TAYLOR
SCHEDULING SOFTWARE

CAPACITY PLANNER

OVERVIEW

Taylor's Capacity Planning Philosophy

There are several aspects of current ERP based Rough-Cut Capacity Planning (RCCP) and Capacity Requirements Planning (CRP) practice that Taylor Scheduling Software improves by providing Capacity Planner (CP) and integrating the planning process with finite scheduling.

First, TS improves the capacity planning process by allowing key components of the current scheduling model to be used as the basis for developing a planning model. This saves model-building time and helps to keep the future model/plan in sync with the current reality.

Second, TS allows the planner to develop a feasible incremental capacity model reflecting potential additional machines, resources and their implementation plans. This process is critical to developing capacity plans that can actually produce the planned goods, if the plan is implemented.

Third, by facilitating the inclusion of the current load and allowing some or all of it to be treated as a "given," TS further enhances the integration of the actual current plan, based on actual current capabilities, with a potential, less restricted future plan.

Fourth, CP allows the development of "load profiles." A load profile can be thought of as a higher level routing that shows the sequence and timing of capacity that will be consumed to produce an item, as well as showing the timing for consuming other key resources. Resources in this case can be anything that is of importance to the planning process, such as key material, labor, tooling, or even capital, warehouse space or energy. When a demand is imported, a load profile is attached to the demand based on: first the item; and then, if there isn't a load profile for the item, based on the item's product family.

Fifth, CP allows the integration and simultaneous planning of forecasts, planned orders and released orders, each at the appropriate level of detail. It then allow for the development of a better plan for transitioning from today's current capacity to tomorrows required capacity. This allows for more consistent short-, intermediate- and long-term decisions and execution.

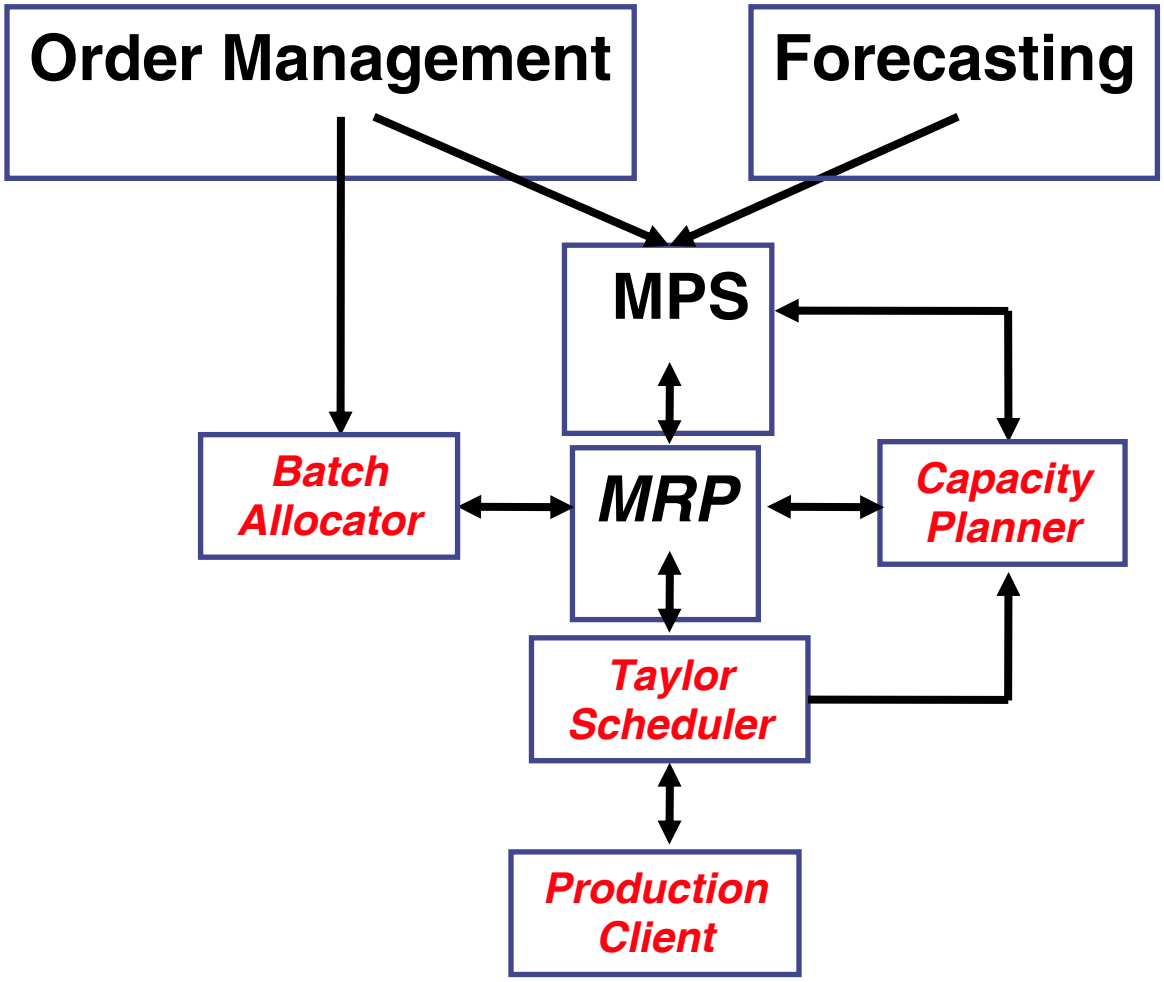
Sixth, because the planning and scheduling models are based on many of the same screens, functions, and navigation the planner and scheduler (if different people) can more easily build consistent models, can better communicate and investigate potential plans, and then later implement the mutually understood and agreed plan.

Finally, because the various scenarios or plans are saved and stored in a central database, different users can easily access the data to obtain consistent projections of future requirements and capabilities. Note: Any user may be allowed reporting capabilities; however, only Capacity Planners (the designated users) can access the scenarios to modify or create new scenarios.

Application of Taylor Scheduling Software

Overview of System Flow

The diagram below outlines the overall flow of information and process within the context of the planning and scheduling systems, and at a high level shows how TS can support your business process. The boxes depicted are not limited to software, but rather the functional process, including software, business policies and procedures.



Order Management: In this area, your customers and the information related to them are captured, organized and reported. The primary components include customer information, product pricing policies, contracts, sales orders, and customer policies. These policies, in this context, refer to instructions the customer has given you about how orders must be shipped and allowed quantity variations.

Forecasting: Typically, a variety of history based and collaborative forecasting techniques are used to develop finished good product group forecasts. This process is typically done annually as part of the budgeting process, but also should be done monthly, or at least quarterly, to reconcile actual to plan and also make plan adjustments.

Product group forecasts are passed to MPS.

Master Production Scheduling: The primary functions of this process are: to disaggregate product group forecasts into SKU requirements; to manage the process of "consuming the forecast," based on time horizon rules; and to plan production so as to meet business goals within capacity constraints. This process is typically performed annually as part of the budgeting process and monthly to update the production plan. The time horizon is typically from six months out to typically two years.

Preliminary production plans at the product group level are passed to Capacity Planner and validation results are received back. The final production plan, disaggregated from the product group level to individual SKUs, is passed to Materials Requirements Planning.

Capacity Planner: Preliminary production plans are validated either at the aggregate product group level (forecast) or the detailed SKU level (MPS output) based on load profiles designed appropriately. The starting point for future load can be based on either a given starting date, or it can be based on existing load. Overall capacity is developed, by adding potentially available capacity to existing capacity. The result of this process is a validated master production schedule, a rough-cut capacity requirements plan for additional resources, and planned utilization of existing resources.

Validated master production plan, based on capacity that can be available in this time frame, is passed back to Master Production Scheduling.

Materials Requirements Planning: Explodes the independent demand from Master Production Planning into a detailed materials plan and generates lower level work orders and purchase orders, based on order policies and static lead times. MRP also generates exception messages for planners to expedite adjustments to keep everything in sync with this plan. Because MRP assumes the capacity will be available (pretty much infinite), this plan needs to be validated against finite capacity for mid-range horizon, typically 60 days to a year out.

Preliminary materials requirements plans are passed to Capacity Planner and validation results are received back. Work and purchase orders are released to Taylor Scheduler and Purchasing, respectively, as they come within the release time horizon and, in the case of work orders, capacity is available.

Capacity Planner: Preliminary materials requirements plans (planned work orders) are planned based on due dates, resource requirements, existing and available capacity, with an initial starting point (current load) based on scheduled released and in-process work orders. Since there is still time to make many capacity decisions, such as staffing, overtime, shift schedule, major maintenance plans, subcontracting, and even some equipment changes within the mid-range time horizon, this planning step is critical to meeting customer commitments and expectations.

Validated material requirements plan, based on capacity that can be available in this time frame, is passed back to Material Requirements Planning.

Batch Allocator: The primary function of this module is to match dynamic customer packaging orders to fixed-size production lots to increase productivity and utilization. Optionally, BA may be used to further increase productivity, reduce waste and increase customer satisfaction by dynamically adjusting customer orders based on order policy rules.

Receives order policies from Order Management. Receives production batches and customer packaging orders from MRP and sends back allocation of packaging orders to production batches and packaging order adjustments within customer order policies.

Taylor Scheduler: Here is where planning stops and detail scheduling begins. TS automatically develops and facilitates scheduler adjustments of an execution schedule, based on additional or last minute information. Depending on the facility, resources such as labor pools, tooling, inspection, set-up and material can be modeled, in addition to the traditional machine capacities. The production facility can also model subcontractor capacity to selectively outsource, when appropriate. Work orders are usually released to the shop floor about six weeks to two months out, as they come into the production horizon and capacity is available.

The detail schedule can be printed out and distributed manually to the shop floor, or it can be distributed on-line via the Production Client. A snapshot of the schedule can be passed to Capacity Planner, to be used as a starting point for rough-cut capacity planning or capacity requirements planning.

Production Client Suite: These shop floor modules provide on-line access to the latest execution schedule by machine center. It allows the operator to input status changes, report production, and indicate if a machine is down and for how long directly on-line. The additional detail collected at this level is ideal input to drive a continuous

improvement program through custom reporting by machine, work order, operator, item, and shift for any time period.

Input is the production schedule. Feedback includes work order/machine status changes, production quantities, and expected machine downtime.

Input is the execution schedule. Output is different views of that schedule.

Capacity Planning Process

There are two main reasons for capacity planning:

1. to validate that a production plan can be produced with a given capacity – set of machines and potential high-level constraints; and

2. to determine what capacity is required to produce a given production plan. Of course, the essence of capacity planning is to resolve these two interacting questions at the same time, to the satisfaction of management – financial and physical reality.

Capacity planning is typically done within various time horizons – long-, medium-, and short-term. In each planning horizon, the questions are the same, but the focus is different. In long-term planning, the focus is in validating the business plan and establishing a capital budget. In the medium-term, the focus is making tactical adjustments to capacity and making commitments to customers. In the short-term, capacity planning becomes finite scheduling, with the focus on executing the plan, minimizing variances, and meeting customer expectations. Clearly short-term success is based on having a valid plan in the first place. This is the main reason Taylor's Capacity Planner is so valuable to manufacturers in today's "must execute properly" world.

Capacity Planner (CP) supports capacity planning at two levels – long-range (RCCP) and a medium-level (CRP). The process is the same in ether horizon; the input details and reporting horizon are the primary differences. The following bullets outline the overall process for capacity planning using CP.

- A "planning model" is initially developed by importing the current actual model (filtered to include only key machines, resources, and their patterns) from Taylor Scheduler (TS). If necessary, the planner can eliminate parts of the imported model, add machine breaks, or change shift patterns (calendars) to establish a planning base model.

- Next, additional feasible capacity is added. Certainly, less feasible capacity may be easily added as well, making the model infinite, in a practical sense. Finally, appropriate planning business rules are incorporated into the model.

- Load profiles are created for each product family, as well as for key SKU items. Load profiles are essentially high-level routings with only key load centers being listed and key resources being required.

- Within the load centers, machines are designated as the planning load units. Existing machines have less cost than potential additional machines to prioritize their use.

- Traditional finite capacity scheduling is performed, using TS, on a day-to-day, week-to-week basis with the finite model, as it is done today. Note: CP can be used without TS, but in that case the starting point is an arbitrary future date and not based on an existing load – see next step.

- As the first step of the capacity planning process, the finite scheduled load is imported as a starting point for capacity planning. The import filters on key machines and resources, as established in TS.

- The planner may then adjust the initial imported load to establish a more accurate starting point for the task at hand. The planner may freeze the entire imported load, or she may freeze the load prior to a certain date. All orders beyond the freeze date are deleted. Note: this portion of the plan is based on many details not available to CP, so it cannot be rescheduled; however, there may be gaps in the current load, which can be utilized by CP.

- Then planned orders may be imported. Every planned order must have an item number; order numbers are not required. During the import, if a load profile exists for the imported item, then it is assigned directly. If the item does not have a load profile, then the item's product family's load profile is used. If an item is not a member of a product family and doesn't have its own load profile, then an error message is logged.

- Next, forecasted items may be imported (actually the order of this and the previous import does not matter). Like planned orders, forecast entries may be at the item or product family level. If there is a load profile for the item, it is assigned directly. If there isn't, then the items product family load profile is assigned. Further, since forecasts are typically in monthly or quarterly quantities, the quantity is disaggregated into more schedulable quantities automatically.

- Similarly, any other order type can be imported. The order type allows the planner to segment and analyze load, utilization, resources requirements by order type, as well as product categories – see reporting below.

- A capacity plan is then developed automatically and can be adjusted by the planner at the machine level until satisfied that capacity has been utilized properly.

Reporting

Capacity Planner reporting is based on accessing independent scenarios stored on a central server. This can be done by users and departments given access that are not necessarily "Capacity Planners," such as engineers, accountants, sales, production, etc.

Each scenario provides a summary text description of that particular model's assumptions. Furthermore, each scenario identifies the scenario upon which it was build, since most analysis is to look at a base scenario and ask "what if" we make this change or that change. However, since the multitudes of model details themselves are in reality the assumptions, we also store the actual model with the resulting schedule results for analysis and comparison.

Most reports allow the user to select or indicate the following information, as the basis for the report to be produced:

- Report Range – a date range from today out to any point in time five years or less.
- Bucket Size – week, month, quarter or year.
- Calendar or days – Should the buckets be cut-offs by the end of calendar weeks, months, quarters or years, or should the buckets start from the beginning of the date range and be of "standard" size buckets of seven, 30, 90 and 360 days respectively.
- Load Center: A range or single load center can be designated.
- Order or Product Type: Several reports segment the graphic display by order or product type. For example, Utilization of 120% in a period may be composed of 50% current orders, 60% planned orders and 10% forecasted orders.

The following key reports will be available to reporting module and CP users:

- Load Center Utilization: planned utilization for each period of each load center with available time for the machines designated as the base being equal to 100%. Typically, this base will be of the "current" machines imported from TS.
- Load Center Utilization Detail: planned utilization of each machine used during each period within each load center.
- Production: the number of units or dollar value by load center, by product family/line, product type or order type for each period.
- Resource Requirements: separate reports showing start and stop dates for each planned key resource – machine, tool, or labor, or requirement dates and quantities for key materials.