Capacity Planning with SAP®

› How to leverage SAP Capacity Management
› Options for capacity scheduling in SAP ERP
› Capacity planning best practices
› Automatic resource and material scheduling with SAP APO
# Table of Contents

**Introduction**

1. **Capacity Management in SAP ERP**
   1.1 Using science in operations and capacity management  
   1.2 Dealing with conflicting goals  
   1.3 What is capacity management?  
   1.4 Areas where capacity management is used  

2. **The Process of Capacity Management**
   2.1 Capacity planning  
   2.2 Sequencing of orders  
   2.3 Capacity leveling  
   2.4 Finite capacity scheduling  
   2.5 Capacity evaluation  

3. **Options and Opportunities for Capacity Scheduling in SAP ERP**
   3.1 Finite scheduling of a discrete work center  
   3.2 Takt-based sequencing and scheduling of a flow line  
   3.3 Takt-based scheduling of a flow line with Kanban withdrawals  
   3.4 Scheduling a mixed model production line with MTS and MTO  
   3.5 Product wheel scheduling for the process industry  
   3.6 Product wheel scheduling for discrete parts production  
   3.7 Kanban  
   3.8 conWIP  
   3.9 Rate-based scheduling of a flow line  
   3.10 Drum-Buffer-Rope
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4  Outlook 2020 and beyond</td>
<td>155</td>
</tr>
<tr>
<td>A  About the Author</td>
<td>158</td>
</tr>
<tr>
<td>B  Index</td>
<td>159</td>
</tr>
<tr>
<td>C  Disclaimer</td>
<td>163</td>
</tr>
</tbody>
</table>
2 The Process of Capacity Management

Capacity management and its functions for planning, sequencing, leveling and scheduling orders, represent an important step in the chain of events for the lean, agile and efficient provision of a detailed production program. Without capacity planning, we fail to consider reality in our efforts to produce as close as possible to customer demand.

Unfortunately, during most SAP implementations, capacity management is put at the bottom of the list of priorities and, due to budget and time constraints, most often falls through the cracks. Well-meaning attempts to make it work later down the track are often unsuccessful due to the overwhelming mountain of issues that need to be dealt with after go-live.

In this chapter, I want to highlight the significance of capacity management and dive deeper into the individual areas and steps that need to be taken to translate a planned demand and a customer demand into a leveled and noiseless production program.

When managing capacity, we usually go through the following phases: planning for capacity, sequencing orders, leveling orders within the available offering and finally scheduling and fixing the orders into the frozen zone. The capacity situation can be evaluated before, during and after the planning phase. Possible overloads are detected and resolved with specific activities which should be clearly defined and documented. It is of utmost importance that the capacity manager knows which horizon is being evaluated so that appropriate measures can be taken.

It is therefore necessary to detail planning horizons and to identify what needs to be done in each one. Figure 2.1 shows this detail and provides a view of long, medium and short-term planning horizons. It also depicts a frozen zone and backorder horizon where expediting and rescheduling take place.
As shown in the figure and detailed in Chapter 1, planning ends where the frozen zone begins and we can arrive at two general rules which streamline the process of capacity management:

**Rule of Planning #1:** ‘There is a point in time at which planning activities end’.

**Rule of Planning #2:** ‘Plan your resources in the medium and long term, and manage demand. Plan your resources and sequence in the short term, and schedule and manage supply’.

Keeping these rules in mind throughout the remainder of this book, we can now look at the specific activities performed in capacity planning, sequencing, leveling, scheduling and evaluation.

### 2.1 Capacity planning

In capacity planning, the user can employ an instrument to plan limited resources at various planning levels. Planning levels refer to various planning horizons within our planning framework. For the long-term planning horizon, we can use rough-cut capacity planning to address
aggregated resource requirements and ensure adherence to planned delivery dates on estimated and forecasted dates. For the medium term we can use simulative capacity planning so that a suitable demand program that lies within the available capacity profile can be activated. And finally, we plan detailed capacity in the short term with specific capacity offering profiles on individual work centers and planned orders generated by MRP.

Figure 2.2 shows the various planning tasks taking place in specific planning horizons.

Figure 2.2: Capacity planning

Detail and planning accuracy increases as we move from long-term planning to medium-term to short-term. Moving through the phases we gradually increase accuracy from work center areas to work center groups to the detail of the work center’s capacity offering—from months to weeks to days and hours, and from incomplete data to complete resource and availability profiles.

Figure 2.3 illustrates this progression.

Thus, capacity planning is about providing enough available resources to meet demand during the planning progression.
2.1.1 Some important planning parameters

In the following sections, I'll discuss the details of some planning parameters which are essential to the planning of a leveled capacity situation. It is important to understand the basic data that supports planning functionality and to operate with a sound setup. This is instrumental for good decision making in long-term, medium-term and short-term planning horizons.

Calculating available capacity

The working hours defined in the work center record are central to planning available capacity. Available working hours are defined for each type of capacity and you can assign as many capacities to a work center as you like. This provides you with the ability to manage various capacity situations. For example, you could make sure that a machine on your shop floor does not exceed its open run time during a standard working week.
Similarly, it is advisable to ensure that workers who are available for 8 hours a day—from Monday to Friday—don’t find themselves working late hours and weekends because the order didn’t match the availability.

However, labor and machine capacities aren’t the only constraints you may have. Warehouse space, oven volume or other space restrictions on a shop floor are just a few examples of the capacities which may have units of measure other than available time. All of them, however, can be set up as a capacity in the work center and can therefore be managed by their constraints.

For each of these capacity categories you can maintain a separate available capacity and assign it to the respective work center.

Furthermore, if a capacity is allocated to several work centers, it is a pooled capacity. For example, the collective available capacity of a human workforce in an area of production can be maintained as a pooled capacity. As such, it must be maintained separately before it is allocated to various work centers.

Once the capacity category is defined, the productive operating time can be calculated, as shown in Figure 2.4.

\[\text{Figure 2.4: Calculation of productive operating time}\]
B  Index

A
actual start 38
agile 37
ALV-Grid 140
APO 76
Assemble To Order 45
assembly line 11
ATP 55
availability checking rule 45
available capacity 34
average inventory 139

B
backward scheduling 23, 102
bly processing 47
bottleneck work center 111
break times 64
buffers 14

C
capacity availability 23
capacity category 65
capacity evaluation 38
capacity load 38
capacity planner 51
capacity profile 34
capacity requirements 23
Capacity Requirements Monitor’ 98
coefficient of variation 52
collective material availability check 36
constraints 63
control cycles 145
conWIP 145
customizing 88
cycle time 14

D
deallocating 100
de-coupling point 138
demand 38
demand driven 36
demand driven manufacturing 123
desired delivery date 102
detailed capacity 61
detailed, time-based planning 74
dispatch 99
display sequence 32
Drum-Buffer-Rope 33

E
earliest start 102
economic lot sizes 22
efficiency rate 64
eKanban 16
EPEI 85
expedite 38

F
factory calendar 64
FIFO 97
finite schedule 24
fixing 36
Flexible Planning 76
flow 21
flow benchmarking 14
forecast accuracy 16
Forecast Monitor 138
framework of reference 18
frozen zone 34

G
Gate Control 49
goods issue date 102
graphical planning board 111
graphical view 79

H
heijunka 24

I
IBP 76
intervals and shifts 28
Inventory Controlling Cockpit 138
inventory/order interface 45

K
Kanban 121
KPI 22

L
labor time 66
latest finish 102
latest start 102
lead time scheduled 111
lead time scheduling 48
Lead Time Scheduling 83
lean 36
Lean Manufacturing Planning & Control 138
leveling 7
Line Balancing 115
line hierarchy 116
Little’s Law 14
LMPC 138
load date 102
long term 42
long term planning 11
Long Term Planning 41
lot size 71

M
Make To Order 49
Make To Stock 45
master recipes 58
material availability check 120
material master record 68
maximum rate 125
middle term 40
mid-point scheduling 103
mixed model line 21
Mixed model production 124
model mix 124
MPS 55
MRP 55
MRP Monitor 138
MRP Run 34

N
Networks 54

O
operating time 66
operations planning 12
order bars 91
order floats 102
output rate 71
INDEX

P
Periodic, rate-based planning 74
planned delivery date 61
planned rate 125
planning cycle 53, 95
planning hierarchy 45
Planning Horizons, 29
planning log 99
Planning Scenario 41, 81
policy 18
pooled capacity 63
Pooling 35
PP-PI 58
process order 95
Process order 54
processing time 66
product families 53
product wheel 95
production line 33
production order 16
production program 38
production rate 11
production type 36
production version 57
pull system 44
push system 43

Q
queue time 102

R
rate based planning 36
rate routing 70
rate-based planning 70
reorder level procedure 143
repetitive manufacturing 36
replenishment policy 22
reschedule 41
Rescheduling 100
resource
  availability 7
  planning 9
rhythm wheel 138
rough cut capacity check 48
rough resource check 52
rough-cut capacity profile 48

S
Safety Stock Simulation 138
sales order 16
sales plan 52
SAP Add-On Tool 98
scheduled start 102
scheduling 7
Scheduling Levels 69
scheduling margin key 102
scheduling types 102
scientific framework of reference 14
segmentation 44
sequence schedule 116
sequencing 7, 125
service level 47
setup 66
setup group category 92
setup group key 92
setup matrix 93
setup optimization 90
setup time 138
shift definition 65
shift sequence 64
simulated planned order 41
simulative capacity evaluation 47
simulative capacity planning 61
SIROP 77
SOP orders 77
standard available capacity 65
Standard SOP 76
standard value key 66
standard values 66
standard work week 64
statistical work center 48
status 91
stock-out 14
strategy group 45
supply 38
supply chain 14
supply chain strategy 43
supply element 41
supply gate 11

T

tabular view 79
takt time 11
takt violations 122
throughput 14
Toyota Production System 85
transaction CM01 38, 98
transaction CM21 57
transaction CM25 35
transaction CO05N 113
transaction CO41 113
transaction CY39 93
transaction LAS2 37
transaction LDB1 116
transaction LDD1 118
transaction MC82 52
transaction MD04 45
transaction MDVP 112
transaction MF50 36
transaction MFS0 78
transport time 102

U

utilization 7

V

Value Stream Map 132
variability 14

W

wait time 102
WiP 14
WIP cap 144
work center 33
work in process 14
working capital 138