

The Geometry of Success: The Automation of Achievement

SUCCESSFUL AUTOMATION OF A LINE OF G.R.C. PANELS USING SIMULATION

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ABSTRACT

This article presents the modeling and simulation study to optimize the manufacturing process of prefabricated G.R.C. (Glass Reinforced Cement) panels for building facades. The process optimisation has changed the tasks organisation, and a proposal to automate the works with more value added has been made to increase panels productivity and quality.

The main characteristic of this products is the flexibility to obtain panels with complex three-dimensional forms. The "DRACE System of GRC: Prefabricated Panels for Building Facades" published in (DRACE 2001) has a detailed explanation of characteristics, specifications and manufacturing operations of GRC panels.

INTRODUCTION

Construction industry automation is still well below the levels of other industries, although an increasing effort has been made in recent years. Applying automation in this important sector is difficult because of the non-repetitive processes and the low level of standardisation. Construction activities can be divided into two main groups: off-site and on-site. On site processes are more relevant and form what is considered typical construction work, i.e. building, civil works, etc. Off-site construction processes are more suitable to be automated, since the work takes place in a structured environment and process variables are under control.

A common off-site process is the manufacturing of prefabricated panels which are later assembled on-site. In recent years one important material used in this kind of industry is the GRC. Thanks to its flexibility, this technology has become very popular. GRC material is prepared mixing cement with small cut glass fiber strips, achieving enough flex-traction strength while maintaining light weight (60 kg/m² in comparison with

conventional concrete panels 220 kg/m²). This allows the manufacture of large panels (7x3m) of any 3D geometry, see Figure 1, with the dual advantage of easy transportation and easy assembly on site.



Figure 1: Panels of GRC with Different Shapes

The Spanish construction company DRACE has been using manually manufactured GRC panels mainly as facade units, see an example in Figure 2, for a long time. The excellent finishing quality of the external parts of GRC panels enables to apply them in a great variety of circumstances. Therefore a project to develop an automated manufacturing factory of prefabricated GRC panels has been launched by DRACE with the financial support of the Spanish Ministry of Industry.



Figure 2: Aspect of Typical GRC Facade

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born.computer vision: Achievements, opportunities, and challenges. Habib Fathi a,1, Fei . tographing a scene, the 3D geometry is projected into the 2D image .. operability should be considered for successful implementation of.students' achievement in geometry and their fundamental logical reasoning ability. The findings offer centuries) attributed their success to geometry (Clements & Sarama,). Learning .. Journal of Automated Reasoning, 32(1), 3-

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