Product report: With AI from predictive maintenance to a predictive asset management strategy

Holistic Maintenance with Qualicision AI

Ensuring high plant availability and minimizing maintenance costs at the same time is a balancing act. The complexity of this area of tension grows with the size of the plant network and the resulting increase in the number of combined, in some cases contradictory, influencing factors. Against this background, more and more companies rely on predictive asset management, which has the goal of making optimized decisions, e.g., on maintenance and repair. In practice, such approaches are limited to solving individual aspects. However, only holistic system solutions that consider all involved processes and surrounding software integratively together, from maintenance recommendations to concrete planning to feedback, offer added value with the implementation of predictive and automated maintenance and servicing and thus create the basis for a successful predictive asset management strategy.

ferent assets on the basis of qualitatively labeled plant data—flexibly scalable and thus suitable for predictive maintenance of a single plant as well as for predictive asset management for geographically distributed plant networks. This creates an additional, AI-independent explanation layer whose simple visualization makes the system's decisions comprehensible and usable even for non-data analysts. The basis is provided by Qualitative Labeling (see Figure 1).

When planning maintenance and repair, there are various challenges that have to be reconciled on a daily basis. If a machine is at a standstill, it devours money every minute. However, it is also clear that over-maintenance causes unnecessary costs due to strict maintenance cycles. Consequently, it is necessary to balance high availability with minimum maintenance requirements. This challenge becomes greater the more machines are in operation. This is because the number of influencing factors increases with each plant, some of which are mutually dependent or mutually exclusive (multicriticality). In this balancing act, many companies rely on a forward-looking strategy in which optimized maintenance and servicing decisions are made by continuously monitoring the condition of the machines. Solutions that not only take into account technical data, e.g., pressure, temperature, or hours worked since the last maintenance, but also include business as-
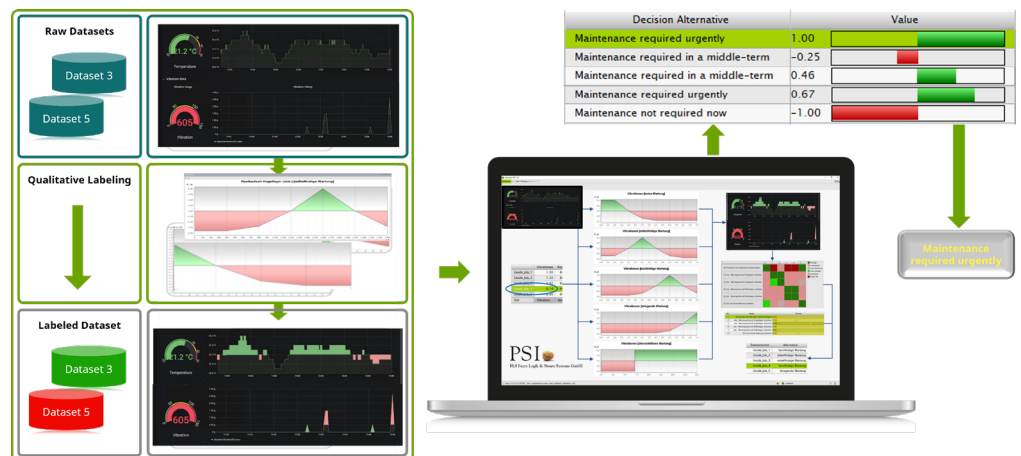

Figure 1: Process of Qualitative Labeling of machine data in predictive maintenance.

pects such as adherence to schedules, utilization of resources, state of depreciation, or need for modernization in the decision-making process—in a cumulative and balanced manner—have proven particularly successful. Due to the volume of data and complex interactions, this is achieved primarily by AI-based methods.

Flexible scalability thanks to labeling algorithm

Qualicision's field-proven AI-based, self-learning decision support and optimization continuously evaluates dif-

Using a corresponding labeling function, the software observes, for example, which temperature ranges of the sensor data provided indicate a need for maintenance and differentiates between positive, i.e. more desirable, machine states and negative value ranges, i.e. undesirable machine states. It then assigns positive and negative connotations—the so-called labels—to the corresponding sensor data.

Understandable visualizations

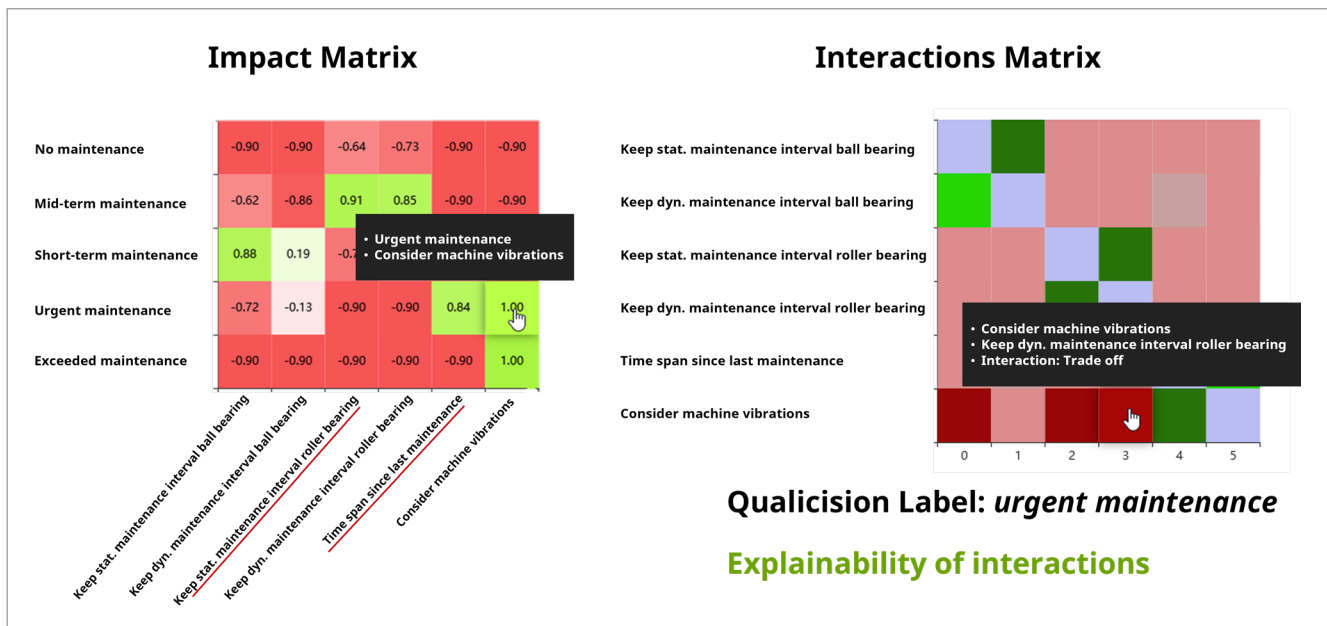The software establishes interactions between the determined labels and

Figure 2: Impact and Interactions Matrix—AI-learned Qualitative Labels with Interactions.

recognizes patterns in them, from which it derives short-, medium- or long-term maintenance recommendations (maintenance labels). Once defined, the labeling functions process and connote any signal sequences. By visualizing the labeled data in impact and interactions matrices, the software allows users to easily understand the derivation of recommended actions and interactively operate the system. For the machine observed in Figure 2, for example, the system recommends urgent maintenance. It can also be seen that the software has taken vibration data into account for this purpose, as well as the dynamic maintenance interval to be observed. The difference to common methods lies less in the results of the forecasts than in the form of their presentation, which enables users without AI expertise to understand and evaluate the basis for decision-making. Thus, users can confirm or reject the

recommendations or adjust the sensitivity of the labels via sliders. From this feedback, a stored learning algorithm in turn derives further patterns and learns continuously via an integrated machine learning process.

Step by step to a predictive asset management strategy

Anyone who operates machinery or plant parks must find a good balance between the highest possible availability and the lowest possible maintenance costs. This can be achieved by holistic and consolidated asset management. Optimized, the relevant in-

teractions can be managed by using artificial intelligence methods, especially if these show those people in charge of the process recommendations for action, the evaluation of which does not require any knowledge of AI. Software solutions for optimized maintenance and repair management are also practical if, in addition to suitable scaling options, such solutions can also map the entire process from maintenance recommendations and concrete planning of maintenance operations to continuous monitoring of the processes (Figure 3, left), e.g., by means of messages on the process-

Figure 3: PSIjscada/Qualicision dashboard for Predictive Asset Management and PSIcommand/Qualicision.

ing status of maintenance and repair operations, and are therefore suitable for both predictive maintenance and predictive asset management scenarios. In the example, this is done by taking into account other influencing factors that are processed using the same systematics and the principle of Qualitative Labeling. Likewise, the learning logic that can be used in the background can learn interactions and systematics at a high scaling level. Consequently, the only change concerns scaling, e.g., with regard to the use of databases and further maintenance management tools such as PSIcommand. On this basis, companies can also gradually approach predictive asset management with predictive maintenance for individual machines and plants and implement a holistic strategy for asset management (Figure 3, right) in the sense of a rolling intelligent process. ◉

PSI FLS
Fuzzy Logik & Neuro Systeme GmbH
Dr. Rudolf Felix
Managing Director
felix@fuzzy.de
www.qualicision.de