




Choosing Avantec as main supplier is based on professional dealing with the task of the project by the very beginning. Avantec put up concrete objective data for discussion already in advance and questioned some decisions of IMC; as well with its knowhow and the quality of its consulting it contributed to optimization.



**INSIDE THE PLANT OF
INDUSTRIE MECCANICHE
CIMOLAI THEY ARE REALIZING
16 STEEL BEAMS, EACH
WEIGHING 760 TONS.
THEIR DESTINATION:
THE ALLSEAS PROJECT.
FUNDAMENTALLY
IMPORTANT IN THIS
MACHINING PROCESS IS
THE ROLE OF THE TOOLS.
THAT'S WHY THEY COME
FROM AVANTEC.**

[UTENSILI]

di Andrea Martinello

Machining *BIG*

The Friulian company Cimolai is known throughout the world for its specialisation in the area of large metal constructions. Among the structures recently implemented are the National Stadium in Brazil in which the World Cup 2014 matches were played, the railway station of the high-speed route in Reggio Emilia Italy, the imposing swing bridge in Bordeaux France; currently under construction are the locks of the Panama Canal, the steel framework of the World Trade Center HUB, the third bridge over the Orinoco, the new protective shield of Chernobyl, to name a just a few of the current projects. The production range is quite broad and includes bridges, municipal buildings and industrial buildings, military facilities, the hulls of ships and welded girders for the shipping industry, i.e. offshore industry. The Cimolai Group has 1200 employees distributed in 10 manufacturing facilities; including the IMC Plant in Monfalcone, Italy (acquired in 2002 with a total area of 278,000 m² and direct ocean access), which is particularly well-suited for the manufacturing of large parts.

The beams – 64 m in length 4.5 m in width, and 6 m high – are attached to a gigantic catamaran 380x140 m) designed for transport of oil platforms on the open sea; the beams with the aid of a complex lever mechanism system contribute to setting up new platforms, or are used as aids in replacing older parts and components as part of regular maintenance tasks. The complete plant in Monfalcone is used exclusively for machining of the beams, one hall is for the welding work and for other preliminary tasks necessary for the gigantic constructions, and a second hall is intended for the processing with machine tools. The workpiece is processed directly on the machine, a Soraluze FXR 64000 milling and drill-

right side: complete view of the steel beams at Meccaniche Cimolai machined with Avantec tools

down left: face milling of a part of the beam made of Inox with 7 m of height

down right: detail of a machined arch



ling centre (with travel distances for the X-axis of 64 m, Y-axis 8 m and Z-axis 3 m). The size of the component, the narrow tolerances necessary and the rigorous requirements in terms of machining time (the entire manufacturing time must not exceed 15 workdays per beam; specialists working 24 hours a day, seven days a week) compelled Cimolai to plan all operations and processes very carefully and very

precisely. And these requirements also necessitated the selection of suitable tools so that the different machining processes could be executed smoothly and the potential offered by the machine could be ideally exploited.

The role of the tools

Machining of these types of gigantic components represents a great challenge for

Machining BIG

everyone, and naturally it also represents a great challenge for the tools selected for the milling process. Avantec, which this year celebrates its 25th company anniversary not only delivered the milling cutters for the machining of the beams, the collaboration of the two companies extends from analysis of the machining strategy, to the 1st test phase of the tools used (several of which were specially developed for this application as special solutions), to monitoring of the cutting data and service life, and ultimately the machining of the first beam, for which the technicians from Cimolai and Avantec were able to jointly verify the developed strategy in its implementation. The beam consists of a steel welded construction that is machined in parallel on two sides to provide the seats for the guides of Hardox 400. For the most part, the



Detail of the so called hedgehog milling tools used to machine the steel beams



Machining of the channel of the bearing seat with a Avantec disc miller

left side: side milling cutter for finishing the saddle

right side: shell end cutter for the rough machining of the steel beam made at Industrie Meccaniche Cimolai

materials to be processed are machine steel S460 and INOX 316L. Dimension tolerances of 0.15 mm (from -0.052 to -0.2 mm) must be maintained - not an easy task for such a large component. However, first and foremost, the main requirement for Industrie Meccaniche Cimolai (IMC) is the ability to ensure process reliability for the demanding roughing or fi-

nishing operations. Consequently, selection of the company was based on tools that are capable of ensuring maximum reliability and constancy of performance under difficult and complex conditions, not just due to the work height or the enormous projections, but also due to the tight machining times required. Vibration damping, service life of the cutting edges, and naturally also the soft cut of the Avantec miller cutters, above all, were the determining factors for the use of AvantecH tools.

Tool package as turnkey solution

Avantec supplied IMC with all milling cutters required for machining on the beams.

A „complete package“ consists of different face milling cutters, shell end mills with different lengths and dimensions for contour processing and side milling cutters for simultaneous machining of the two beam grooves. Together, Avantec and IMC analyzed the complete process; the critical points were intensively investigated and the best milling strategy was determined to assure the end result and thus avoid unpleasant surprises. In this regard the machining of the first beam, which was supported step-by-step by Avantec technicians, was of fundamental importance, in order to quickly and correctly implement the changes and corrections in the planned strategy.



left side: one of the milling tools of Avantec delivered to IMC for the machining of the steel beams

right side: machining with a side miller. Note the throat depth of approx. 2 m



„The technical support provided by Avantec was the decisive factor for us“ emphasizes Pier Paolo Polita, who is responsible for mechanical machining at IMC – „actually the collaboration first came about through this project: We preferred Avantec over various potential suppliers mainly due to their professional attitude; right from the start Avantec brought concrete objective data into the discussions and questioned several of our decisions that we had originally planned, and then they demonstrated their know-how, as well as the quality of their specialized knowledge. For example, initially we were opposed to using shell end mills for this difficult machining. However, after we tested the milling cutters and saw them used in practice, we had to change our opinion in this regard.

This was actually the type of support that we had been looking for, namely to arrive at the optimal machining process step-by-step together with a competent partner. With the second beam we had already succeeded in

Machining of the saddle with the hedgehog miller D.92 ap = 130 mm and ae = 20 mm



TOGETHER, AVANTEC AND INDUSTRIE MECCANICHE CIMOLAI HAVE ANALYSED THE PROCESS TO BE SURE AND CERTAIN OF THE END RESULTS AND

NOT TO HAVE ANY SUPRISSES

maintaining all processing times and achieving the intended goals.“

Concrete advantages

The particularity of the Avantec milling cutters – all with mechanical fastening systems – consist of the highly positive cutting geometries and the precision-ground indexable inserts. These key advantages enable extreme feeds, which means that the capacity of the machine can be optimally utilized. The high-precision ground carbide inserts can ensure consistency of service life, as well as the utmost process reliability. A critical factor for processing the beams is the vibration that unavoidably occurs with the superimposed welding construction; its enormous weight does not permit positioning; in addition thermal drift must also be taken into account. We determined that these milling cutters also work optimally in this case, i.e. the workpiece does not absorb heat during the machining process“, – explains Mr. Terraneo – „the entire heat development occurs on the shavings and not on the workpiece.“ Even at the critical points – and particularly on the part made of INOX 316L, which is welded onto the beam at a height of 6 m, the Avantec milling cutters were equal to

our requirements. With such a heavy material as VA, even small vibrations can have serious consequences that affect the service life of the indexable inserts and the quality of the processing, and at a height of 6 m the work conditions are certainly not the best. Moreover, extremely narrow tolerances must be complied with: For the upper guides of INOX, where the gear rack for the drive of the beam is located, the required tolerance (on the guide surface) is 0.05 mm over a length of 2270 mm. Another critical point is the front saddle on the beam (seat of the bearing) that requires a certain coaxiality between the two sides. Here the contour is processed with the side milling cutter; note that the RAM of the machine extends almost 2 m. In this case the milling path of the tool is so great that a consistent quality of the coating, as well as of the finished surface, is required from start to end. The Avantec milling cutters are capable of assuring the process stability desired by IMC, which is absolutely indispensable for manufacturing such gigantic components under particularly difficult conditions, 24 hours a day, 7 days a week.