

# Digital maintenance tool increases the availability of forging manipulators

*Along with hydraulic presses, manipulators are the key components of any forging operation. Unplanned shutdowns of these highly dynamic machines not only lead to production interruptions and consequential costs in the forging process itself, but also in the downstream processes. This is why DANGO & DIENENTHAL has developed a new digital maintenance tool for rail-bound forging manipulators. With its digital calendar, preventive maintenance, and predictive maintenance, it increases the efficiency of the forging line.*

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If the manipulator (Figure 1) breaks down in a forging operation, the forged material has to be heated again later. There are also costly interruptions to production during heat treatment and mechanical processing.

The manipulators can only achieve maximum productivity if the hydraulic control and all seven axes work reliably and precisely. This is why optimum maintenance is so important. This applies not only to the maintenance work that needs to be carried out at regular intervals, but also to the prompt replacement or repair of components that show signs of wear or failure.

DANGO & DIENENTHAL has developed its new digital maintenance tool to prevent unplanned shutdowns and to ensure the availability of the entire forging line. It consists of three modules:

- Digital maintenance calendar
- Preventive maintenance
- Predictive maintenance

## MODULE 1 – DIGITAL MAINTENANCE CALENDAR

Regular maintenance is a basic prerequisite to ensure high availability and a long service life of the manipulator and thus efficient and undisturbed process sequences.

The digital maintenance calendar replaces the manual logging of regular maintenance work and ensures that all maintenance work is carried out on time. The machine's operating hours and the respective maintenance schedule provide the input data for the digital maintenance calendar. The colour change from red to green then documents the proper condition of the machine. This makes it much

easier for the maintenance team to plan and carry out the necessary maintenance work.

The digital maintenance calendar can be retrieved on the machine visualization and includes:

- Overview of upcoming work.
- Acknowledgment of completed work steps.
- Information on maintenance work to be carried out by DANGO & DIENENTHAL.

## MODULE 2 – PREVENTIVE MAINTENANCE

The preventive maintenance module also incorporates and evaluates machine data from the manipulator. It ensures that components are serviced, cleaned, or replaced in time, before their breakdown affects the operation. Among other things, it uses measured values from sensors that are already present in the manipulator such as:

- Operating hours of the pumps.
- Distances covered by the travel drive.
- Strokes of the cylinders.
- Rotations of motors and gearboxes.

The data are continuously evaluated and compared with information on the maintenance intervals of the individual components, their nominal life expectancy, and the replacement times. The results are displayed in the visualization in the form of color-coded service life indicators (Figure 2). They provide answers to questions about the condition of the machine's key components, such as:

- How long has this component been in operation?



Fig 1 A rail-bound forging manipulator from the SSM series

- How long can it still be used before it needs to be replaced?
- When must the spare part be ordered at the latest so that it arrives at the plant in time for replacement?

If internet access is available, DANGO & DIENENTHAL can provide the measured values and evaluations on request. This ensures customer service representatives are always informed about the current status of the manipulators. They can arrange for delivery of spare parts or suggest dates for maintenance.

### MODULE 3 – PREDICTIVE MAINTENANCE

For predictive maintenance, further functional groups of the manipulator are equipped with additional sensors. These record the condition of important components in detail. In this way, it is possible to identify current maintenance requirements and to carry out maintenance work exactly when it is really needed. The module thus minimizes unnecessary downtimes and maximizes the efficiency of maintenance processes. →

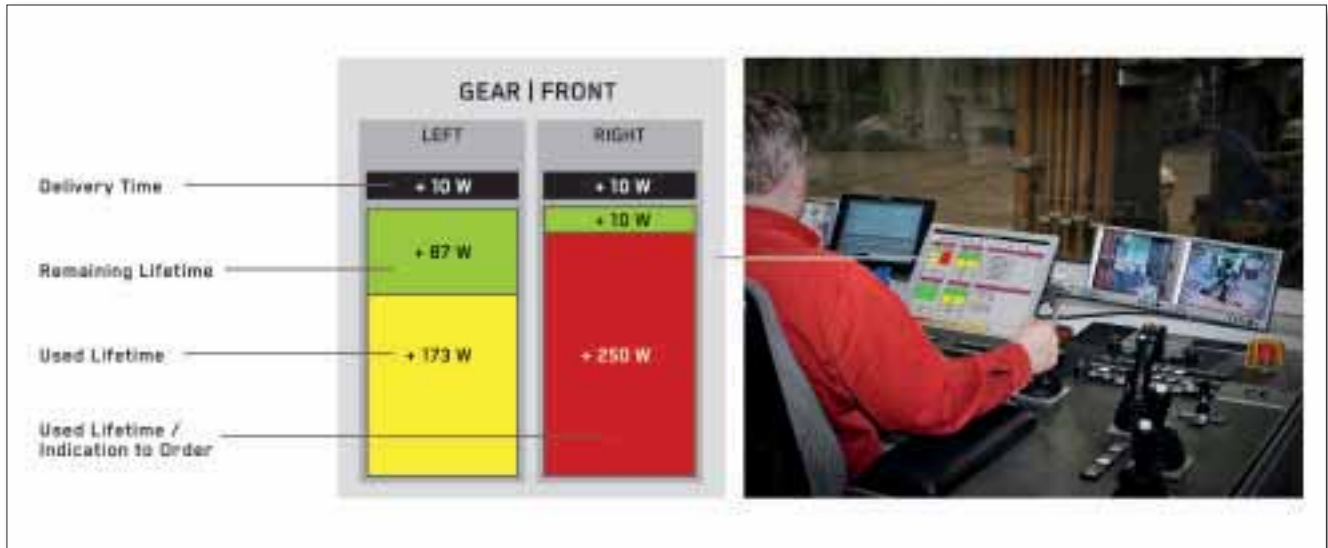


Fig 2 Data on the service life of components is displayed on the machine visualization



Fig 3 The digital maintenance tool ensures the high productivity of the rail-bound forging manipulators

The additional sensors record parameters such as:

- Contamination of the hydraulic and transmission oils
- Flow rate of the leak oil in the main pumps and in the drive and tong rotary motors
- Vibrations of the travel gears and the

spherical roller bearings of the tongs' rotation drive

- Wear of the lantern racks and lantern wheels

The software uses a variety of data analysis techniques to detect anomalies that could indicate impending breakdowns or wear. This permits early intervention to be initiated

if unusual jumps in measured values are registered, or if they are approaching predefined limit values.

The tests are generally carried out at quarterly intervals. In the process, the machine runs through a predefined movement profile. The measured values of the sensors, for example frequency, pressure and speed curves, are compared with those of the initial commissioning or more recent results. The expected remaining service life of the monitored components is updated based on this data. As a supplement to module 2, they are based on precise measured values from many sensors and a differentiated data analysis.

### CASE STUDY

With a forging capacity of 15t/h, 360t of material is heated per day in a three-shift

operation. If the forging manipulator breaks down for one day, the forged material, which has already been heated for hours, will have to be heated back up to forging temperature later on, which requires a significant energy input. This results in breakdown costs, and therefore lost contribution margins, for materials, energy, and personnel. For the first day of the shutdown alone this adds up to over €200,000, which can be avoided with the digital maintenance tool (Figure 3). **MS**

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