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PROSIDYC: Simulation Program for Construction Operations

Purdue ECT Team
Purdue University, ectinfo@ecn.purdue.edu

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Other Technologies – Engineering Software

PROSIDYC: SIMULATION PROGRAM FOR CONSTRUCTION OPERATIONS

THE NEED

Currently 3D-modelling is the trend in the simulation area. However, developing 3D models of construction operations is very complex and time consuming. In general, the study of construction operations requires a tool that provides solutions without requiring the input of copious amounts of data. In order for construction company to use a simulation tool, the methodology has to be presented in a very simple and graphical context. Pictorial and schematic tools are easily accepted. In contrast, if the methodology appears t be too theoretical or analytical it will be avoided by construction practitioners.

THE TECHNOLOGY

PROSIDYC is a system for simulating construction operations jointly developed by the Planning and Methods Unit of Dragados y Construcciones, Madrid, Spain and the Division of Construction Engineering & Management at Purdue University.

PROject SImulation Dragados Y Construcciones (PROSIDYC) is a computer based system for analyzing construction job site production processes. It is used to improve productivity in the field by studying resource utilization and cycle times and identifying opportunities for production improvement. PROSIDYC uses the CYCLic Operations NEtwork (CYCLONE) modeling format originally developed by Daniel W. Halpin. A set of graphical modeling elements are utilized to develop a network model of the process of interest. The model identifies waiting or delay states as well as active productive states. The computer program allows the modeler to identify resources which are under utilized and bottlenecks in the process Linder study.

The use of this approach has achieved 100%o success in productivity improvement on the processes studied. Improvements range from 30% to 200%. Data support the fact that for every hour of analyst time used, a saving of $2,000 is realized. Therefore, for 100 hours of engineering-time invested a saving of $200.000 is achieved (Example of Prosidyc Network).

The potential for further improvements in productivity are virtually unlimited. Models developed for one project can be adapted and reused on other projects. This leads to a data base of expertise which focuses management's attention on searching out

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productivity improvements. It supports the concept that process design and improvement is a way of life. This has had a major impact on managers in the field and supported a company culture in which improved productivity is an area of daily emphasis within the firm.

This same mindset has great potential for the construction industry in general. Emphasizing design of field processes to achieve repetition leads to improved productivity and expedited project delivery without sacrificing quality and functionality.

BENEFITS

This modeling framework includes a number of benefits including:

- A simplified and stylized input module.
- Simplified linking, formats for model construction and representation.
- A resource module which expedites presentation of information about the saturation and production capacity of each resource and displays bottlenecks to assist in assessment and identification of improvements to the process.
- Preparation of a multi-activity chart which explains in detail how the work should be organized and which is easily understood by the project chain of command.

STATUS

The program has been used on over 30 projects including tunnels, maritime projects, dams, highways, etc. Examples of these projects are:

- A precast factory: PROSIDYC was used to analyze and improve the manufacturing of 29,950 precast segments for a 5.85-km sewer collector. An improvement of 44% was obtained. The production rate increased from 128 segments per day to 216 segments per day.
- Construction of floating caissons of large dimensions (42m long, 16m wide, 16.5m height). The simulation of the construction processes allowed the calculation of the precise volume, allowing a very important increase in the final production (45%).
- Improvement of the production of a concrete plant. A concrete plant was bought from a supplier who claimed a production rate of 50 cubic m/hr. In its first use the production did not exceed 33 cubic m/hr. After implementing the improvements indicated by the program, the production rate reached a value of 43 cubic m/hr, a 30% increase.
- Concrete pouring in a Roller-Compacted dam. The application of PROSIDYC provided the optimization of all the activities that were to be done in every laver.
- Renovation of train tracks without traffic interruption. The simulation program was applied to coordinate the work. The results doubled the initial estimates for the daily production.

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- Tunnel excavation. Simulation was done to improve the operations considering the available space, improvements of 20% in the excavation cycles were obtained.

The interaction between Purdue and Dragados is continuing with projects in progress to improve the PROSIDYC system by utilizing, an improved Windows interface.

Barriers

- Lack of focus on savings to be achieved using construction process analysis
- Need to use a special department with expertise in simulation to gain advantages with this method

Points of Contact

Daniel W. Halpin, Head of Division of Construction Engineering and Management, Purdue University, Phone: (765) 494-2244, Fax: (765) 494-0644, E-mail: **halpin@ecn.purdue.edu**
Edmundo Balbotin Bravo, Dragados y Construcciones, Chief, Planning and Mthods Unit.

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Reviewers

Peer reviewed as an emerging construction technology

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