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Robotized Spraying of GRC Panels

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ROBOTIZED SPRAYING OF GRC PANELS

THE NEED

The process of spraying GRC (Glass Reinforced Cement) panels is still totally manual in most of the factories. The decrease in an adequate supply of labor, the need to increase productivity, to reduce costs and to achieve higher quality standards are the primary motives driving automation.

THE TECHNOLOGY

The manual manufacturing process of GRC panels consists of two or four consecutive stages, depending on the panel type. Each phase consists basically of spraying a layer of mortar and glass-fiber with a concentric spraying gun.

FIGURE 1 EXAMPLE OF APPLICATION GRC PANELS AS WALL UNITS

The mortar and the glass-fiber are mixed outside the gun while spraying. In successive spraying cycles, several elements, such as insulation and anchoring, are placed in the panels. Additionally, there are also series of operations prior to the spraying as well as operations to be executed after the spraying.

The robotized spraying process is controlled by three (3) main modules which are executed sequentially or in parallel, depending on the task. The first module utilizes a common CAD environment with access to information relating to the manufacturing

tools and parameters and to the design rules for the product. The off-line module is divided into three different submodules: kinematic control, path planning and task planning.

FIGURE 2 SPRAYING CELL

It uses the information generated by the CAD environment. The last module controls the whole lay-out, including the robot and peripheral equipment. The on-line control performs both the scheduling and monitoring of the system.

FIGURE 3 SYSTEM STRUCTURE SCHEME

THE BENEFITS

The main advantages over traditional forms of construction are lightness, good structure resistance and excellent superficial finishing of GRC panels, which make them very useful.

Key aspects of this robotic manufacturing system are: a) a high level of integration among the system modules, b) communications and management of data and information throughout the system as a whole and c) automatic process, task and path planning of robots and specialized machines.

The system has been designed to take into account the flexible manufacturing concept. The robotized flexible manufacturing system has been developed to be used on a group of different applications which are connected with 3D surface treatment: spraying, painting, cleaning, sealing, etc.

The uniformity of the layers sprayed by the robot is greater than in the manual application, because the robot describes rectilinear trajectories in a specific direction over the mold surface, being transverse to the layers projected before. Additionally if the cross-section is very irregular, as in manual application, it is necessary to add excess material to cover the error in the zones which have not achieved required thickness. The robotic surface application results in a significant savings of material.

The robotized system replaces workmen in one of the hardest tasks involved in the production of GRC panels, the application of the mortar. This operation is done in a polluted environment due to the use of cement and glass-fiber.

The quantity of material to be applied by the gun is 28 kg/min. for the robot spraying versus 12 kg/min. for the manual application. The spraying of the mortar with much higher pressure eliminates intermediate compaction. This is a fundamental part of the manual application. The removal of compaction reduces handling and therefore the robot non-productive time. This increases the overall productivity significantly. This system demonstrates the advantage that automation can bring into quality and factory productivity in an off-site manufacturing process.

STATUS

The most common applications of GRC panels are for wall units, urban furniture, and ornamental decoration. A prototypical system has been finished, and is now producing panels in a Dragados Construcciones factory near Madrid, Spain.

BARRIERS

Capital costs of initial investment. Associated economies of scale or mass production must be realized to reduce costs, recover the investment and achieve profitable operations.

POINT OF CONTACT

Dragados y Construcciones, S.A., Avda.

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REVIEWERS

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