
mandelli
SPARK

The algorithms of reliability

COLLECTING AND PROCESSING DATA, TO PROVIDE USEFUL INDICATIONS ABOUT HOW A MACHINE TOOL IS OPERATING AND WHETHER A **TECHNICAL INTERVENTION IS NECESSARY**. THIS IS THE TASK OF IPUM@PREDICT, THE IPUM@SUITE4.0 MODULE DEVELOPED BY MANDELLI SISTEMI IN PARTNERSHIP WITH CAMOZZI DIGITAL.

by Davide Davò

The technological evolution of machine tool industry never stops because the market is always looking for tools that improve specific aspects of the sector. Company needs change over time so production systems have to adapt to the new scenarios. Even in high output industries, the single lots are stepping aside in favour of different product lots though important in quantities. That's why the machine tool performance required now are changing. Production departments are focusing on the continuity of plant operations more than on their dynamic performances but this aspect does not only depend on how the machine has been designed or on its technology: the main role is played by the conditions a plant operates every day and how maintenance is carried out. «Under this point of view, predictive maintenance is strategic to detect any possible precocious wear of a vital component and consequently arrange its replacement in due time – says Marco Colombi, Sales Manager at Mandelli Sistemi. Besides, the many sensors on board monitor the data collected and alert the operator in real time about any possible malfunctioning so as to intervene on the machine parameters and restore the system to its optimal operating conditions, thus extending its uptime. These are the two main aspects that

Left : Mandelli Sistemi is an Italian company highly committed to technology

Right : The partnership with Camozzi Digital has brought to life a project that enhances the value of Made in Italy in the world

represent the essence of predictive maintenance according to Mandelli and these are the guidelines Mandelli has followed together with some partners while developing iPum@predict, the module included in the iPum@suite 4.0 package to take its customers fully into the digital production era where our SW solutions can contribute to increasing the efficiency of our production systems through a correct use of the information available».

A complete suite

Mandelli is familiar with digitisation as it has been developed within the company since the beginning of the 2000s. The recent revolution of sensors and digital tools has allowed Mandelli to turn these projects into real solutions which were first introduced at BIMU 2016 under the name of iPum@suite 4.0. It is a suite which includes five different products developed according to the principles of innovativeness, imagination, intelligence, ingenuity, inspiration and intuitiveness. In detail, iPum@control is a renovated version of the Mandelli user interface using a 22" MultiTouch screen to make the use of machines much more intuitive.

iPum@reality is an APP using Augmented Reality which, firstly conceived to support the operator in solving problems and failures while combining virtual and real information, can now be considered a cross technology Mandelli is using for Pre Sales, Design, Assembly and Customer Care.

iPum@scada is the SW controlling the FMSs and FMCs which avails of the 30-year experience Mandelli has in this field. iPum@smartcut is the HW and SW system offered to guarantee optimal operating conditions based on the onboard sensors which detect the machine vibrations during machining. An algorithm implemented by the NC processes the data and adapts the cutting parameters to avoid damage to the workpiece or the machine.

Everything starts from the sensors

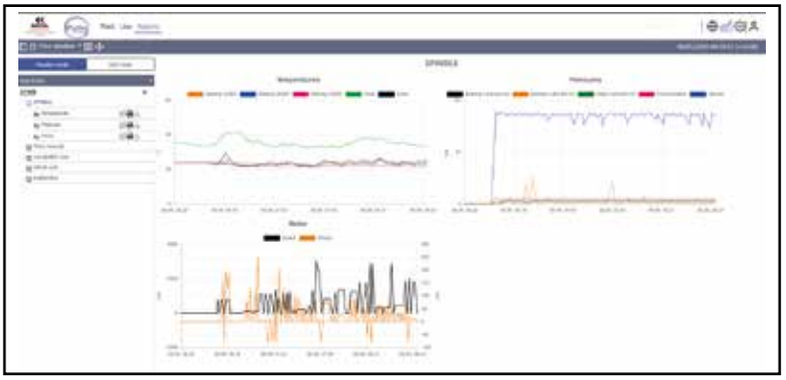
iPum@predict is the high technology module that completes the suite, dedicated to predictive maintenance and developed in partnership with Camozzi Digital.

«iPum@predict represents the highest evolution of the 2016 concepts that took us to introduce iPum@ - says Giuseppe Galbiati, Project Manager at Mandelli Sistemi. The quantity of sensors installed on our machines enabled us to collect a large amount of data related to different values and systems of the HMC. In order to develop an efficient predictive maintenance it was necessary to optimize the data acquisition and this is the reason why we have firstly identified the main values to be taken into consideration and where to get these data onto the machine so as to change the position and the type of sensors on board. At the same time, we also started looking for a partner having the right know-how, such as ICT, mathematical, industrial automation and processes, to turn our project into a real solution devised for the market. Soon we became aware of a critical issue – adds Giuseppe Galbiati – which was that all the companies we had started talking about the project had great mathematical knowledge but it was poor in terms of production. In fact, we needed a partner with this knowledge too to be able to cope with all the criticalities that may arise when a virtual model is put to the test into real life. Our search ended in 2018 when we met Camozzi Digital. Their knowledge of industrial world, their ability to understand the meaning of a digital value and their approach to our project immediately convinced us and it's with them that we started developing iPum@predict».

Marco Colombi, Sales Manager at Mandelli Sistemi

A first-class partner

Firstly, Camozzi Digital investigated one of our HMCs model Spark 2100 equipped with last generation sensors. They reviewed the sensors data together with the reports of our Customer Care Dept. so as to subdivide the machine into 8 main sub-units to focus their attention on.



Left: iPuma@predict provides useful information to monitor the machine status

Right: Cristian Locatelli, General Manager at Camozzi Digital

«Following the philosophy at the basis of Mandelli's project, we developed iPum@predict so as to be successful on all types of machine – says Cristian Locatelli, General Manager at Camozzi Digital. The subdivision of the system into sub-units soon gave positive feedbacks which were later confirmed by other machines being assembled at Mandelli's and other systems already installed at some of our customers' that served as beta-testers. Thanks to these tests on different machines and applications we have collected an important amount of data and experiences that enabled us to optimize the algorithms and make their results more and more reliable. In detail, Camozzi Digital's approach is based on three pillars. The first is the precise definition of the infrastructure necessary to collect the data and make them available. The second is the data collection, filtering and analysis. The third is the making of physical models and statistical algorithms. Today iPum@ hosts more than 25 algorithms monitoring the machine parameters – adds Locatelli. Every algorithm refers to 4 or 5 different values which are interrelated, data are collected 24/7 and processed according to a time schedule agreed between the customer and Mandelli and the real risks or needs. It has been a really tangible job, started with Camozzi Digital's experience and developed thanks to Mandelli's technical know-how which led our data scientists onto the right path».

Always updated

In practice, all the work made by the two partners has become a tool which is really easy to use as it does not require any special IT skills. «The customers of iPum@predict simply have to turn on the system through a customized and protected web page in which they will find all the date related to their HMCs in the workshop – says Colombi. Our technicians analyse the data and report the wrong parameters which do not allow the HMC to work properly. This way, the customer only has to read the alarms and modify them to avoid excessive wear on a specific unit or part. In practice, iPuma@predict is not only useful to plan maintenance interventions but also to support the customers and assure their machines the longest lifetime». ■

Tools like Augmented Reality are used widely by Mandelli Sistemi