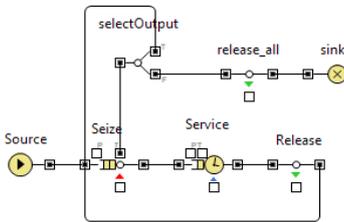
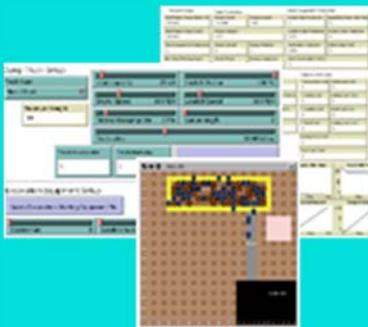


Modeling and Simulation Services

“The knowledge gained through simulation reduces the risk associated with important decision making in real life.”



CCT has been providing its Construction customers modeling and simulation services since 2005; be it schedule validation, low level resource planning, performance improvement, process optimization, look ahead scheduling, assessing direct and indirect impact of employee changes (delay and disruption, lost productivity & rework), and quantification and justification of claims.



Earthworks Simulator



Asphalt Paving Simulator

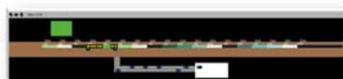
As construction projects grow larger and more complex, managing them using traditional techniques becomes too much of a hassle. It is at this point that computer simulation becomes essential to be incorporated. Computer simulation allows the modeling of projects ranging in size and complexity from a room in a building to a fully-fledged facility or project. Using computer-generated scenarios, computer simulation allows engineers to visualize their end project, estimate the required resources, locate bottlenecks, and forecast time and cost requirements without having to perform on site analysis.

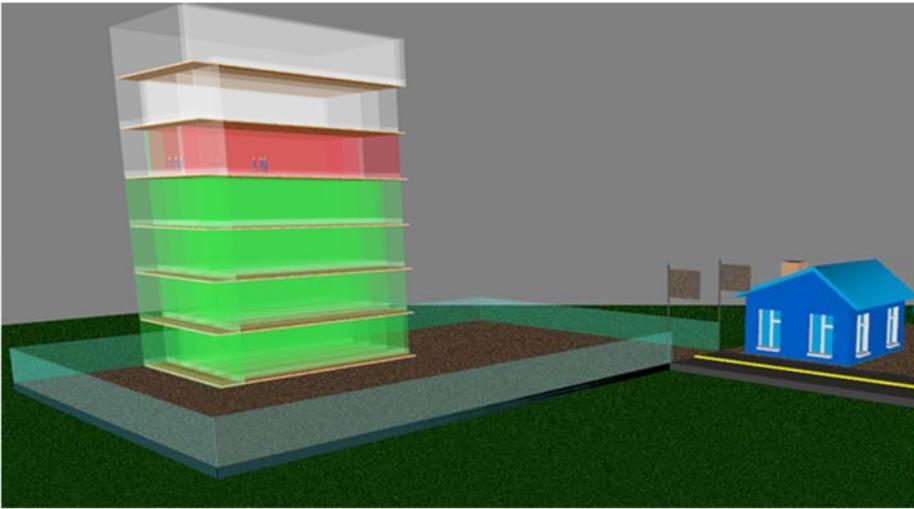
To achieve this, we have developed multiple simulators to cater for the diverse needs of the construction domain. A great number of the policies and rules that govern our simulation outputs were developed from real time experiences with project resources and their effect on productivity (i.e. queuing delays, equipment availability, capacity mismatches etc...). All our simulators were developed in collaboration with and by experts from the relevant field, mainly through CCT's Knowledge Management Communities of Practice for each engineering discipline involved.

Earthworks Simulator : The earthworks simulator was developed in collaboration with a seasoned contractor with multinational experience and knowledge of managing the earthworks community. The simulator helps site engineers tackle questions as the likes of: What is the estimated time of completion of a certain project that utilizes a specific set of equipment? What is the optimal and most well-rounded set of equipment that is required for the completion of the project at the lowest cost possible? How much does the total cost sum up to? How much is the subsequent cost per unit? What piece of equipment will likely constitute a bottleneck? Is there a specific piece of equipment that is not being utilized sufficiently? How will scheduled maintenance affect productivity?

Asphalt Paving Simulator: The asphalt paving simulator was developed by a community similar to that of the earthworks simulator, and as such has its core policies stemming from several decades of paving experience. It allows contractors and their employers to inspect a paving operation before it is executed, or even during its execution. It is a tool that is used to assess the delivery date of a paving operation, its cost breakdown, the requirements of the asphalt plant, the equipment needed, and what aspect of the operation is forecasted to constitute a bottleneck.

Building Finishes: Allows smooth integration with C3D™ or other BIM solutions, and aids in optimizing finishing activities in order to minimize crew idle times, time and cost completion requirements. It is also used as a means of maintaining the schedule of finishing tasks.

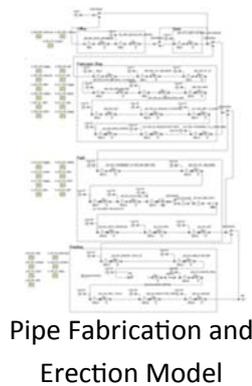




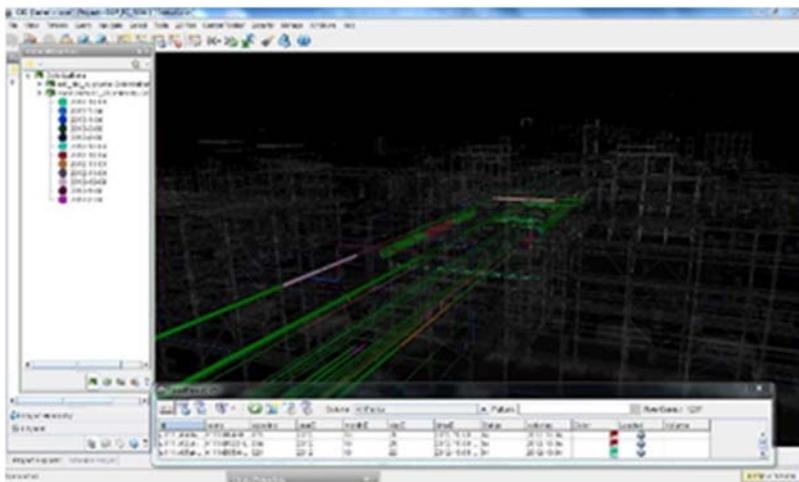
Building Finishes Simulator

Pipe Fabrication and Erection:

With the need to simulate the delicate logistical requirements of piping projects spanning over 4 continents, arose the creation of the Pipe Fabrication simulator. This simulator serves to analyze, maintain, and optimize pipe fabrication and erection tasks, in addition to monitoring crew productivity.



Pipe Fabrication and Erection Model



Pipe Fabrication Simulator Outputs in C3D

The above simulators have been implemented at numerous projects to assist with schedule validation, resource planning, and time and cost forecasting. Some recent on-site implementations include Barzan ESW (E/W), DPCT (E/W, Asphalt), DHP (E/W, Asphalt), FMWP (E/W), Barzan BOP (Pipe Fabrication).

Some additional services we offer:

- Process flow management,
- Optimization,
- Equipment mix predictions to meet deadlines or overcome unaccounted for constraints.

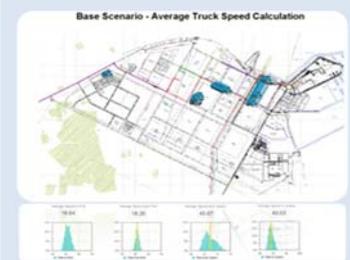
Quick Case Study

Title: Claims for Time Extension on Large Industrial Project

Description: After a large-scale industrial construction project faced several honest and unforeseen hindrances, the scheduling timeline agreed upon during contract signature was jeopardized and it seemed that the project was going to suffer great overrun costs. However, by utilizing computer-based modeling and simulation, a CCT consultation highlighted the detrimental impact of the hindrances, and was thus able to prove to the client the need to grant an unpenalized time extension to the contractor along with the permission to double his daily shifts to two.

CCT achieved that optimal solution by doing multiple simulations of the project, its hindrances, its bottlenecks, and different logistical and financial approaches, and selecting the best resulting scenario.

Total savings resulting: \$10M+



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