BW COMPETENCE

BURKHARDT+WEBER PROJECT-REPORT

Forward-looking manufacturing processes

BW BURKHARDT + WEBER

Strong and accurate since 1888

Quantum Leap in Manufacturing Technology

Shortly after the acquisition of BURKHARDT + WEBER by Indústrias ROMI S.A. in February 2012, a project team of manufacturing experts from both companies was formed, to define and develop joint efforts towards combining beneficial manufacturing know-how. And urgency was demanded, as the ROMI board had already decided to integrate and relocate the older plant operations in the Santa Bárbara d'Oeste downtown area into the new factory located on the outskirts of the city.
Of course, there is always a leap in technology associated with such milestone setting decisions.

The new ROMI factory at the outskirts of Santa Bárbara

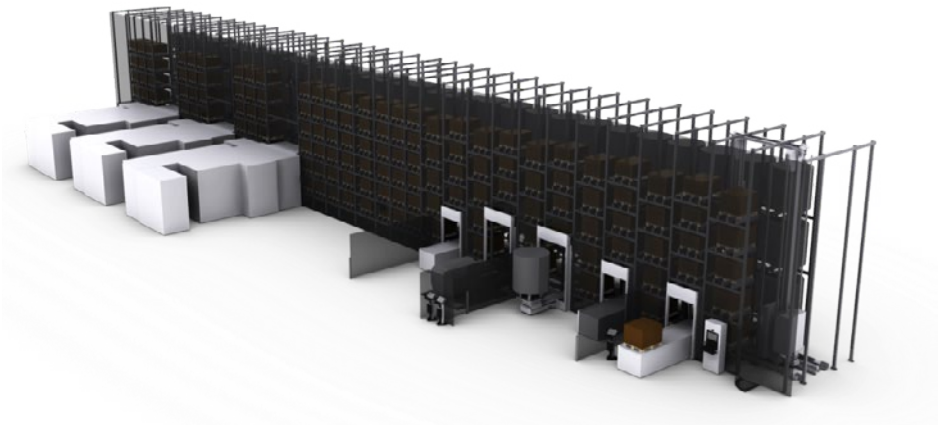
Together with the Brazilian colleagues, thorough investigations of the production capacity requirements, the possibility for lead time reductions, the optimization of component set-ups, and the benefit with 5-axis machining were started. Specification of the ROMI board was to invest in today's proven most advanced manufacturing technologies in order for ROMI to be ideally positioned for both, the national and the international markets. This demanded a flexible manufacturing system with capabilities for a lights-out night shift, highly flexible, and performing with highest efficiencies while delivering top accuracies.

The assembled team benefited from German-speaking ROMI members and Portuguese-speaking engineers from BURKHARDT+WEBER. First, an inventory of existing production processes was made: which parts, with what lot sizes, and within which part families had to be manufactured together; what materials and what special sequences for part fixturing had to be observed. In total, over 150 major machine tool components were examined, and associated to modern modular tool and fixturing technologies. After that, everything was grouped by families of parts, and lot sizes, with priority definitions for the volume parts. Also important was the integration of in-process measuring techniques to avoid the previously needed manual interventions as much as possible, together with automatically generating interim quality protocols for the finished parts. By applying more efficient, modern tool technologies the machining times had to be reduced significantly and intermediate manufacturing steps had to be eliminated.

Soon it was apparent that most part sizes fit within a 1.0 m³ - 1.5 m³ envelope, and about 20% of them could be completely machined in one set-up on 5 sides. As expected many of the common qualities for form, angularity, and position tolerances were within the 10 µm range for length up to 1,000 mm, and dimensioned in IT7 or IT6 qualities. High demands were also parallelism and the overall part envelope accuracies. For machine bases, supports, support-housings, slides, headstocks, guide-housing, etc., that are not extraordinary requirements for BW, who delivers precision CNC machining centers to many well known reputable German machine tool manufacturers since decades already.

After defining the overall concept, the next task was the selection of the machine types and sizes. Because highest flexibility was needed to allow major volume capacity changes, it was determined that all three machining centers were best to have the same work envelope with identical axis strokes. And to prepare the system for future increases in parts applicable for complete machining on 5 sides or those benefiting from 5-axis machining, two machines where equipped with a 5-axis HV-headstock and only one with a horizontal spindle.

The final selection resulted into a system arrangement with two MCX 900 HVC machines and one MCX 900. The MCX 900 series has a swing capacity of 1,700 mm, features a Z-axis stroke of 1,600 mm, also integrating deep-hole drilling, and has a pallet load capacity of 3,000 kg. All machines were equipped with a high accuracy package for close tolerance machining with high-precision positioning capabilities. The MCX 900 with the horizontal spindle was also equipped with the very successful BW tool extension. This extension tool is stored in BURKHARDT+WEBER's industry leading rack-magazine, and thus enables the use of any standard tool, in combination with this 350 mm long extension, which also supports fully automatic tool



The complete manufacturing system with 120 maschine pallets and 150 storage locations

MCX with tool magazine for 450 tools

exchange. Thus, deep-seated bores can be precision machined in combination with the tool extension using short tools, or for example when far reaches from one side through holes are required.

All three machines were equipped with the large tool magazine featuring 450 tool pockets capacity and tool lengths up to 1,000 mm, thus achieving the highest flexibility and to eliminate tool rearrangements between machines. For the lights-out shifts also sister tool capacity was demanded. Special tools with up to 75 kg in weight and 140 Nm handling torque round up this modern tool handling system where process monitoring and tool-chip encoding is already the standard. However, in order to make a really big step towards flexibility, shorter lead times, and just-in-time production, the three MCX 900 were fully automated at the part supply side. Here the ROMI/BURKHARDT+WEBER team decided for a high-rise storage system from Fastems because it featured single sourcing with a Brazil based manufacturer support and service, both for the storage system hardware and the system controller. The 4-level pallet storage system selected offers 120 storage locations for machine tool pallets of 800 x 1,000 mm size with additional 150 storage positions for material pallets. To realize the overall parts envelope, the system has two loading stations for machine pallets with rotation and two correlated ready stations for material pallets, as well as a material input station to load the system with raw parts on pallets.

MCX 900 integrated in Fastems storage system

In the material shelves, raw parts are stored together with semi-finished product, and part fixture components, to best react quickly to varying part fixture demands and changes in the manufacturing needs. The overall system control is networked to the FMS control and the production planning system, as well as a higher-level ERP (Enterprise Resource Planning) system. The system has an overall length of 60 m, is almost 10 m high, and already prepared for the integration of an additional fourth MCX 900.

During the manufacturing of the machines at BURKHARDT+WEBER in Reutlingen, the ROMI team in Brazil was not idle, but busy with designing and manufacturing tasks for basic and special tool kits, the sourcing of purchased tools, and the generation of the CNC part programs using their PLM system and post-processor. Thus, ROMI would be ready to start-up the machining system quickly, after arrival at their plant. This was then accomplished successfully after the commissioning and quality acceptance at the ROMI plant in Santa Bárbara. In March 2014, within a few weeks, the production with the FMS was ramped up quickly to full capacity by ROMI technicians, supported by BW technology experts. The ceremonial inauguration of the entire system took place together with the opening of the new ROMI showroom building, now housing 9 ROMI demo machines. This enormous investment, which totals in excess of US$ 7,000,000.00 makes ROMI a trendsetter for the Brazilian machine tool industry, and the interest of ROMI and BURKHARDT+WEBER customers in this investment is equally large.

The ROMI Technology Center in Groß-Gerau

ROMI Europe – Machine Tools Made in Brazil

Since its founding in 1930, ROMI has established itself as the largest machine tool manufacturer in South America. Equally as large is the machine range offered, starting with simple manual lathes, cycle-controlled CNC lathes, fully automated turning centers with turn/mill capacities to heavy duty lathes with up to 100 tons between centers or vertical lathes with up to 7,000 mm turning diameter. Also vertical and horizontal machining centers and boring mills are produced. Today's modern ROMI factory, located at the outskirts of Santa Bárbara d'Oeste, has an extremely high manufacturing depth, starting with two wholly-owned foundries, and an in-house cable assembly for wire harnesses. More than 50 types of machine tools are manufactured and the annual production quantity results to about 3,000 machines. This makes ROMI one of the biggest players among the machine tool builders in the world.

Common to all ROMI machines are generously dimensioned components, high reliability, precision, and flexibility through an ample variety of options. With a network of sales offices and technology centers, especially equipped for customer support, ROMI covers the European, American, and the Asian markets. Support for the European market is responsibility of the Romi Europa GmbH in Gross-Gerau, Germany. Since 2001, the ROMI Europa GmbH offers from this location their innovative product solutions, with strong technical support, which includes service and spare parts. For the German and European market the following ROMI product lines are available:

- Cycle-controlled, CNC flatbed lathes, for swings ranging from 420 mm to 1,000 mm, rounded up by their heavy duty series featuring a maximum swing diameter of up to 2.6 m with up to 12 m center distance, and even an extra heavy duty lathe for up to 100 tons workpiece capacity between centers.
- Vertical CNC turning centers from 500 mm to 7,000 mm turning diameter.
- Turning centers with main- and sub-spindle, rotating tools and CNC controlled Y-Axis.
- Vertical machining centers in conventional and 5-axis designs with full 5-axis contouring capability.

New ROMI showroom in Brazil

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