very high	High to Very high	High to Very high	High to very high
Inter-press loading	Extreme	Very high	Very high	Extreme

The gearbox wear is almost proportional to the joint duty factor, for a given cycle.

The Condition Based Maintenance provides two levels of analysis. **Level 1** provides a factual overview of the customer's installed base and identifies the most stressed robots in the fleet.

A **Level 2** analysis provides a detailed investigation of the robots in the Level 1 analysis, enabling a recommended customized preventive maintenance scheme to be created.

The results of the analysis are presented in a summary table with a graphical color scheme that clearly indicates the status of each axis and the overall health of the robot indicated by the calculated joint usage score.

An official report is provided to the customer with the robot overview, summary table, data analysis, individual maintenance recommendations, conclusions and rating of the system.

The Condition Based Maintenance service offers the following benefits:
- Gives the customer a detailed overview of how their robots are used in their plant (level 1)
- Gives the customer a detailed knowledge of their most "stressed" robots (level 2)
- Prevents risk of unexpected gearbox breakdown in production and gives recommendations about how to deal with the most "stressed" robots (level 2)
- Support in defining the budget for spare parts (look ahead of future replacement)
- Support for strategy to upgrade robots to newer version (e.g. IRB6640 to IRB 6700)
- Support for strategy to select and reuse the "right" robots

Hardware and software requirements	
Operating system	Windows 7 (32 or 64-bit) or Windows 10 (64-bit)
CPU	2.0 GHz or faster processor, multiple cores recommended
Memory	3 GB if running Windows 32 bit edition, 8 GB if running Windows 64 bit edition. 16GB or more is recommended when working with large CAD models.
Graphics card	High-performance DirectX 11 compatible graphics card. For the Advanced lightning mode Direct3D feature level 10_1 or higher is required.
Screen resolution	1920 x 1080 pixels or higher is recommended
DPI	Normal size (100 % / 96 dpi) up to Large size (150 % / 144 dpi)
Mouse	Three-button mouse
3D Mouse [optional]	Any 3D mouse from 3DConnexion, see www.3dconnexion.com
Touch screen	Touch is enabled for Windows Multitouch screens

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