Analysis of Tunnel Jobsite Logistics Processes

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PHASE I: BACKGROUND

COMPANY PROFILE

Herrenknecht AG develops technical solutions, such as tunnel boring machines (TBM), for the construction of underground tunnels. A TBM excavates earth material in its path and builds rings of concrete linings to create a tunnel.

TBM LOGISTIC SYSTEM

Comprises of machinery such as gantry cranes, mobile cranes and trains. Responsible for the transportation of materials to and from the TBM.

PLANNING

At present, the project contractor plans and procures the machinery that comprise the TBM

PHASE II: PROBLEMS AND OBJECTIVES

- Current planning for the TBM logistic system is based on rough estimates
- Does not take into account dependencies between resources
- Does not take into account variability in the durations of logistic processes
- Scheduling is on an ad-hoc basis
- Overall impact on TBM efficiency is not considered

- Disruptions due to logistic operations
 Higher costs incurred
- Substantial idle times for the TBM
- Longer project durations

Design a systematic method of planning for the TBM logistic system

- Develop a method of describing a TBM logistic system
- Systematically plan for a tunneling project
- Consider and compare alternative designs
- Recommend improvements to the current system

PHASE III: METHODOLOGY

DESCRIPTION

'Blueprint': a description of the logistic system

- Component Description Lists and describes all resources that comprise the TBM logistic system
- Overall Layout Geographically displays the positions of all the resources on a map of the jobsite
- Material Coverage Lists all routes of transporting a material
- Dependencies Indicates possible conflicts between the resources of the TBM logistic system
- Timing & Scheduling Statistical summary of relevant timings and an approximate timeline of activities

SIMULATION MODEL

- Conceptualize an existing jobsite
- Develop a simulation model using data from the blueprint of existing jobsite
- Compare model with the jobsite

ALTERNATIVE DESIGNS

- Explore alternative designs that vary the combination, arrangement and scheduling
- Develop simulation models and compare performance of the alternative systems

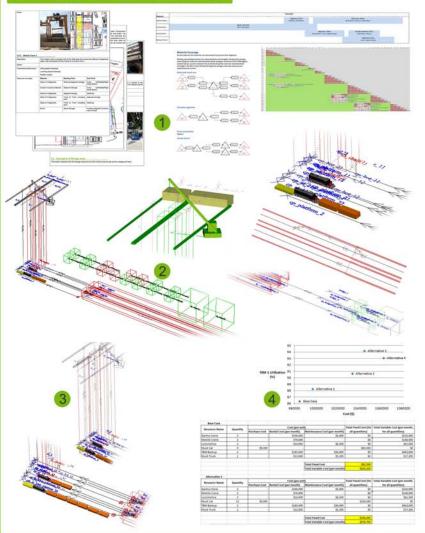
COST-BENEFIT ANALYSIS

- Perform cost-benefit analysis to compare the various designs
- Examine the expenditure required to improve the system

RECOMMENDATIONS

The set of resources that serve to minimize TBM idle time, while taking into consideration total cost, will be recommended.

PHASE IV: IMPLEMENTATION



PHASE V: FUTURE DIRECTION

- Improvements in blueprint template as it is implemented in more tunneling projects to make it more clear and concise
- Simulation software that caters specifically to modeling the TBM Logistic System
- Excel macros that can perform the subsequent Cost-Benefit Analysis
- Explore other approaches that can aid in systematic planning of the TBM Logistic System