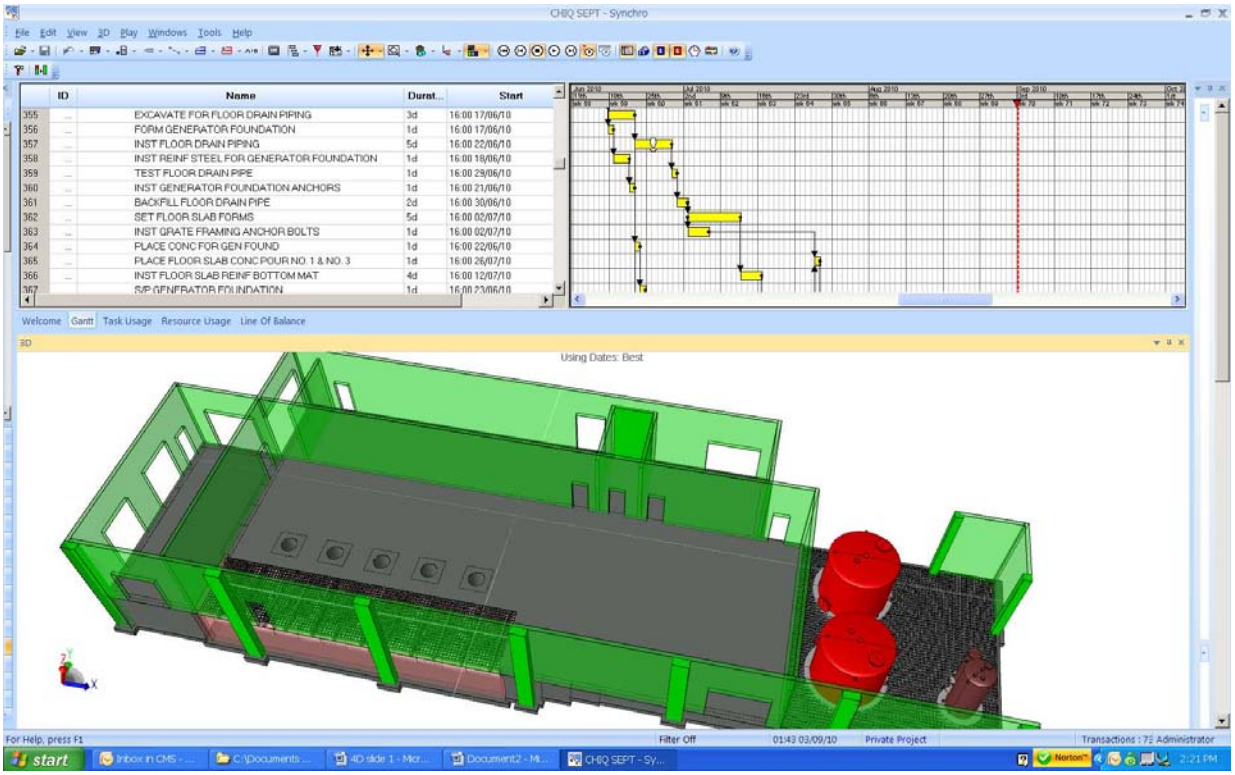
Implementing 4D Schedules in Construction

The concept of 4D scheduling has been discussed in great length and has become generally accepted as a tool that can provide value throughout the construction lifecycle. In recent years this concept has transitioned into practice in construction projects across the United States, including here in Southern California. The main focus of this article will be to discuss the actual implementation of 4D schedules in construction, specifically on a major Wastewater Treatment facility upgrade in Southern California currently under construction.

A 4D schedule is the combination of three dimensional project renderings that have been linked to the construction schedule via a synchronization platform. By combining the 3D contract drawings with the 4th dimension of time (represented by the project schedule), the p roject can be built, modified and planned "virtually" on a continuous basis throughout the lifecycle of the project. With the increase in owner demand for 3D contract drawings and the availability of "off the shelf" synchronization software, 4D scheduling has become a practical tool that is providing value to construction projects.



4D is not a replacement for traditional CPM scheduling practice and review. 4D creates value by providing greater levels of project visualization which can help optimize the use of critical resources. By seeing the broader picture of work, even the most experienced planner can visualize work dependencies and relationships that may be overlooked by using 2D drawings and CPM schedules alone.

A 4D schedule is currently being used on an 80 Million dollar Wastewater Treatment Facility upgrade in Southern California. There are two prime Contractors involved in the project, each working on separate but interconnected scopes of work within the same plant. As can be imagined, this scenario presents many logistical and coordination challenges. In addition to these challenges, the project must be

constructed without affecting the operation of the existing facility. 4D was implemented to provide a time-phased, virtual representation of the new construction taking place and of the existing facility for the purpose of planning, site logistics, communication, logic review, work clash detection and to help mitigate and analyze delay claims.

The first step to creating a 4D schedule is to obtain or create 3D modeled renderings of the design drawings. At the beginning of the Wastewater Treatment Facility project, 3D drawings were still under development and not yet available. An outside Architectural consultant was hired to convert the 2D design drawings into 3D. For the purpose of scheduling, these 3D renderings needed only to include approximate dimensions and locations of the new and existing structures, duct banks and underground piping in order to link them to the corresponding work activities in the schedule. For projects which design drawings are already available in 3D, this exercise is not necessary.

Once the 3D drawings are obtained, baseline schedules from the prime and major subcontractors are linked to the 3D drawings via a synchronization platform. "Syncro" provided the platform to combine the work activities in the schedule with their corresponding 3D renderings. This process generally requires a senior level understanding of scheduling and the construction project being built. It is important to note that commercially available synchronization platforms such as Syncro accept most of the industry standard scheduling and CAD software formats. Once the work activities were linked to the 3D drawings, the project could be built and reviewed "virtually". Having the foresight to see the interrelation between work activities and the ability to adjust the construction plan to avoid potential work conflicts and delays has been of enormous benefit to this project.

Throughout the Wastewater Treatment Facility project, the 4D schedule has been used to detect inaccuracies in the projected work logic, clashes between scopes of work between the Contractors and with the existing plant operations. Each month a four month "look-ahead" schedule is provided to the project team which visually highlights potential conflicts and areas of concern in the upcoming months. The Construction Management team uses this information in collaboration with the contracts to adjust the work plan where necessary to prevent potential time delays and to alert the plant Operations staff of upcoming shutdowns, tie-ins and other work being performed.

Due to the inherent nature of change in any construction project, even the most airtight project schedule will undergo a certain level of change as the project progresses. For a schedule to be an effective tool, it must be maintained and updated as the most current information becomes available. A 4D schedule is no different. Monthly schedule updates must be input into the synchronization program to ensure that the 4D schedule is kept up to date with the most recent and accurate project information. Because the synchronization program links the schedule's unique activity ID numbers to the subsequent rendering, keeping the 4D schedule updated is a relatively simple process if the system is set up correctly.

4D scheduling is a practice that can provide numerous benefits, but is not a replacement for traditional scheduling, project controls and project management systems. When used in conjunction with traditional project controls and management systems, the added benefits can include an increase in schedule quality, reduction in RFI's and an increase in proactive stakeholder communication and problem solving. In addition, 4D schedules can be highly successful in delay claim mitigation and review and can help explain the technical aspects of delays and concurrency to a non-technical audience when necessary. 4D schedules, once a powerful idea in concept, have transitioned into practice and have become value-added tools for Owners, Construction Managers and Contractors throughout the construction project lifecycle.

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