

## MACHINING ROBOTS BRING STONE MASON'S SKILLS INTO THE 21<sup>st</sup> CENTURY

**The latest robotic technology, state of the art processing equipment and an environmentally friendly, healthy and safe business approach are not what might be readily associated with the stone quarrying industry, but at JWQ (Johnson Wellfield Quarries) in Huddersfield investment in new facilities and a desire to produce sustainable engineered, natural stone, has significantly extended capabilities for this 150 year old quarry.**

JWQ are part of the family owned and managed Myers Group of companies, a Group started in the 1950's and focused on supplying building materials to the construction sector. The Johnson Wellfield quarry is located just outside Huddersfield and has a long history right back to the Industrial Revolution. It was acquired by the Myers Group in 1978 and has been the subject of significant and ongoing investment that continues right up to the present day. Their most recent investment is a robotic machining facility using Stäubli 6 axis robots and the latest Robotmaster CAD/CAM software; all integrated into JWQ's production system by Rochdale based, CR Solutions.

Over the years JWQ has been the source of top quality sandstone used in many high profile applications such as paving and seating in Paternoster Square, London and the highly praised St George's Square restoration in Huddersfield.. A recent opportunity to provide artistically sculptured sandstone planters and seating units for the Sheffield City Council redevelopment of Tudor Square in association with the Crucible Theatre renovation in Sheffield City Centre convinced John Myers that a radical approach to machining natural stone was needed.



To identify the processing equipment that would meet their need to machine stone to a wide range of shapes, JWQ conducted research into alternative production techniques and concluded that if possible, a bespoke 6 axis robotic solution would be the preferred solution. Consultation with CR Solutions

provided additional expertise and guidance.

Initial contact with Stäubli Robotics in Telford quickly lead onto a demonstration of the capability of their 6 axis robots to machine stone to the shapes and precision required. A visit to their state-of-the-art

factory in Haut Savoie, France convinced JWQ that Stäubli was a robot supplier with a keen interest not only to provide a 6-axis machine of suitable size but also to work with a project team who were determined to achieve a successful outcome to such a challenging project.

Whilst there are other proprietary solutions available to the masonry sector, the contractual obligations of the Sheffield Project demanded extraordinary levels of commitment from all the parties involved and JWQ opted for a bespoke solution from a team of dedicated suppliers.

Converting CAD drawings into instructions that can be used to operate a robot arm is a specialized field and Robotmaster are recognized as the leading supplier of the software to make this transposition. The individual stones for the planters were works of art, with no geometric shape and the files necessary for the machining process were of such a size as to stress the software to new boundaries.

Machining robots are the latest introduction to the broad Stäubli robot range. They are capable of high speed machining; a spindle can be directly integrated into the robot forearm. The drive to the spindle and all associated services such as cooling and lubrication can be placed inside the robot arm, and

connected to the various supplies via the robot foot. This design ensures a protection class of IP65 for the complete arm and IP67 for the wrist. The option of pressurization can be specified where required.



Stäubli's VAL HSM software controls the robot arm and manages all required functions; Robotmaster/Mastercam software is used to import and translate CAD/CAM data, apply and optimize 6-axis robotic tool paths into Stäubli's VAL3 language, which can then be used to control the robot. The sophisticated Robotmaster software provides the ability to program the robot arm as simply as a CNC machine tool and automatically generates the toolpaths, optimizes them for the specific robot model, detecting and avoiding any potential collisions with full visual simulation of the robot machining process.

Tests performed on various materials from alloy and stainless steels to Inconel 600 and aluminum have proved the accuracy and repeatability of Stäubli's machining robots. Machining of the Crosland Hill stone is no different to any other material in so far as the choice of tooling is critical to the accuracy achieved.

The stone machining demonstration at Stäubli convinced JWQ that robots were capable of machining and sculpting of stone. Three RX270 6-axis robots were ordered complete with Robotmaster software. The design and construction of the multiple robot production facility, machining stations, spindle design and tooling were all carried out by the Myers Group In House teams, with electronic integration provided by C R solutions.

Robotic machining has additionally introduced new possibilities for surface texturing on the stone surface, significantly adding to the aesthetics, presenting an innovative and pleasing artistic appearance. The textures would be difficult if not impossible to achieve by any other production process.

Interestingly, Shaun Berry, Unit Manager of JWQ, adds another benefit that the machining robots have brought to his company, "One of my main objectives is to improve the workplace for our employees, traditionally stone masons have worked in dusty, hazardous conditions and when using pneumatic chisels can suffer from vibration injuries; the new robotic system removes these dangers completely".



Machining robots are opening up new markets for Stäubli, but already the benefits of adaptability and lower cost over traditional CNC machine tools is being appreciated by customers seeking to 'future proof' their machining capabilities. Stäubli's range of robots is continually being developed, traditional high speed, high precision robot applications in the pharmaceutical, electronics and plastics sectors are being extended into markets new to robotics. The range now comprises both 4 and 6 axis robots with handling capability from 1kg up to 250kg and to a maximum reach of 3210mm. New applications are

continually being developed as users realize the benefits that flow from a comprehensive understanding and appreciation of the wide ranging capabilities of these advanced, user friendly, robots.

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