Critical Path Method Construction Scheduling with Asta Powerproject

Scott M. Francis, P.E., PSP

LONG INTERNATIONAL

Long International, Inc. • 10098 Whistling Elk Drive • Littleton, CO 80127-6109 U.S.A. • (303) 972-2443 • long-intl.com

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1. INTRODUCTION

Asta Powerproject (APP)[1] is a commercially available software program used for developing and maintaining Critical Path Method (CPM) construction schedules. The software has been designed specifically for construction planning and scheduling.

This article resulted from the author learning to use the APP software and discussing the software with contractors and subcontractors who are currently utilizing APP to plan and manage construction projects of all sizes. These interviews served to gauge the effectiveness of the software and to determine if contractors are finding that APP meets their planning and scheduling needs. The article is intended to inform the reader of some of the useful features, tools, and benefits of using the software to schedule construction projects, and is not a comprehensive review of all of the features and capabilities of the software.

Based in the United Kingdom, APP has been in use and development since 1988 and currently has over 100,000 worldwide users. Approximately 90 percent of major contractors in the United Kingdom are using APP, and use in the United States has been increasing rapidly over the past few years. The growth in the United States appears to be based on the construction industry focus of the software. The development of APP has been specific to the wants and needs of the worldwide construction community. Many construction professionals have been looking for software that is tailored specifically to construction, and many are finding that their search for scheduling software is now satisfied. Additionally, APP appears to be dedicated to the needs of its customers, and many of the upgrades through the years have been based on customer input and requests.

The growth of APP in the United States is further recognized by the acceptance of the software by the United States Army Corps of Engineers (USACE). In 2013, the USACE recognized APP as fully compliant with their Standard Data Exchange Format (SDEF) requirements. Because the USACE manages construction projects throughout the world, their acceptance of the software indicates that it meets the needs of large and complex construction projects and that it is satisfactory to a known and recognized owner.

2. A COST-EFFECTIVE TOOL FOR PLANNING AND SCHEDULING

Asta Powerproject appears to offer a cost-effective solution for construction companies who want to invest in planning and scheduling but do not want to be burdened with Information Technology (IT) and training difficulties or expenses.

[1] Powerproject is a registered trademark of Asta Development in the USA, UK, European Union, and Australia.

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2.1 LICENSING OPTIONS

Some of the most frequent accolades heard from APP users concern the licensing options and associated cost benefits. APP provides several types of licensing options, and the most desired option for many contractors are concurrent (or shared) licenses. This option allows a company to purchase the number of licenses that may be used at any given time, regardless of the number of total users. The software can be installed on multiple machines which all link to a central machine on the internal company network where the APP license server is installed. An unlimited number of computers can have the software, but the number of users allowed to access the software at one time is based on the number of concurrent licenses purchased.

Contractors are finding that the shared licenses are a cost-effective solution for their scheduling needs. This type of configuration is beneficial for project teams that may need to use a scheduling program occasionally, but their use does not warrant a full-time license.

Another popular licensing approach is the stand-alone license, where the software can be accessed on a specific machine only. This type of license is beneficial for a full-time scheduler or a person that may need to use APP on a regular basis. Many construction companies are purchasing several stand-alone licenses for the full-time schedulers, and are purchasing additional concurrent licenses for other staff that may need intermittent access to the project schedules.

Asta Powerproject can also be set up in an enterprise environment in which projects, costs, resources, and calendars can be shared among the users. This option tends to be more popular among larger contractors and can be useful for contractors that need to share real-time access on a single project or across multiple projects.

2.2 INFORMATION TECHNOLOGY BENEFITS

From an Information Technology (IT) perspective, APP provides significant cost and time savings due to its simple installation and ease of maintenance. APP concurrent and stand-alone licenses do not require a database, which alleviates the need for database configuration, support, and maintenance. Typically, users install APP via a simple download, and brief IT support is needed to configure the license server for concurrent licenses. Once a company is up and running, IT support appears to be minimal, which can result in significant cost and time savings. As will be discussed later in this article, technical support for APP can be obtained from the APP distributor or directly from APP.

2.3 LIMITED TRAINING REQUIREMENTS

Another area of cost and time savings is the minimal training that is needed before a user can begin working efficiently within the program. The ease of use, discussed in more detail later in this article, enables a user to develop and maintain schedules after only a few hours of training.

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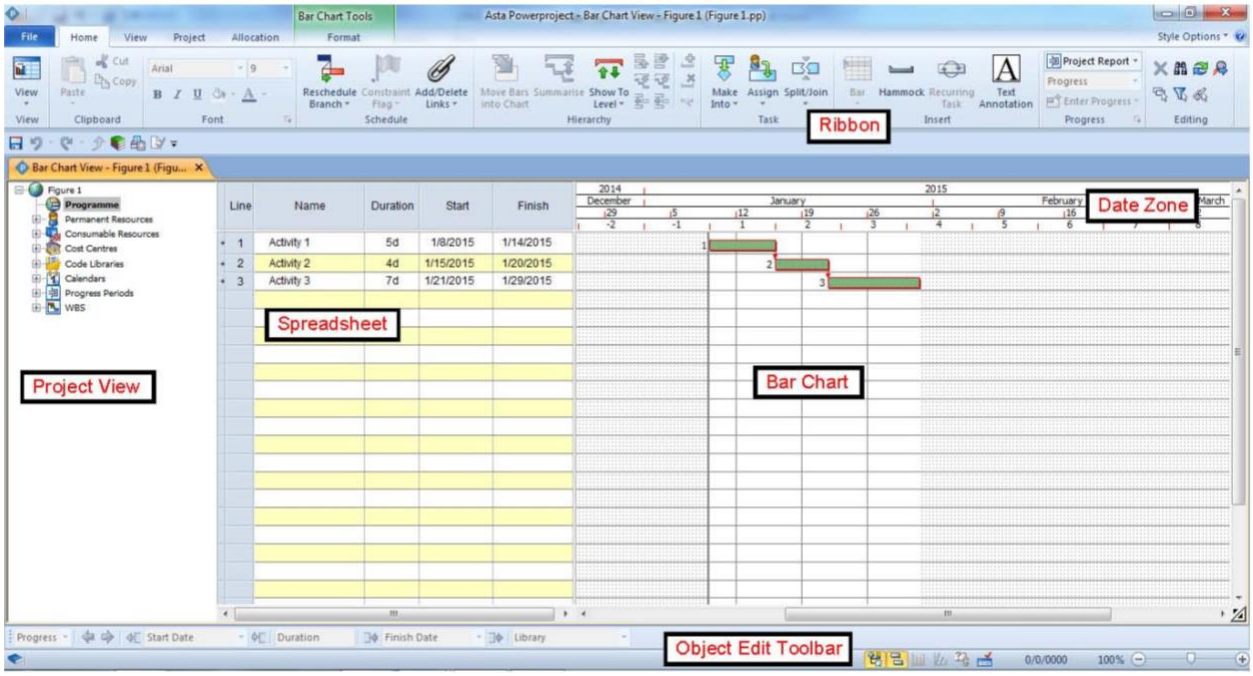
The ease of use and familiar user interface provide a less intimidating scheduling option for staff that may be hesitant to use other scheduling software. As with any new computer software or application, the bulk of the learning comes from simply using the software on an active project. When questions arise, APP contains a detailed help menu and an online knowledgebase.

3. FAMILIAR AND EASY TO USE INTERFACE

One of the most popular features of Asta Powerproject is the familiarity of the user interface. The software has the look and function of a Microsoft application and works very similar to a spreadsheet. Figure 1 below displays the main screen within APP.

Figure 1
Asta Powerproject Overall Layout



As with most of the features within APP, this view can be customized and the spreadsheet and bar chart can be viewed together or individually depending on the needs of the user. Also, the project view can remain open as shown in the figure, or can be hidden to maximize the work space of the spreadsheet and/or bar chart.

As indicated in Figure 1, the ribbon consists of the various commands and functions necessary to use the program. Similar to Microsoft Excel, the ribbon commands can be used for the program

functions or the functions can be accessed with right clicks to bring up the various command menus.

The project view menu contains key elements of the project such as the work breakdown structure, calendars, codes,[2] progress periods, resources, and cost codes. The items within the project view menu can be expanded to show the detail of the items within each category. Adjacent to the project view menu is the spreadsheet area, in which the schedule data is entered and edited. The spreadsheet feature is a very useful item, and task data can be entered as it would in a normal spreadsheet.

The spreadsheet functionality is very useful for construction staff because many superintendents are comfortable with Excel, and often manage a schedule, or parts of a schedule, with Excel. Superintendents may find APP easier to use than other software, and the familiar interface provides a less intimidating option for new schedule users. Tasks and associated data can be created in Excel, and pasted directly into the spreadsheet. This cut and paste feature works well when developing a schedule, and also works well to supplement a schedule with input from field personnel. Tasks can be added simply by inserting a row in the spreadsheet, or copying other tasks and pasting them back into the spreadsheet area.

The project view menu and spreadsheet functions can be used together to populate tasks with calendars, resources, or codes. APP includes a drag and drop feature which allows the user to select one or more tasks and assign task data from the project view menu via drag and drop.

The bar chart displays the task bars and logic information. APP offers unique features of the functionality and display capabilities within the bar chart. This will be discussed in more detail later in this article.

4. TOOLS AND FEATURES FOR FASTER SCHEDULE DEVELOPMENT

Asta Powerproject provides several features that allow project teams to develop detailed schedules quickly and efficiently.

4.1 PROJECT TEMPLATES

Asta Powerproject allows users to create templates that project teams can use to quickly develop detailed schedules. The templates can be set up to include specific calendars, codes, resources,

[2] In construction schedules, individual work items are commonly referred to as activities. Within Asta Powerproject, work items are referred to as tasks. Also, what are commonly referred to as activity codes in other scheduling software are simply referred to as codes within APP.

filters, views, and other company specific information. These templates can be as detailed or as general as needed.

Developing a good, detailed, baseline schedule can be extremely time consuming, and this work is typically concurrent with the large amount of work that must be done when starting a new project. These templates allow the users to focus on developing tasks and logic and not have the burden of setting up all the other elements of a schedule.

A contractor that builds hospitals, schools, and hotels can have one or more templates set up for each of these types of projects. Upon contract award, the template can be opened and the project team/scheduler can immediately begin creating the project schedule. The time consuming tasks of developing calendars, codes, and schedule structure is already done, which allows the team to focus on developing the schedule details.

4.2 TASK POOLS

Another feature of Asta Powerproject that allows for faster schedule development is task pools. Task pools are sets of logic-linked tasks that represent a sequence of work. For example, a task pool could be all of the tasks for the build-out of one floor of an office building or a task pool could be as large as the construction of a steel structure. There is no limit to the number of tasks that can be created within a task pool, nor is there a limit to the number of task pools that can be created within the software.

The tasks within the task pool are logically linked and can be coded to calendars, codes, and/or resources. The user simply highlights the task pool and drags it to the bar chart and the task pool tasks are added to the schedule.

This can be extremely useful in the case of repetitive work tasks. For example, if a contractor is creating a schedule for a ten floor office building with similar floors, a task pool can be used to create the build-out of each floor. Upon adding the task pool to the schedule, a find and replace feature can be used to replace the floor number within the task names. Using this method, the schedule tasks for the interior build-out of ten floors can be completed in minutes. The user would then simply link the start and end of each floor to the overall schedule and add any other logic that may be needed.

Asta Powerproject users are finding that detailed baseline schedules can be developed faster through the use of templates, task pools, and the ease of adding task data discussed above. These time saving features allow project teams to focus on the imminent tasks of beginning a new project and save the project some of the time and cost required to set up a detailed schedule.

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5. UNIQUE FEATURES OF THE INTERACTIVE BAR CHART

Another useful and unique feature of Asta Powerproject is the interactive bar chart. The APP bar chart area is not simply a depiction of task dates and durations. APP's bar chart provides methods for adding to or modifying the schedule and offers numerous presentation options. These features are discussed in the following sections.

5.1 SCHEDULE CHANGES OR ADDITIONS CAN BE COMPLETED DIRECTLY ON THE BAR CHART

Within the bar chart, tasks can be added to the schedule by simply clicking on the chart and dragging the newly created task to the desired duration. Similarly, existing task durations can be adjusted directly on the bar chart by dragging the end date of a task. Logic can be added or adjusted in a similar manner. Relationships can be added or modified via the bar chart or the user can highlight a relationship and right click to bring up the logic properties window.

Once tasks are shown in the bar chart, the tasks can be shifted to the right or left, or extended or compressed, without adjusting the duration of the task within the spreadsheet or rescheduling the project. These task adjustments are performed by using buttons on the object edit toolbar as shown in Figure 1 above. After the project is scheduled, the changes will take effect.

This adjustment feature is especially useful when developing or modifying work tasks that overlap and it is necessary to visually observe the overlapping nature of the work. The user is able to modify any number of tasks and can highlight the group of tasks, and APP can add logic based on how the tasks are drawn within the bar chart. Logic relationships and associated lags will be added to the schedule with the overlapping tasks sequenced exactly as they were developed in the bar chart. This function may be helpful in the case of complicated, overlapping work. The user or project team can create and see the work sequences and have the software automatically create the required relationships.

5.2 EXTENSIVE PRESENTATION OPTIONS

In addition, the bar chart provides many options for the presentation and display of tasks and their associated time scale. Figure 2 on the next page displays the spreadsheet view and bar chart of a sample schedule.

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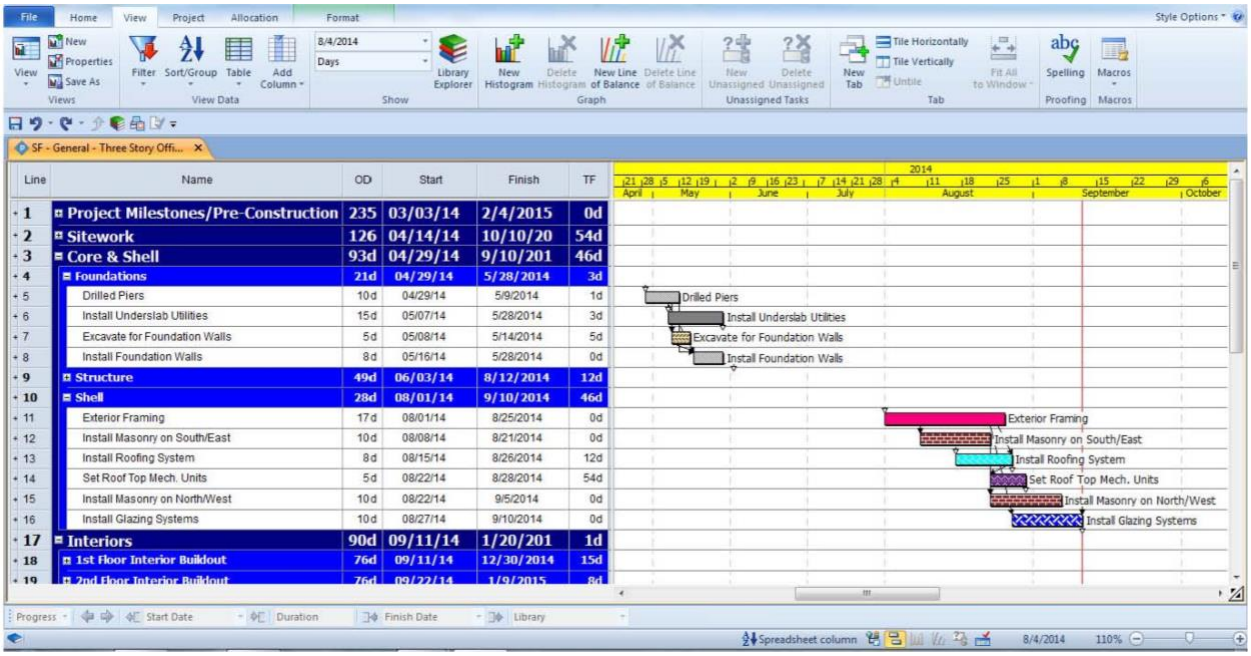
Figure 2
Sample Schedule and Bar Chart



As shown in Figure 2 above, the top of the bar chart features a customizable date zone or time scale. This date zone can be set up to include any increment of time and can show as many as ten different date options at one time. The scale can be set up to show the elapsed time on a project or can be split to show two or three different date scales in the same bar chart. As shown in Figure 2 above, beginning in August 2014, the scale shifts to show more detail within the new date zone.

The date scales can be accompanied by customizable gridlines for any or all of the dates within the date zone. Gridlines can also be added for custom dates to reflect a certain project milestone. For example, the figure above displays a vertical red line representing the baseline building weatherproof date. Many styles and colors are available to create custom date presentations and gridlines.

Task bars and baseline bars are similar such that their appearance can be customized with different styles or colors. In Figure 2 above, different colors and shading patterns have been set up for different subcontractors. Additionally, task information can be added to the bars based on what the user wants to present. Schedulers often include task names on the bars within a Gantt chart, but APP allows any task information (date, float, etc.) to be added to the bar chart labels.

Another unique and useful feature of the bar chart is the ability to color code selected periods of time, which can be shaded and labeled. This color coding is useful to highlight a certain time frame within the time scale in which an impact occurred. As with the other items within the bar chart, the color shading is fully customizable.

Interesting additional features of the bar chart include the option for adding notes on tasks, hiding specific tasks from view or printing, text annotations, and picture annotations. Each of these features, combined with the other features discussed in more detail above, make APP unique in the way schedule information can be displayed and presented.

6. OTHER USEFUL TOOLS FOR SCHEDULE DEVELOPMENT AND UPDATING

Although this article is not intended to be a comprehensive overview of the software, there are several other useful features that merit a brief discussion. These items are discussed below:

- Undo and Redo – Any change in APP can be undone with the click of a button, including the schedule calculation. This is a beneficial feature to see how rescheduling may affect a milestone or group of tasks. The schedule can be calculated to determine the extent of a modification and the calculation can be undone if necessary.
- Multiple tasks can be added as a single line in the spreadsheet/bar chart – This feature is beneficial in several instances. First, a task can be suspended and resumed an unlimited number of times and dates can be tracked accordingly. This function may be beneficial to show an impacted task and show that the work was suspended and resumed numerous times. The feature is also beneficial for work tasks that may be repeated many times in the schedule. For example, procurement tasks such as submit, approve, procure, and deliver can all be added to one line item and tracked within the one row of the spreadsheet/bar chart.
- Multiple views or layouts can be open at one time – It is often necessary to switch back and forth from different views while developing and/or updating a schedule. Instead of closing a view and opening a new view, APP allows multiple views to remain open at one time. The user can click back and forth between multiple views for ease of use. Additionally, APP can support multiple open projects at one time and numerous views of each project can be open concurrently.
- The baseline feature is easy to use and unlimited baselines are available – Baselines within APP are easy to set up and use, and the unlimited availability of baselines offers a robust capability for schedule comparisons. If a baseline

is set up for each progress period, a user can compare a schedule field from one update to the next. For example, if a user wanted to track the projected finish date of a task throughout each progress period, the spreadsheet can be set up such that the finish date for each baseline or update can be visible in a column of the spreadsheet. The unlimited number of baselines works well with the multiple views option discussed above. Different baselines can be compared in different views without having to modify other settings or filters.

- Multiple progress periods (report dates) – This is a must have feature for scheduling software, and APP provides the option to create an unlimited number of progress periods in any time increment. Although progress periods can be associated with baselines of projects, a schedule can have multiple progress periods without adding baselines. Additionally, APP provides the option to display the progress periods in different colors and or patterns within the bar chart.
- Summary Tasks – Summary tasks can be created to provide a summary of the tasks that are included within its schedule hierarchy. Summary tasks "roll up" data related to the tasks within the summary but are not actually linked to any of the tasks within it; although, links to summary tasks can be added if desired. Summary tasks can serve a function similar to work breakdown structures and codes. Summary tasks can be created within other summary tasks to provide a detailed schedule structure. Some users are finding that the summary tasks are eliminating the need for a work breakdown structure and limiting the number of required codes.
- User defined fields – APP provides the ability to create user defined fields for text, numbers, dates, hyperlinks, or Boolean fields.[3]
- Multiple links between tasks – This is a must have feature for construction schedules that is not available in all scheduling software packages.

7. COST AND RESOURCE ANALYSIS MADE SIMPLE

Cost and resource loading within construction schedules is a tool utilized by many contractors. However, some contractors have abandoned utilizing these models due to the complexity of the cost and resource features within some scheduling programs. The contractors that want or need to create cost and/or resource models often require a customized approach specific to their internal standards. Sometimes the modeling needs to be modified based on the requirements of

[3] A Boolean field is a data type with only two possible values such as True/False or Yes/No.

an individual project. Some contractors may want to track only man-hours per task, while others may want to track crews or individual workers assigned to tasks. Similarly, some contractors may want the number of hours on a task to be fixed, regardless of the duration, and other contractors may want the number of hours to be linked to the duration so that changes to the duration are reflected in the hours assigned to the task.

The same requirements and variables are often found with cost loading. Some contractors want to link the man-hours with costs and others want costs to be fixed within the schedule and only be modified manually. Contractors who are currently using Asta Powerproject indicate that cost and resource loading is working well and allows them to track resources and costs as needed. It appears that APP's capabilities are not limited by default settings within the program that require cost and resource analyses to be done a specific way.

Although APP is able to perform a broad range of cost and resource modeling functions, it may take some effort to set up the calculations and views specific to the contractor's needs. However, once resources and costs are set up, they can become part of the overall project templates (discussed above) and would not have to be set up for each project. Upon opening a template, all settings for cost and resource loading can be in place. Additionally, all necessary layouts, filters, and presentation options associated with the cost and resource loading can be contained in the templates.

Figure 3 on the next page displays a sample spreadsheet and bar chart layout where several of the tasks have been assigned a resource and man-hours (man-hours are referred to as effort in APP).

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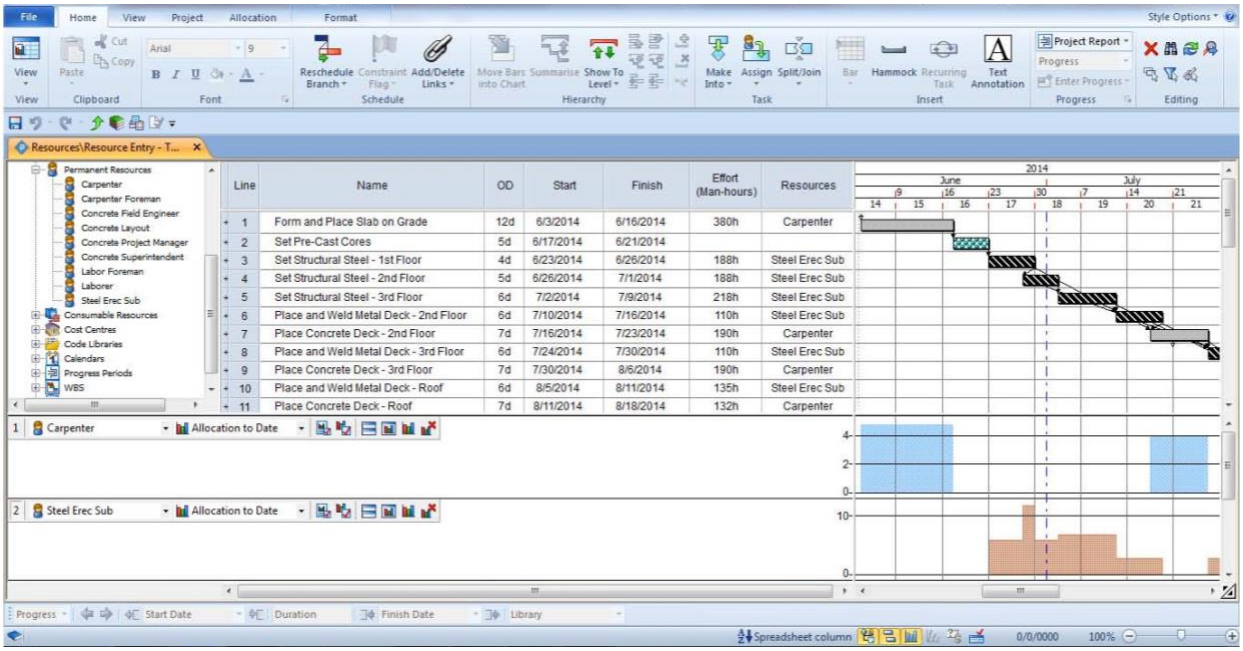
Figure 3
Resource Loading Example



As can be seen in Figure 3, histograms for resources can be viewed together with the spreadsheet and bar chart. This function is convenient when working with resources and noting the effects on the histogram when resource assignments are changed. The resource and cost data can be maintained in APP or exported to Excel. As with most of the other features of APP, the histograms and related views are completely customizable.

8. COMPATIBLE WITH OTHER SCHEDULING SOFTWARE

A popular concern regarding the use of Asta Powerproject pertains to instances in which specific software is regulated by the contract documents. Although APP has been recognized as software acceptable to the US Army Corps of Engineers, there are owners and organizations that have software preferences. In these instances, APP can still be used by the contractor to meet the contract requirements.

If APP is not listed as approved software in the contract documents, the contractor can build and manage the schedule with APP, and save the schedule to another file type to submit to the owner. When saving the file, the user selects options on how the data should be exported, depending on the file extension that is selected for the export. This allows features such as calendars and lags to export correctly.

There are currently contractors using APP on projects that specify a different software requirement. The schedules are developed and maintained in APP, and the file is exported to the contract specified software file type and submitted to the owner. These contractors do not report any issues in communicating the project schedule to the owner and meeting the contractual requirements.

In addition to the ability to save a schedule to different file types, APP has the capability to open projects that were created in other software. This is beneficial if a general contractor is working with subcontractors who may use a different scheduling software package.

9. COMMITMENT TO CUSTOMER SUPPORT

As discussed in the introduction to this article, the growth and development of Asta Powerproject over the past 25 years has been based largely on customer feedback. APP appears to work closely with their sales team and distributors to identify any input or concerns that are being raised by their customers. APP has grown and evolved based on not only functions that users need but also features that users want. Because APP was developed specifically for construction scheduling, the input received is specific to companies that are planning and building projects, and not companies who are engaged in different business industries.

For service requests, a user contacts its distributor as the first line of support and the issue is typically able to be resolved at this level. APP only operates through approved distributors who have been thoroughly trained in the software. If the distributor is not able to provide the necessary support, the issue is escalated to APP customer support and APP commits to a one-hour response time. It can be frustrating to have software issues when facing a deadline and APP's one-hour commitment is refreshing. Because APP is based in the United Kingdom, the one-hour response is based on working hours in the United Kingdom.

10. ASTA POWERPROJECT BIM

Although not researched thoroughly for this article, Asta Powerproject BIM (Building Information Modeling) is another product that is due to be released in the United States in 2015 (it is currently available in the United Kingdom). This program uses BIM models to create 4D schedules, which are video models depicting how the three-dimensional components of a building or facility are installed and erected over time.

Typically, 4D schedules are created using a BIM model, scheduling software, and another program which allows the interface between the building model and schedule program. The software that offers this interface is often difficult to learn and cumbersome to use. APP BIM eliminates the need for this interface program and allows the 4D schedule to be developed in APP.

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APP BIM imports the building model directly into an APP project, and the model can be viewed adjacent to the spreadsheet and bar chart. As the detailed schedule is developed, pieces of the model can be assigned to tasks via a simple drag and drop function. To further facilitate the development of the 4D schedule, the user can customize the interfaces or develop templates that automatically link to an object in the model based on the name of a task or based on the object name within the model.

When updating the schedule, the ability to have the 4D capability within the scheduling software appears to make the 4D update process much easier. As the schedule is updated, the user is able to see the effects directly on the building model. Although not part of the initial release in the United States, future versions of APP BIM will allow a video of the schedule model to be exported directly from the software. For contractors interested in 4D scheduling, Asta Powerproject BIM appears to be a product worthy of research and consideration.

11. CONCLUSION

Asta Powerproject provides a powerful and easy to use tool to plan and manage construction projects of all sizes. The flexible licensing options, cost-effectiveness, ease of use, and accessible technical support have contributed to the growing popularity of APP with construction companies of all sizes. The powerful tools for schedule development, cost and resource analysis, and presentation graphics make the software attractive to planners and schedulers.

One of the concerns occasionally raised by industry professionals was that the use of APP may be prohibited by contract specifications and the requirement for a specific type of software. As discussed in this article, APP allows exporting to and importing from other file types, and APP has been used on projects that specify a different software package. Therefore, the use of APP by construction companies need not be limited by contractual requirements.

For additional information about Asta Powerproject or free software demonstrations, contact Curt Corrigan of Project Integration at 303-494-2100, curtc@projectintegration.net, or visit www.astapowerproject.com.

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About the Author

Scott M. Francis, P.E., PSP, *is a Vice President of Long International and has nearly 20 years of experience in various areas of project management, contract disputes and resolution, CPM schedule development and execution, contract administration, design engineering, construction management, and government contracting. Mr. Francis has performed CPM schedule development and updating, project cost control, impact identification and causation analyses, change order pricing and resolution, retrospective schedule delay analyses, time extension and acceleration analyses, concurrent delay assessments, and damages quantification. Mr. Francis' work experience includes petrochemical, oil refinery, nuclear power, commercial, industrial, road/highway, and hospital/medical projects. He holds a B.S. degree in Civil Engineering from Colorado State University and a minor in mathematics. Mr. Francis is based in the Denver, Colorado area and can be contacted at sfrancis@long-intl.com and (720) 204-6213.*