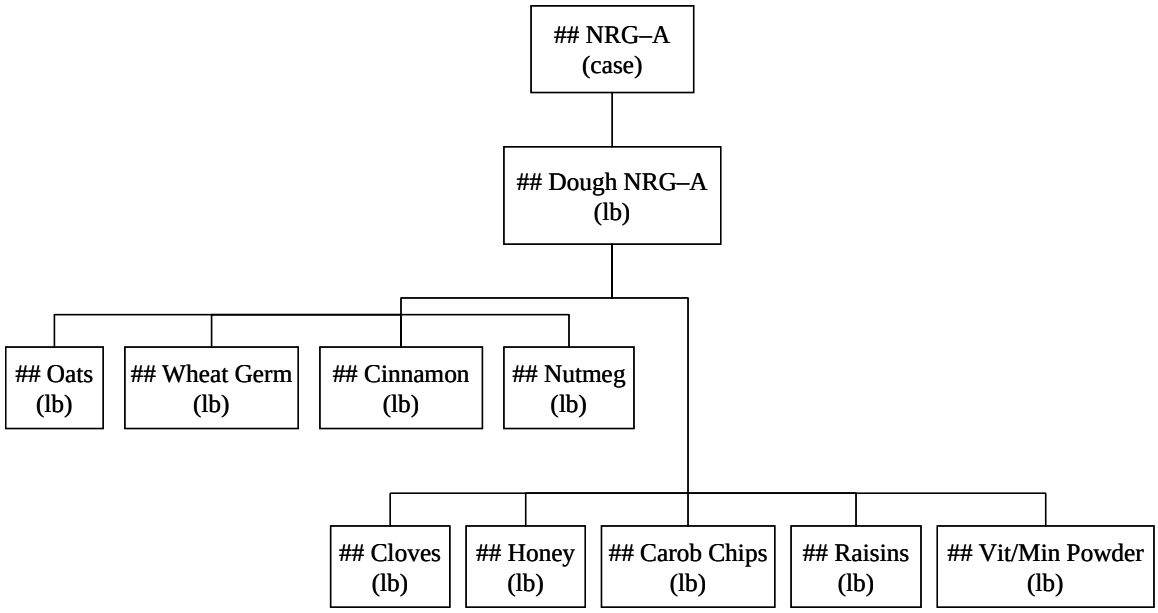
Bill of Material (BOM)

A critical input to the MRP process is the bill of material (BOM), which shows how components and semifinished products are combined to produce the final product. A graphical representation of the BOM for the NRG-A bar is shown below:

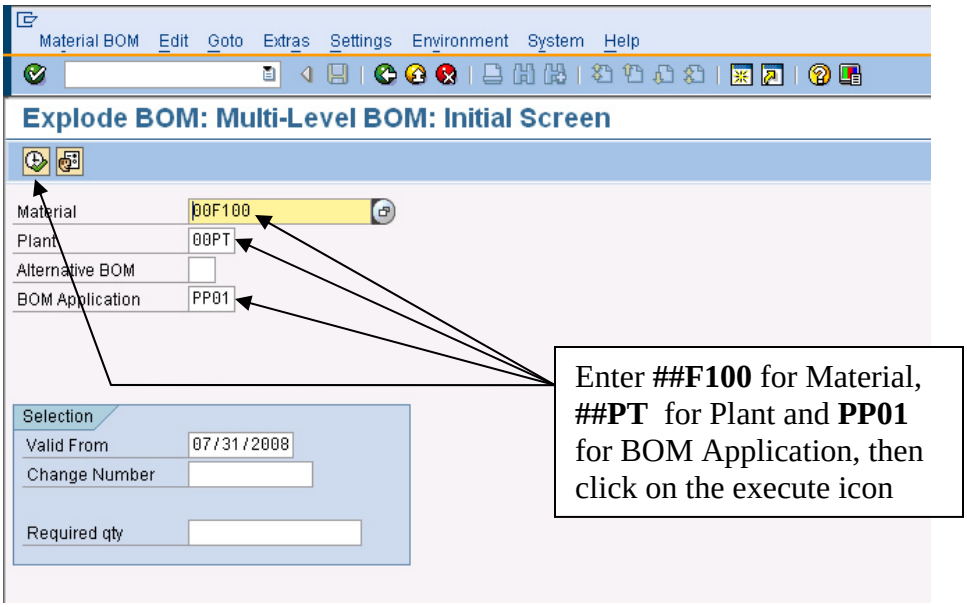


The raw materials (Oats, Wheat Germ, etc.) are combined in a mixer to produce a 500 lb. batch of dough. The dough is then transferred to the baking line, where it is formed into bars, baked and packaged. For simplicity, we have ignored the wrappers, boxes and cases that are needed to produce a complete case of Fitter Snacker bars.

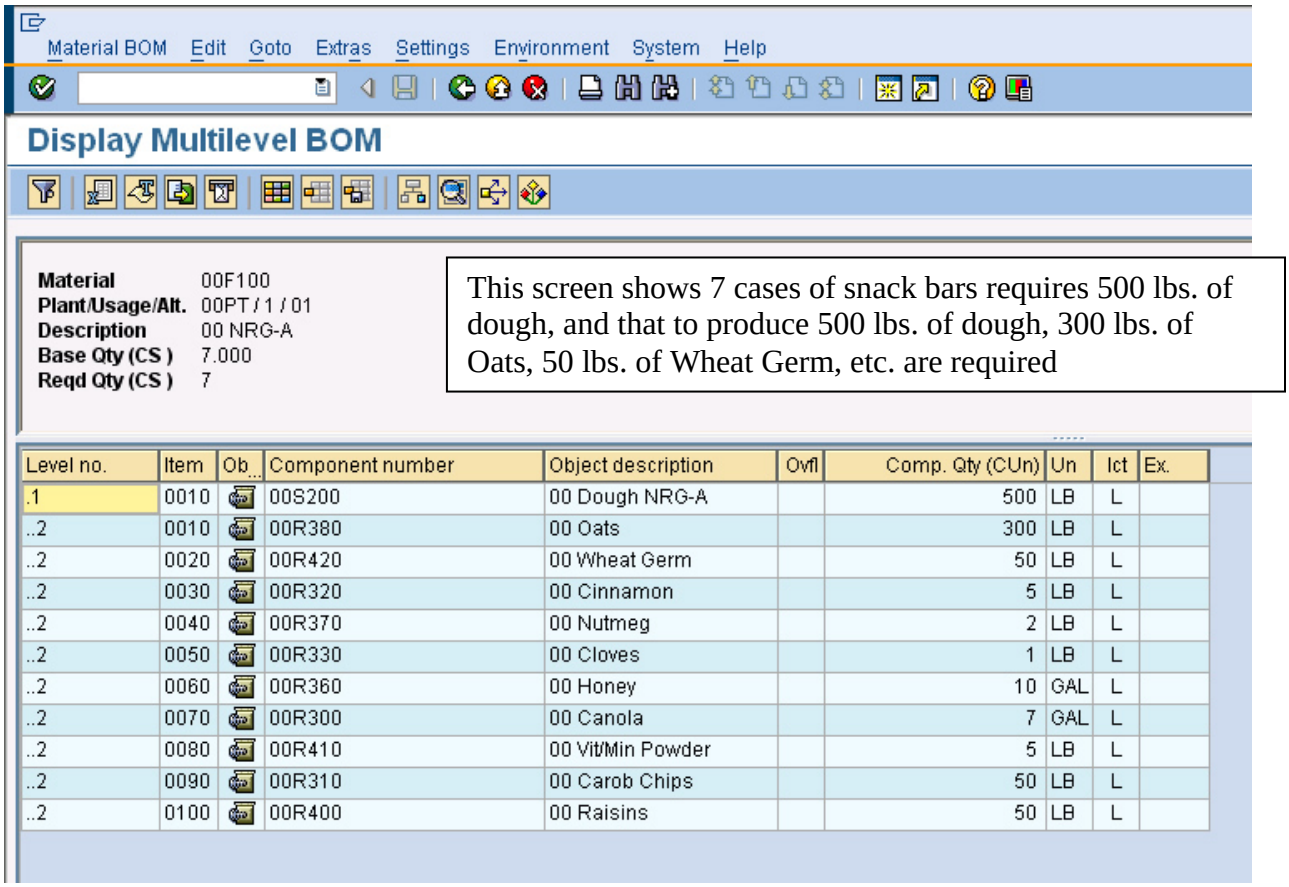
To view the BOMs for Fitter Snacker, follow the menu path:

Logistics ▷Production ▷Master Data ▷Bills of Material ▷Reporting ▷BOM Explosion ▷Material BOM ▷Multilevel ▷Material BOM Browser

Which will produce the following screen:

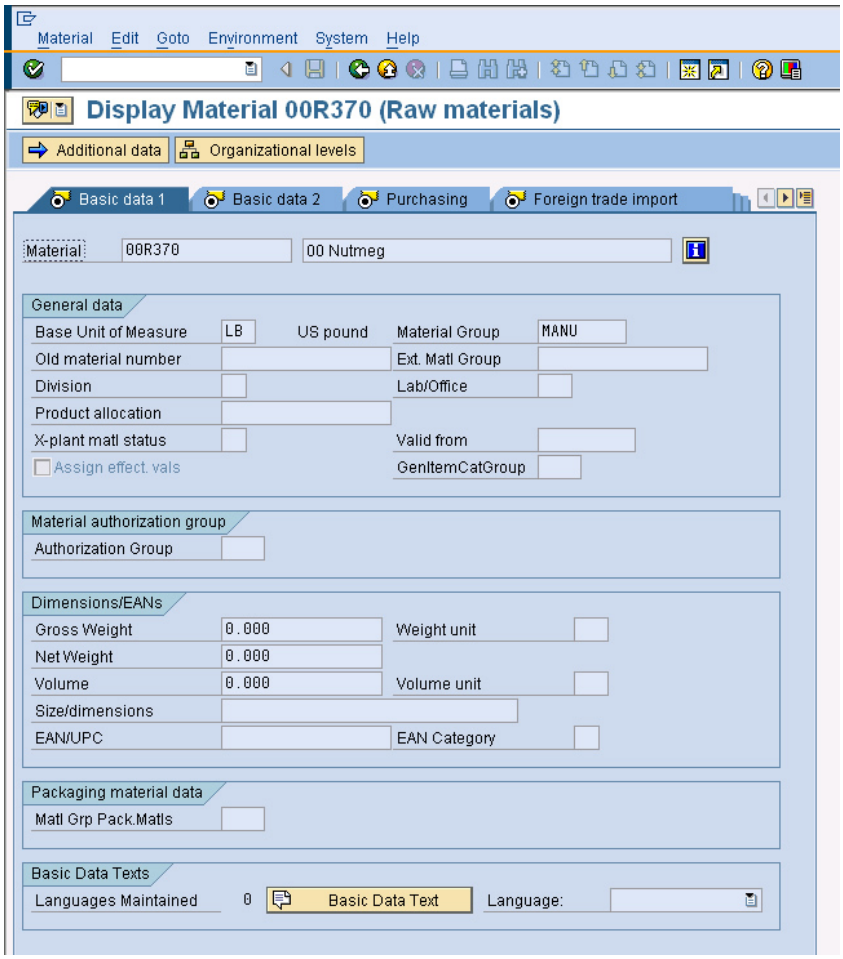


Enter **##F100** for Material, **##PT** for Plant and **PP01 (P P Zero One)** for BOM Application, then click on the execute icon (), which will produce the following screen:



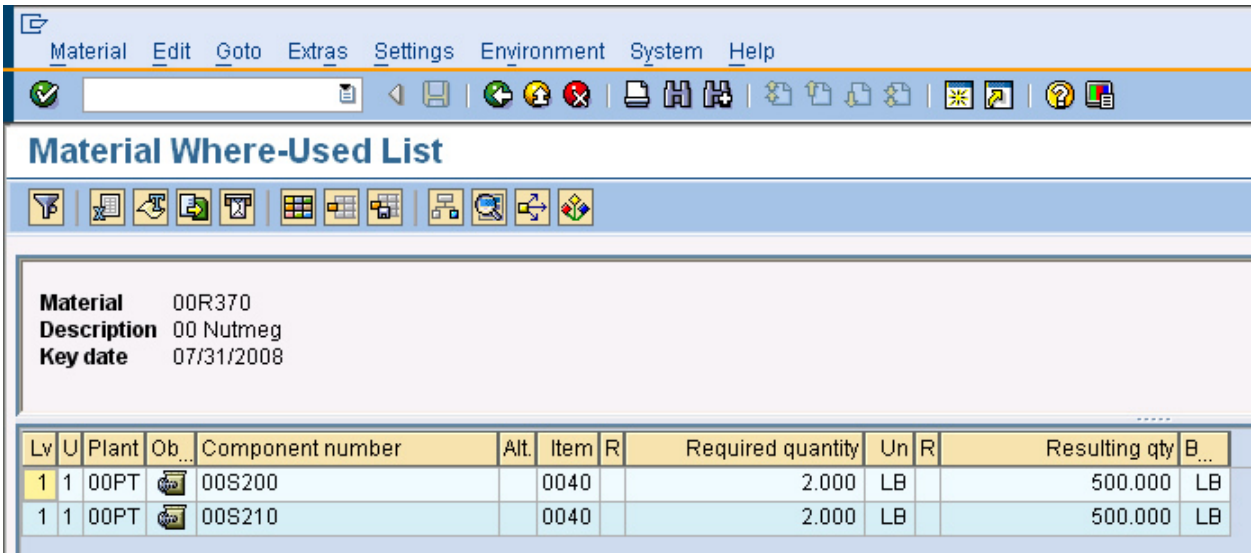
Level no.	Item	Ob...	Component number	Object description	Ovfl	Comp. Qty (CUn)	Un	Ict	Ex.
.1	0010		00S200	00 Dough NRG-A		500	LB	L	
..2	0010		00R380	00 Oats		300	LB	L	
..2	0020		00R420	00 Wheat Germ		50	LB	L	
..2	0030		00R320	00 Cinnamon		5	LB	L	
..2	0040		00R370	00 Nutmeg		2	LB	L	
..2	0050		00R330	00 Cloves		1	LB	L	
..2	0060		00R360	00 Honey		10	GAL	L	
..2	0070		00R300	00 Canola		7	GAL	L	
..2	0080		00R410	00 Vit/Min Powder		5	LB	L	
..2	0090		00R310	00 Carob Chips		50	LB	L	
..2	0100		00R400	00 Raisins		50	LB	L	

This screen shows the recipe required for seven cases of dough. To learn more about any of the materials required to make an NRG-A bar, select the item and click on the detail icon. For example, clicking on the ## Nutmeg row and clicking on the detail icon ( ) will call up the material master for Nutmeg:



The Material Master is a multi-tabbed screen that contains all information about a material used by any module in the SAP ERP system.

Click on the back icon ( ) and then, with the nutmeg selected, click on the where-used icon ( ), which will call up the following screen:



This screen shows that Nutmeg is used in two products—NRG-A and NRG-B bars. According to help.sap.com, the where-used list can be used to:

- Determine requirements for a specific material
- Select products that are affected by a change to an individual part
- Find assemblies that will be delayed if, for example, there is a delay in the delivery of a raw material
- Calculate the effect on the cost of a product if the price of a raw material rises

Click on the exit icon () until you return to the SAP Easy Access screen.

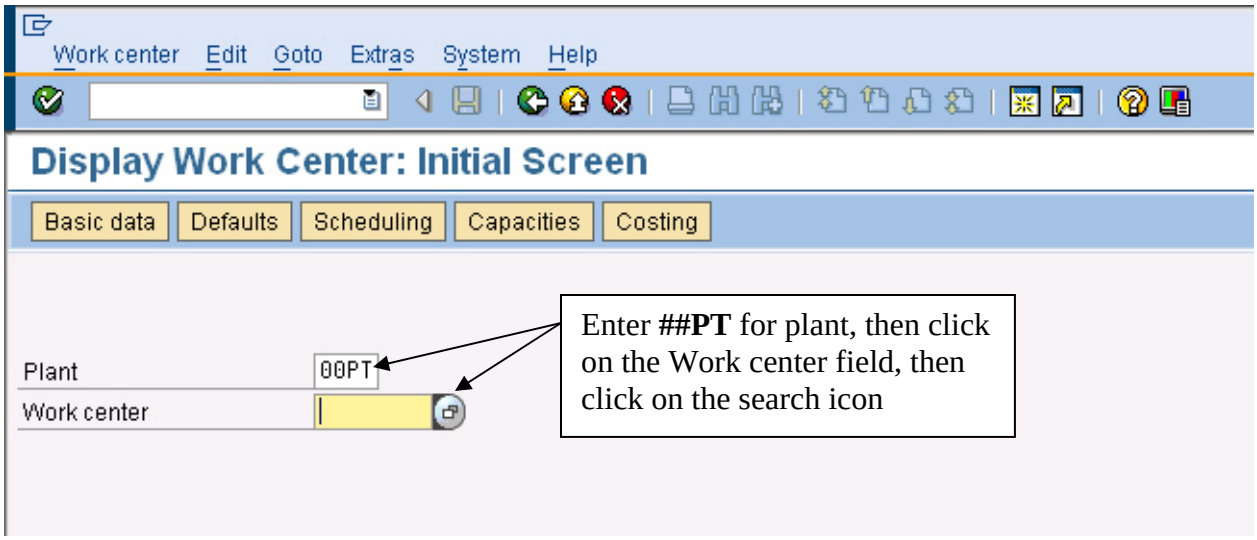
Display Workcenters

Production is carried out at workcenters. In the SAP ERP system, workcenters can represent machines or groups of machines, production lines, assembly lines, employees or groups of employees.

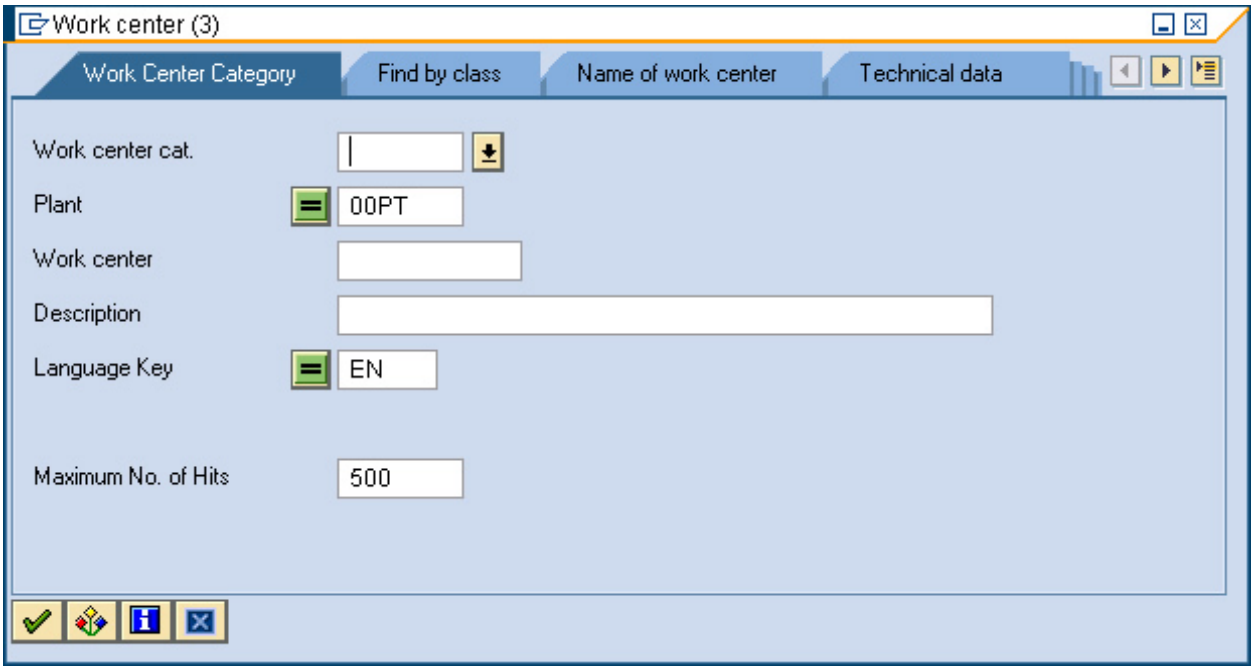
To display the workcenters used for Fitter Snacker's snack bar production, follow the menu path:

Logistics ▷Production ▷Master Data ▷Work Centers ▷Work Center ▷Display

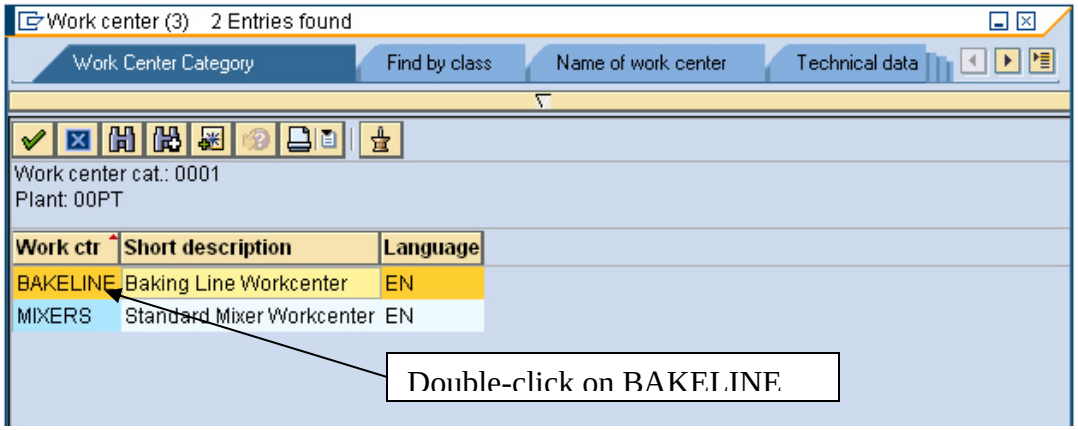
which will produce the following screen:



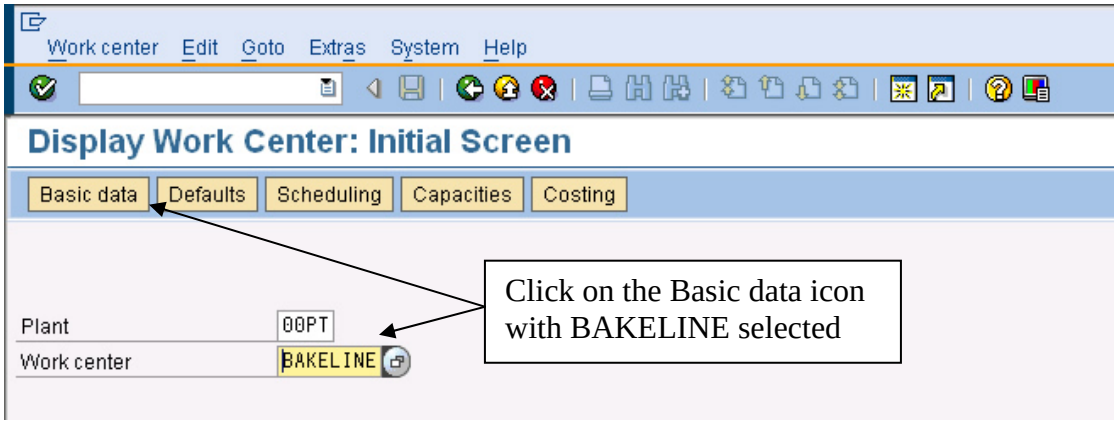
Enter **##PT** for Plant, then click on the search icon to call up the search window for Work centers:



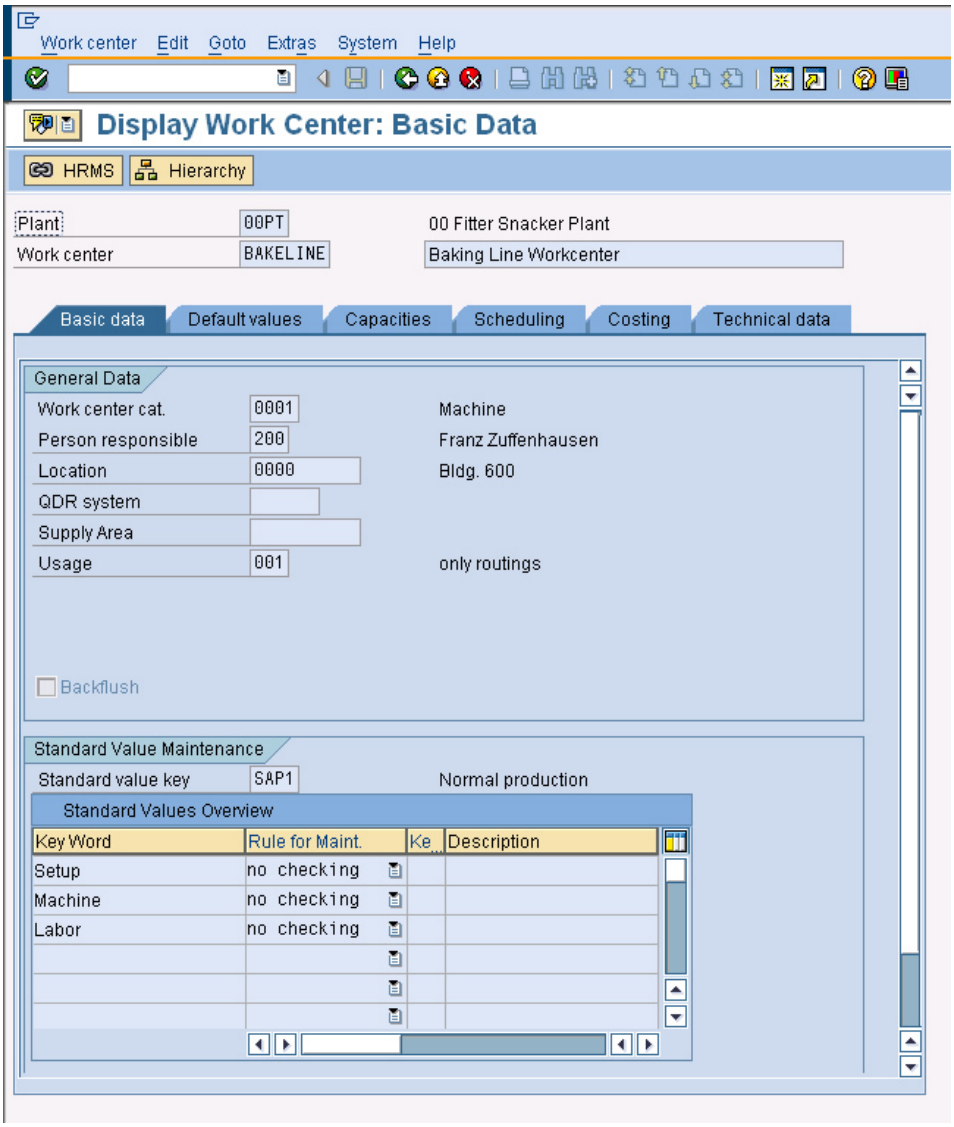
Make sure that you select the **Work Center Category** tab and that **##PT** is entered for **Plant**, then click on the enter icon (✔) to pull up a list of work centers:



Double-click on the **BAKELINE** row to select it:



Then click on the Basic Data icon to get the following screen:



This multi-tabbed screen contains all relevant data for the workcenter. Click on the exit icon ( ) until you return to the SAP Easy Access screen.

Routings

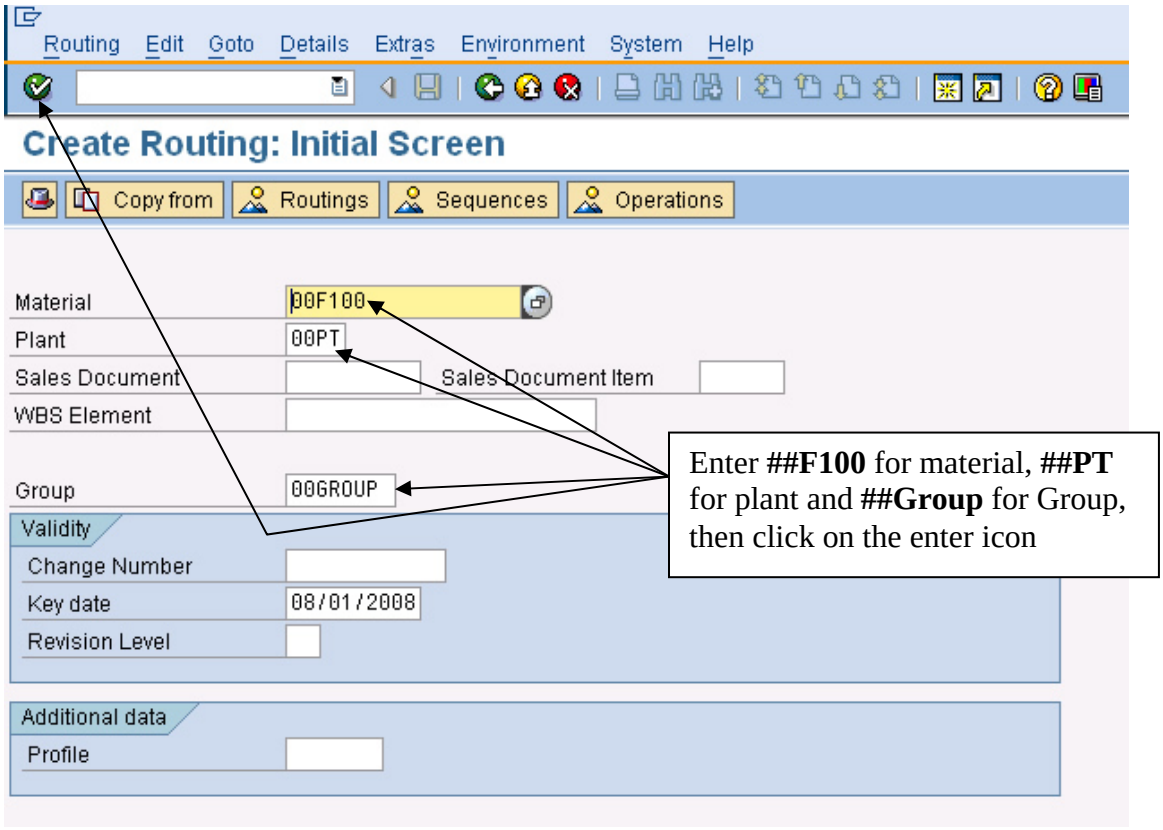
Routings define the workcenters that a product must visit in the production process. Routings also define the operations that must be performed at each workcenter and the components that are needed for each operation.

1. Create ##F100 (NRG-A bar) and ##F110 (NRG-B bar) Routings

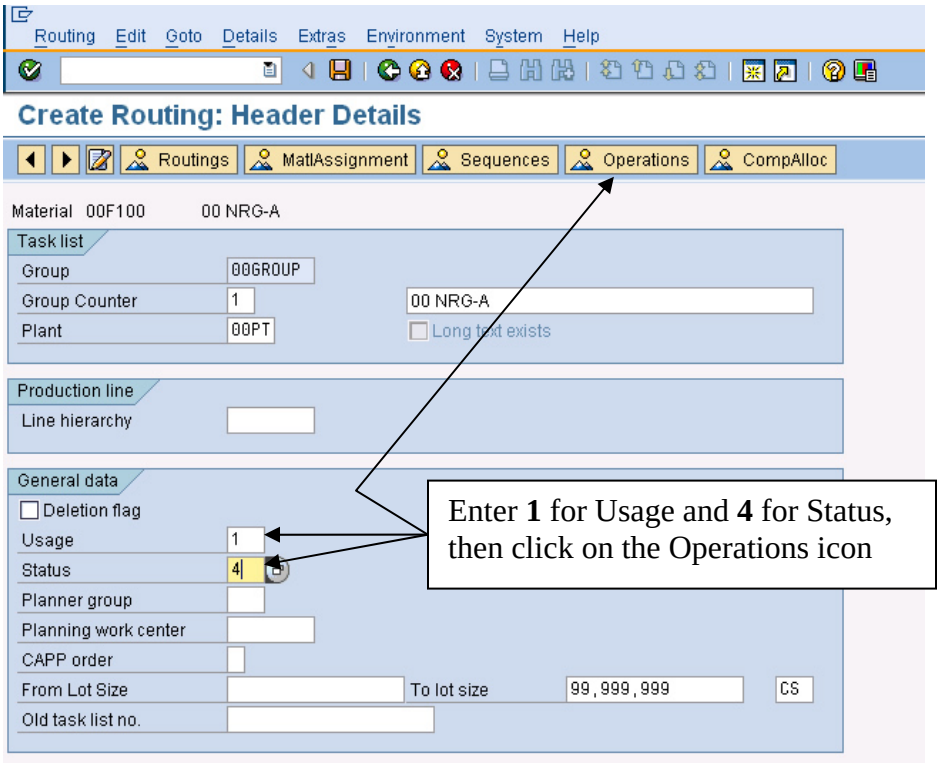
To create a routing for the NRG-A bars, follow the menu path:

Logistics ▷Production ▷Master Data ▷Routings ▷Routings ▷Standard Routings ▷Create

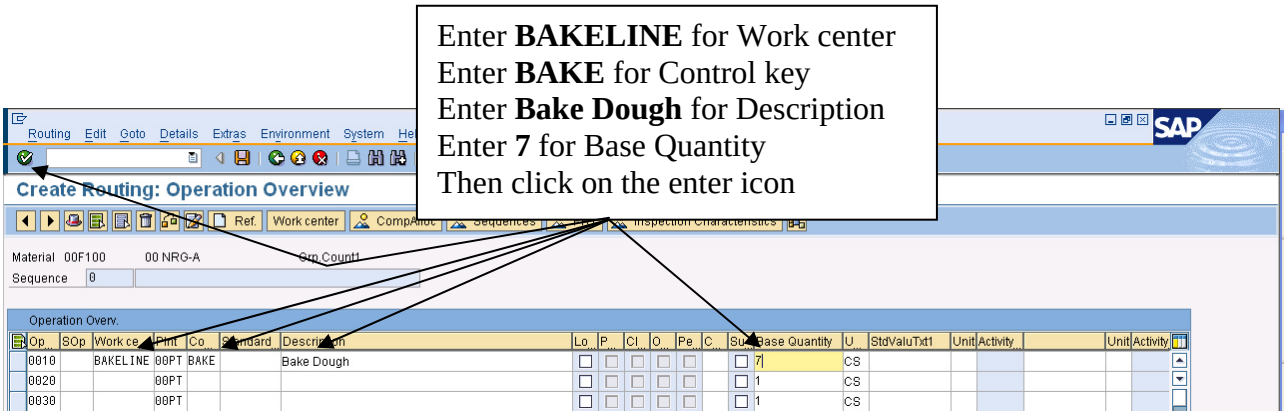
which will produce the following screen:



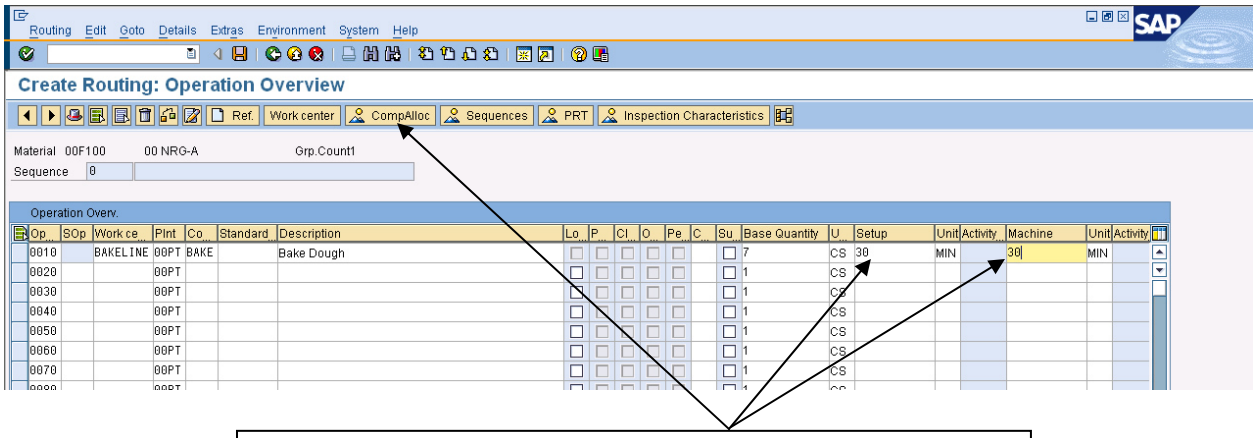
Enter **##F100** for material, **##PT** for plant and **##Group** for group, click on the enter icon (✓) and the following screen will appear:



Enter **1** for Usage and **4** for Status, then click on the Operations icon (Operations), which will produce the following screen:

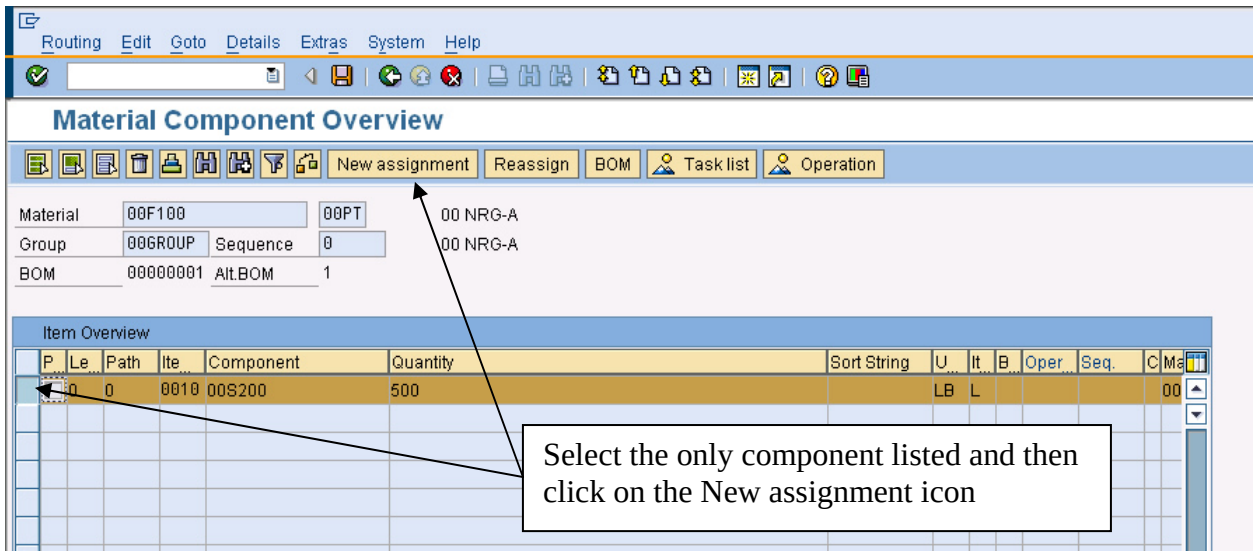


Enter **BAKELINE** for Work center, **BAKE** for Control key, **Bake Dough** for Description, **7** for Base Quantity, then click on the enter icon ( ):

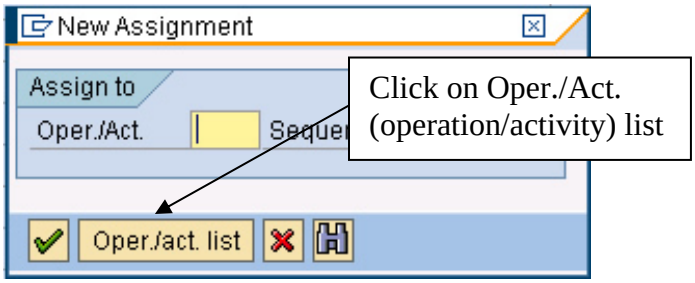


Scroll over and enter **30** for Setup and **30** for Machine, then click on the CompAlloc (component allocation) icon

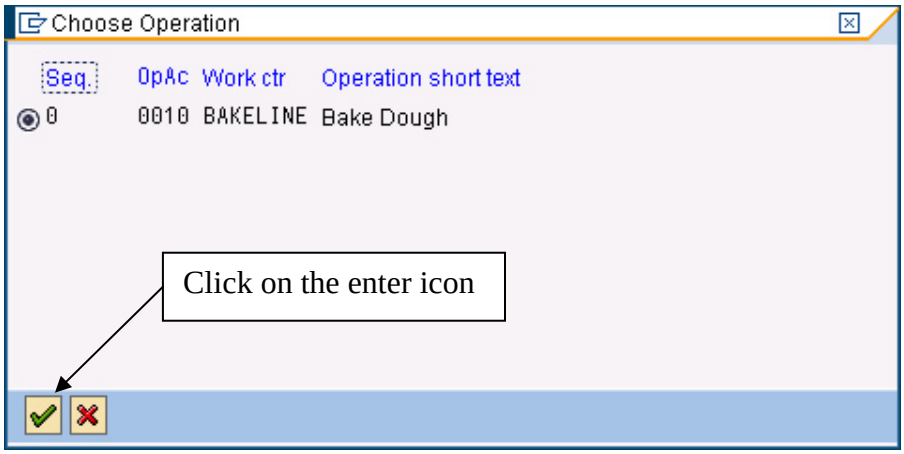
Enter **30** for setup time (how long it takes to change the bakeline from one type of bar to another) and machine time (how long it takes to bake 7 cases of snack bars). Click on the CompAlloc (component allocation) icon (CompAlloc), which will produce the following screen:



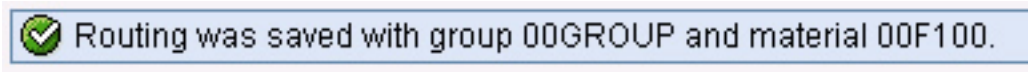
Select the only component listed (SAP determined the list of components from the BOM) and then click on the New assignment icon (New assignment), which will bring up the following pop-up window:



Click on the Operation/Activity list icon to get the list of operations for this routing:



Click on the enter icon (✔) to allocate the material (dough) to the only operation on the routing (bake dough), then click on the save icon (💾) to save the routing. You will get a message like the following:



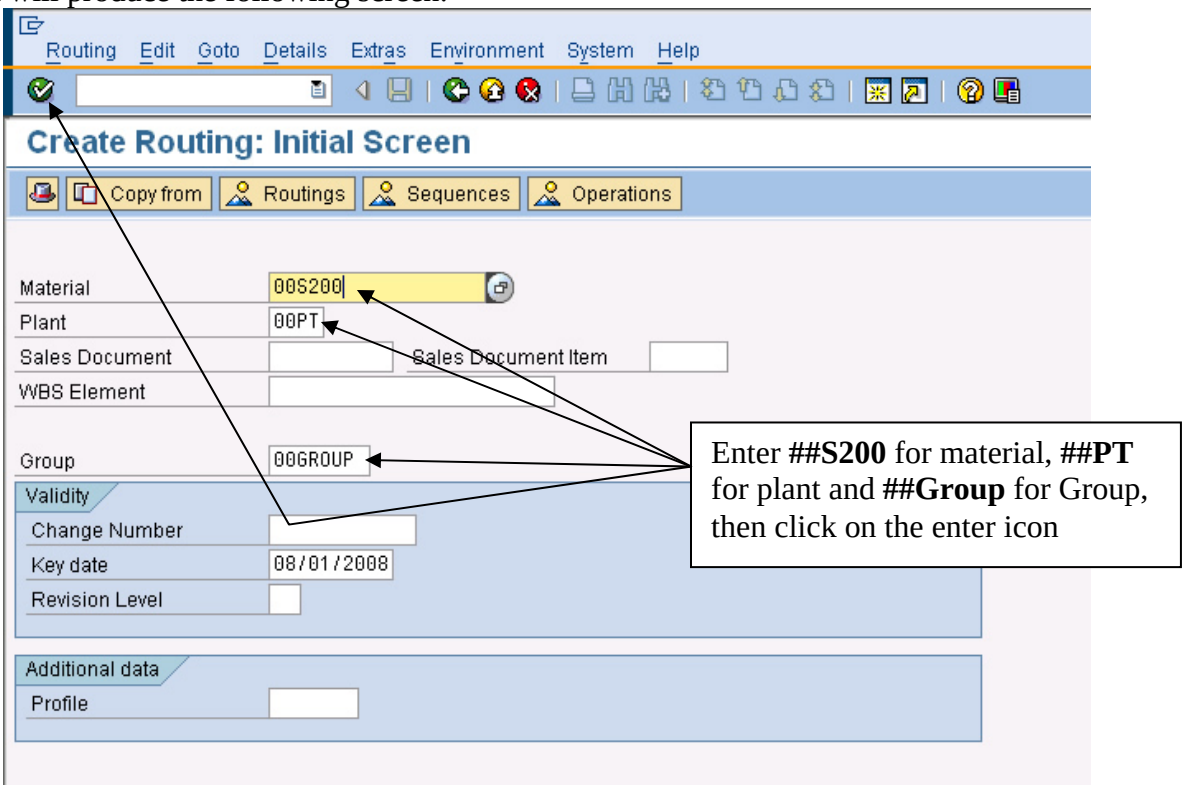
Return to the beginning of section 1 and
repeat the process to create a routing for material **##F110** (NRG-B bars).
All entries are the same as for the **##F100** (NRG-A bars).

2. Create Routings for material ##S200 (dough for NRG-A bars) and ##S210 (dough for NRG-B bars)

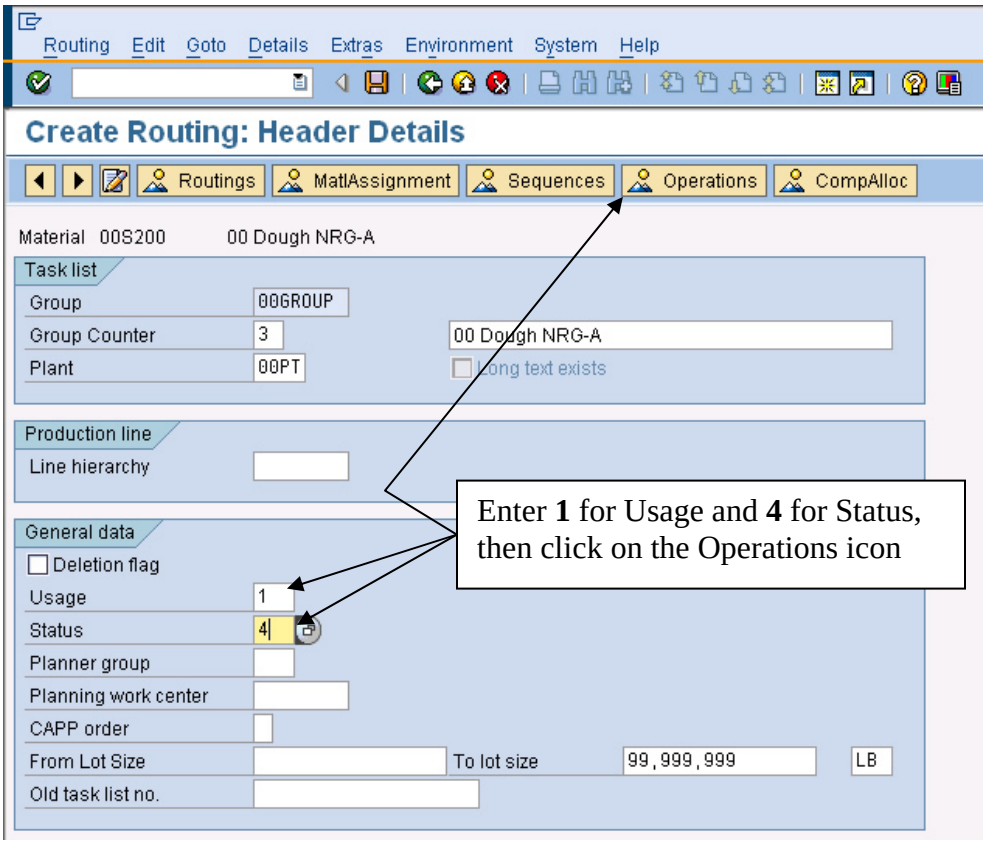
To create a routing for ##S200 (dough for NRG-A bars), again follow the menu path:

Logistics ▷Production ▷Master Data ▷Routings ▷Routings ▷Standard Routings ▷Create

which will produce the following screen:

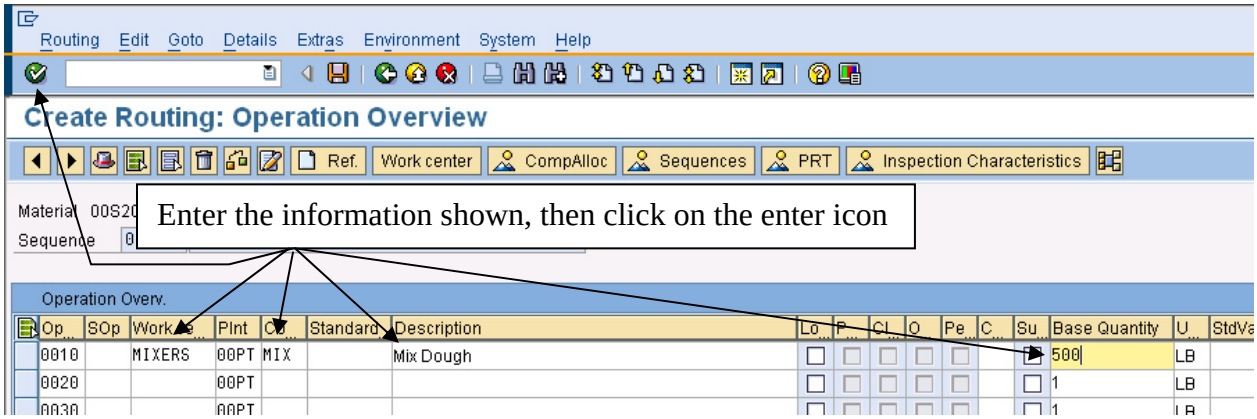


Enter **##S200** (dough for NRG-A bars), **##PT** for Plant and **##Group** for group, then click on the enter icon ( ) and the following screen will appear:

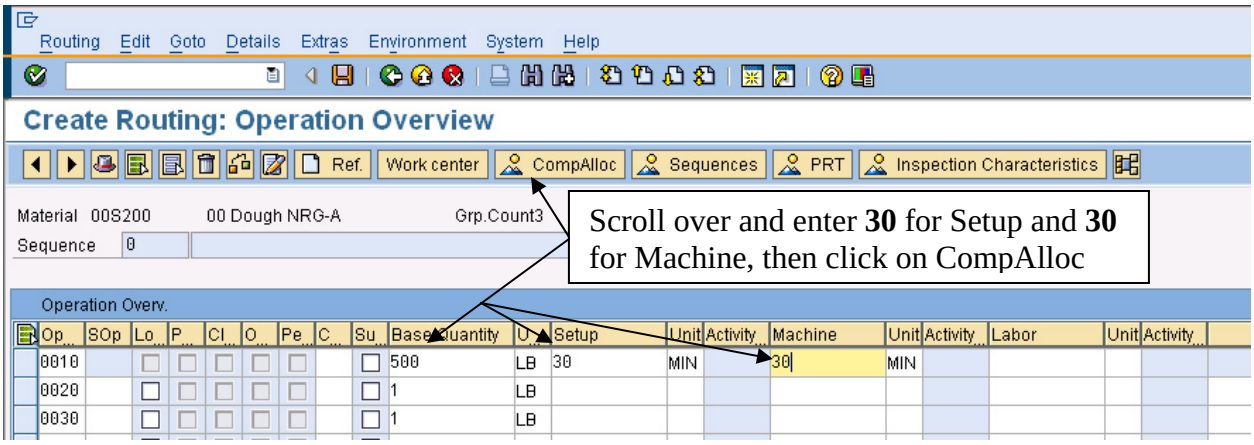


Enter **1** for Usage and **4** for Status, then click on the Operations icon (

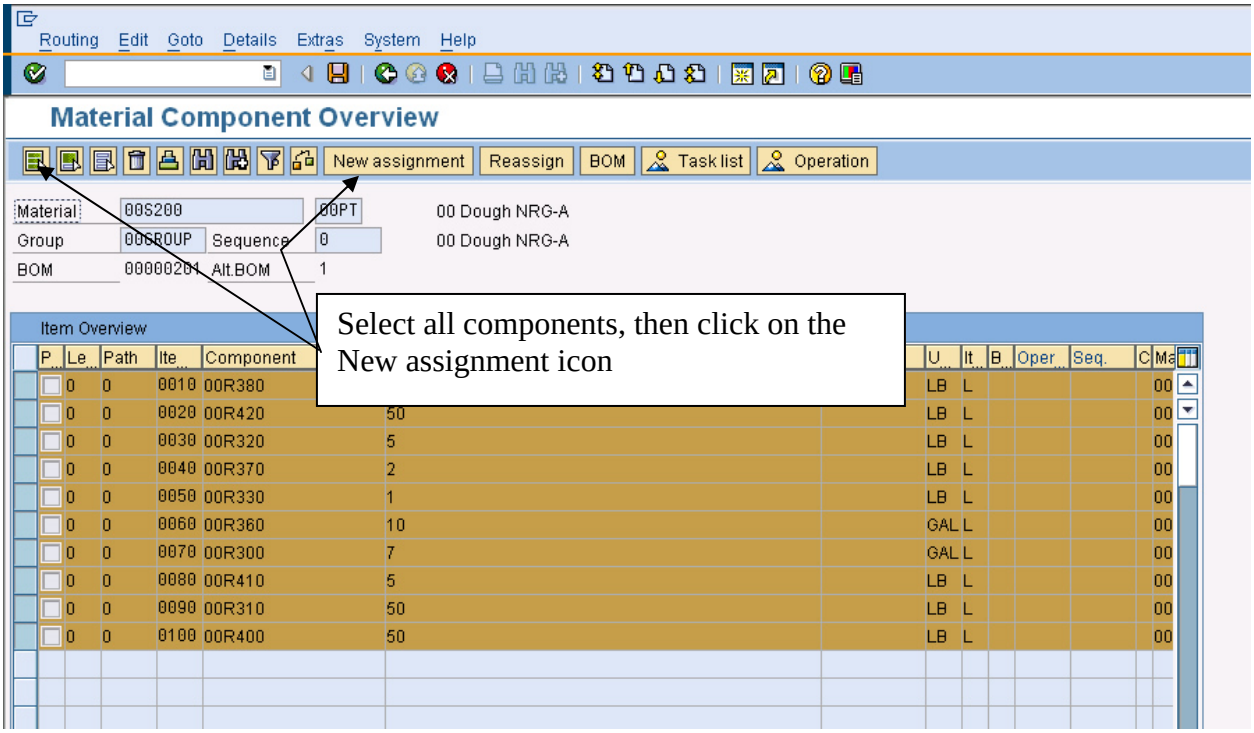
), which will produce the following screen:



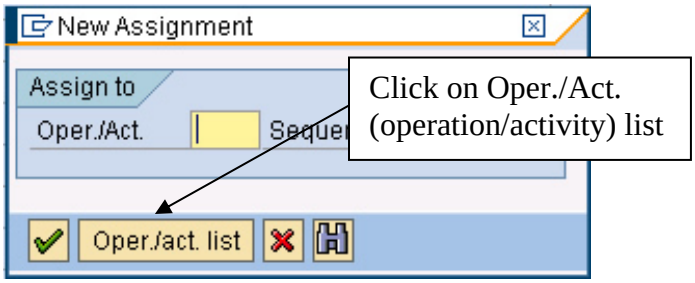
Enter **MIXERS** for the Workcenter, **MIX** for the Control Key, **Mix Dough** for the description and **500** for base quantity, then click on the enter icon (
). Clicking on the enter icon here will call up the headings for setup and machine time:



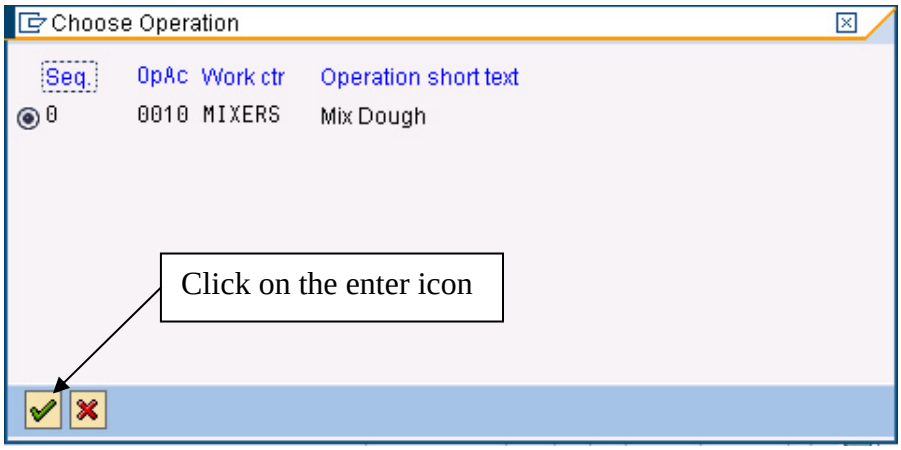
Scroll over and enter **30** for Setup and **30** for Machine, then and click on the CompAlloc (component allocation) icon (CompAlloc) to allocate components to the operations. This will produce the following screen:



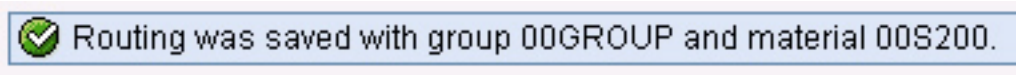
Select all components by clicking on the select all icon ( ), then click on the New assignment icon (New assignment), which will bring up the following pop-up window:



Click on the Operation/Activity list icon to get the list of operations for this routing:



Click on the enter icon (✔) to allocate the materials to the only operation on the routing (mix dough), then click on the save icon (💾) to save the routing. You will get a message like the following:



Return to the beginning of section 2 and repeat the process to create a routing for **##S210** (dough for NRG-B bars).
All entries are the same as for **##S200** (dough for NRG-A bars).

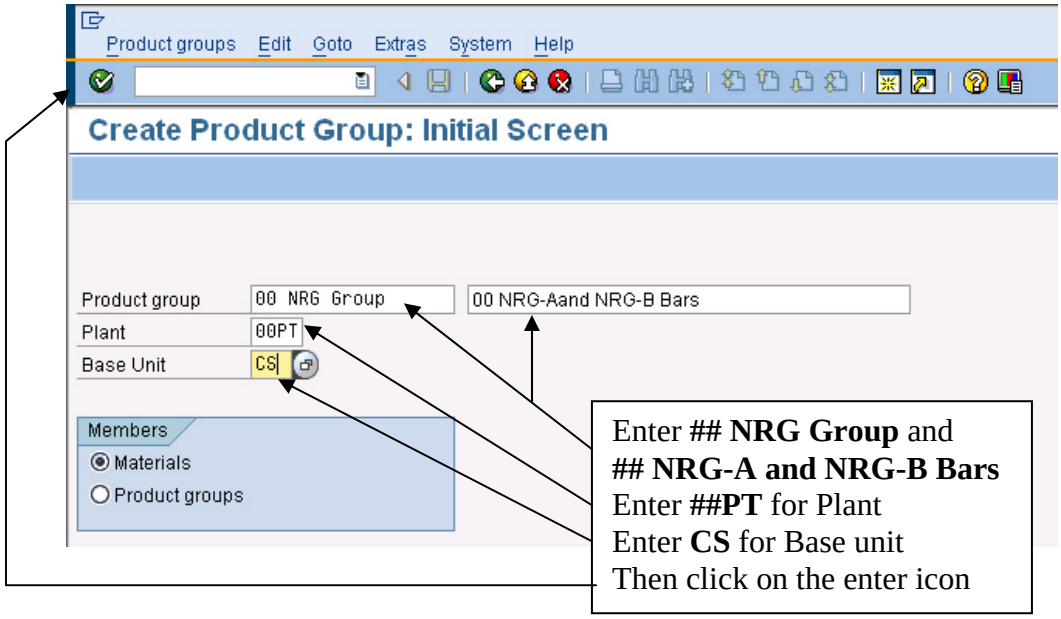
3. Create Product Group

Many firms produce hundreds of products, and planning for each product individually is not feasible or desirable. What these firms do is create product groups, and then plan production for a small number of product groups and then transfer these plans to individual products based on historic percentages. While Fitter Snacker does not have a large of number products, we will use the product group process anyway.

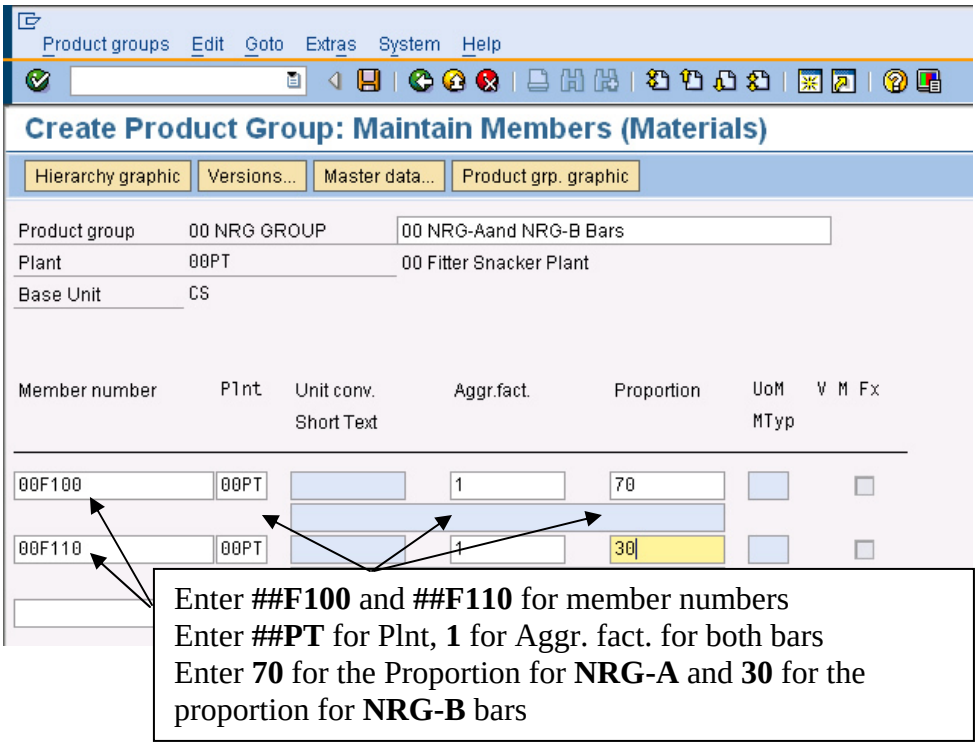
To create a product group for Fitter Snacker, follow the menu path:

Logistics ▷Production ▷SOP ▷Product Group ▷Create

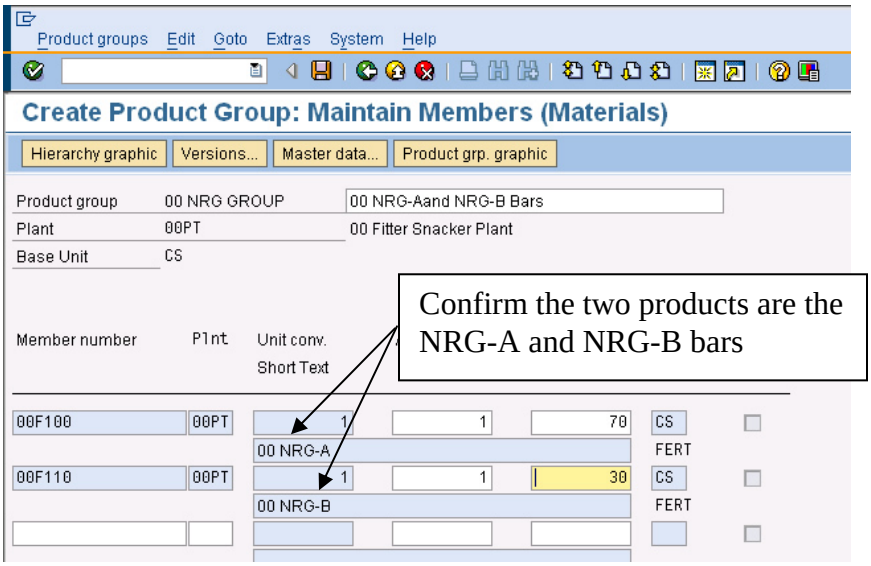
which will produce the following screen:



Enter **## NRG Group** and **## NRG-A and NRG-B Bars** for the title of the product group, enter **##PT** for Plant and **CS** for Base unit then click on the enter icon ( ). This will produce the following screen:



Enter **##F100** and **##F110** for the two members of the group. For both members, enter **##PT** for Plnt and **1** for "Aggr. fact." Enter **70** for the Proportion for **NRG-A** bars and **30** for the proportion for **NRG-B** bars. These proportions mean that whatever production is planned for the NRG group, it will be assumed that 70% of the production should be NRG-A bars and 30% should be NRG-B bars. Click on the enter icon ( ) to confirm that you have the correct products in the group:



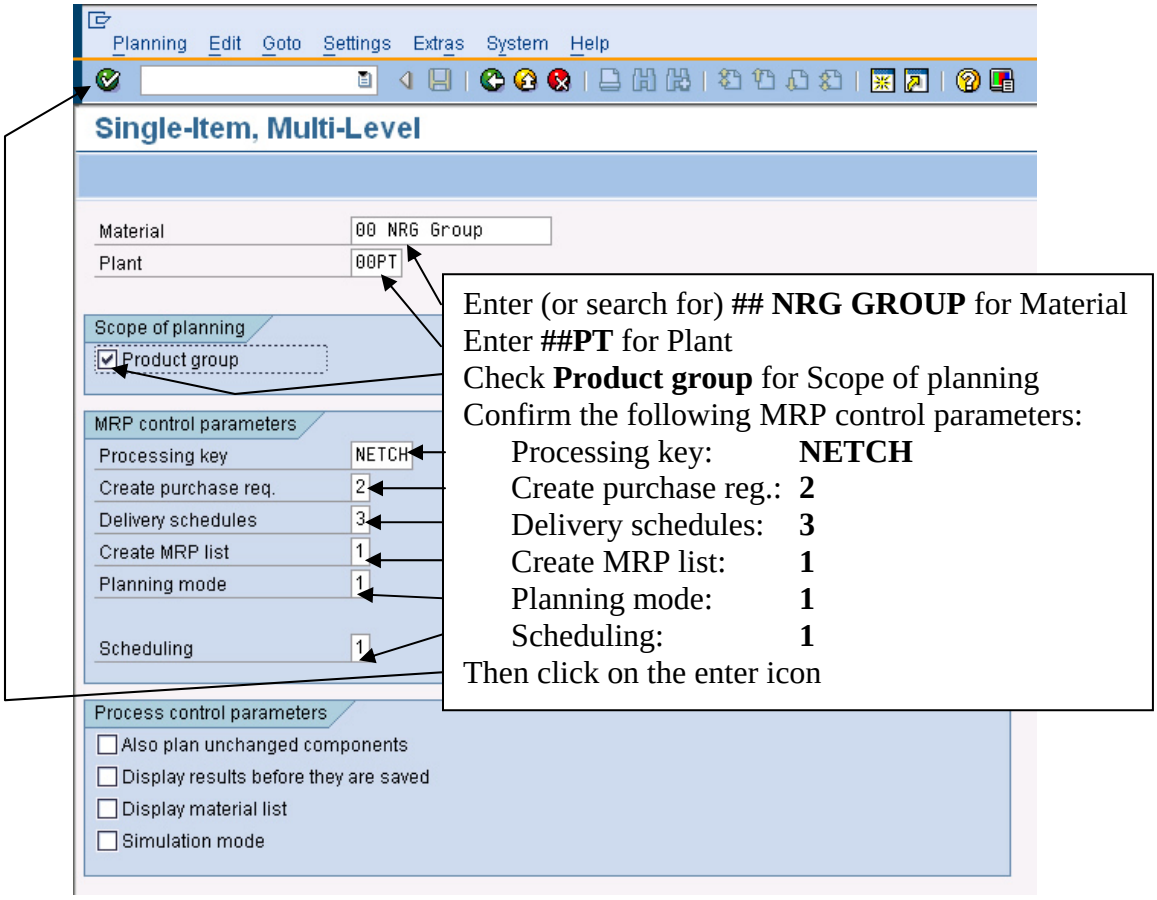
Click on the save icon ( ) to save the product group.

4. Run MRP

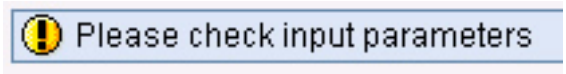
We can run the MRP process on our new product group. To do this, follow the menu path:

Logistics ▷Production ▷MRP ▷Planning ▷Single-Item, Multi-Level Planning

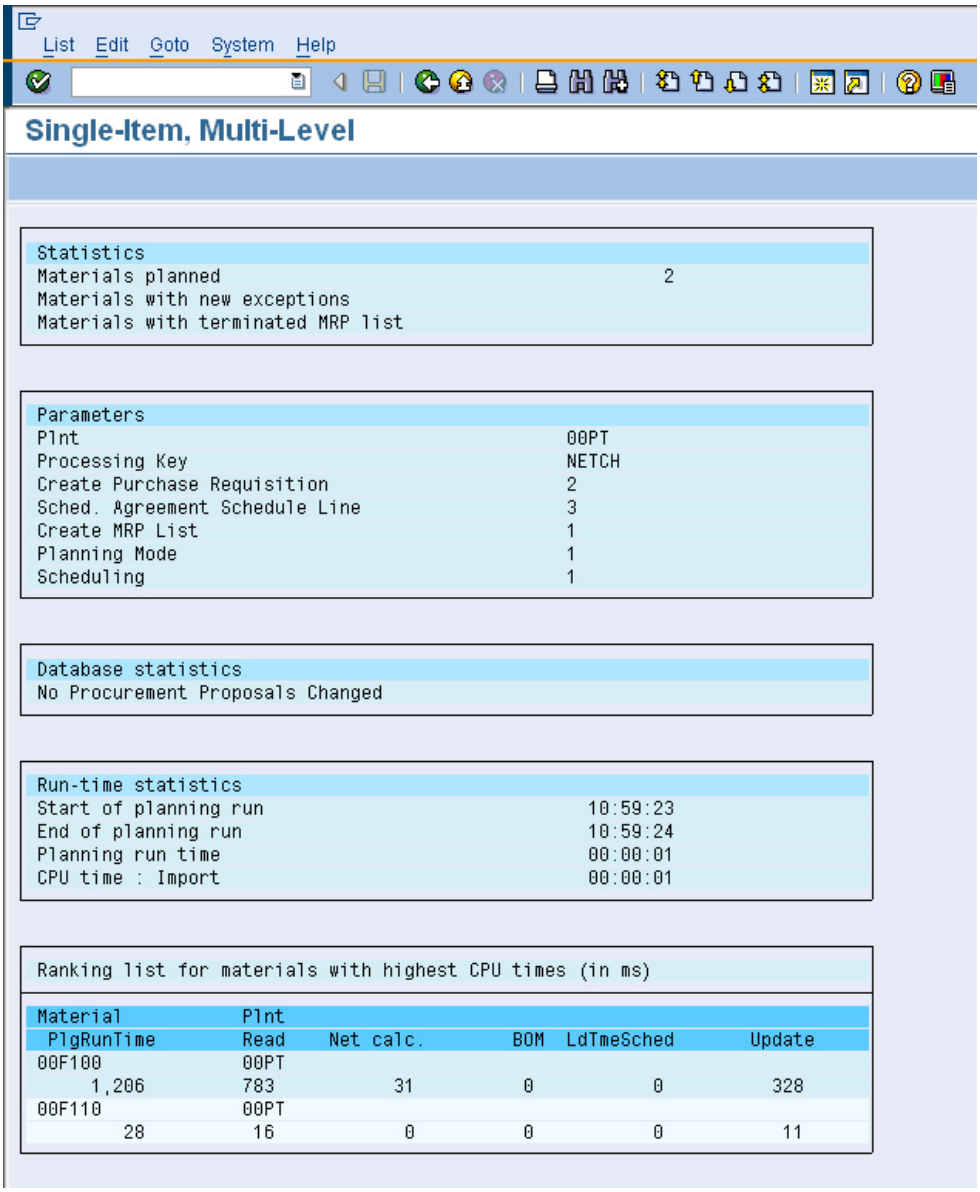
which will produce the following screen:



Enter the information shown above, then click on the enter icon (✓). This will produce the following message:



Click on the enter icon (✓) again and you should get a report like the following:

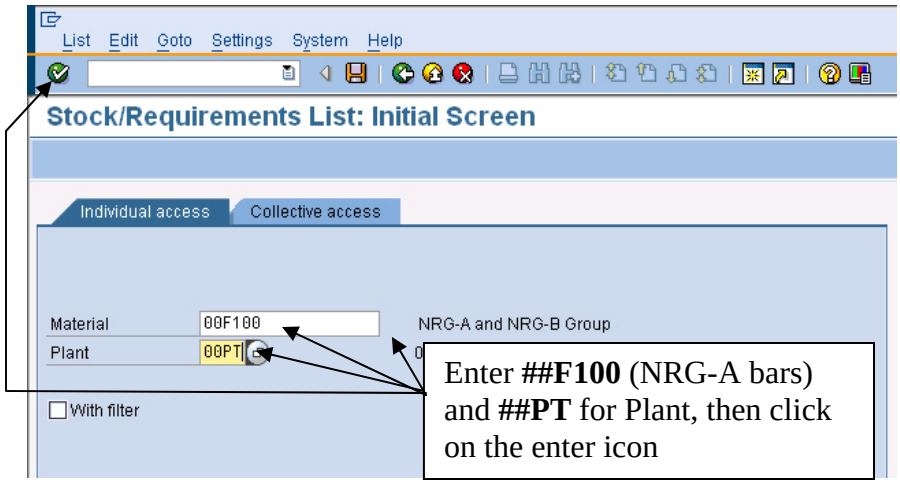


The details of your report may be different, but that is not a problem. As long as you don't have an error messages, things should be okay. To confirm that they are, we can check the status of key materials.

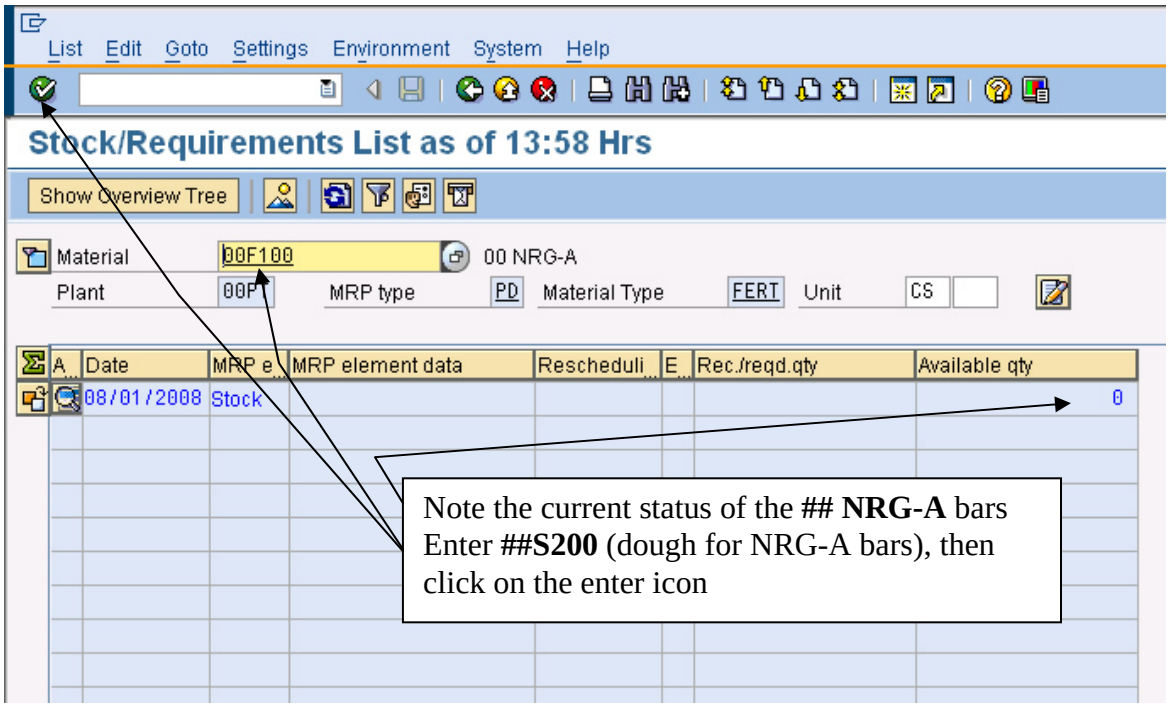
To view the status of a material, we can use the Stock/Requirements list. Like many transactions in the SAP system, there are a number of menu paths that can take you to the Stock/Requirements list. One of these is:

Logistics ▷Production ▷MRP ▷Evaluations ▷Stock/Requirements List

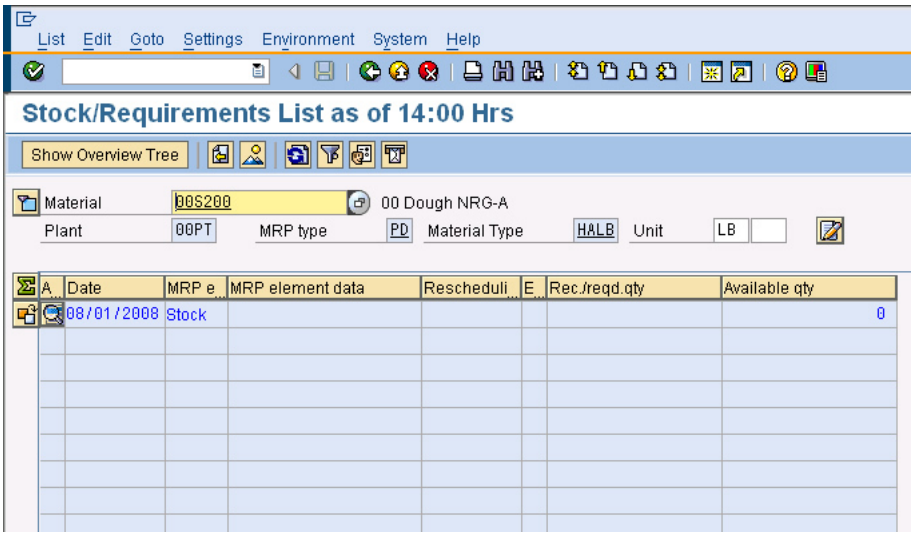
which will produce the following screen:



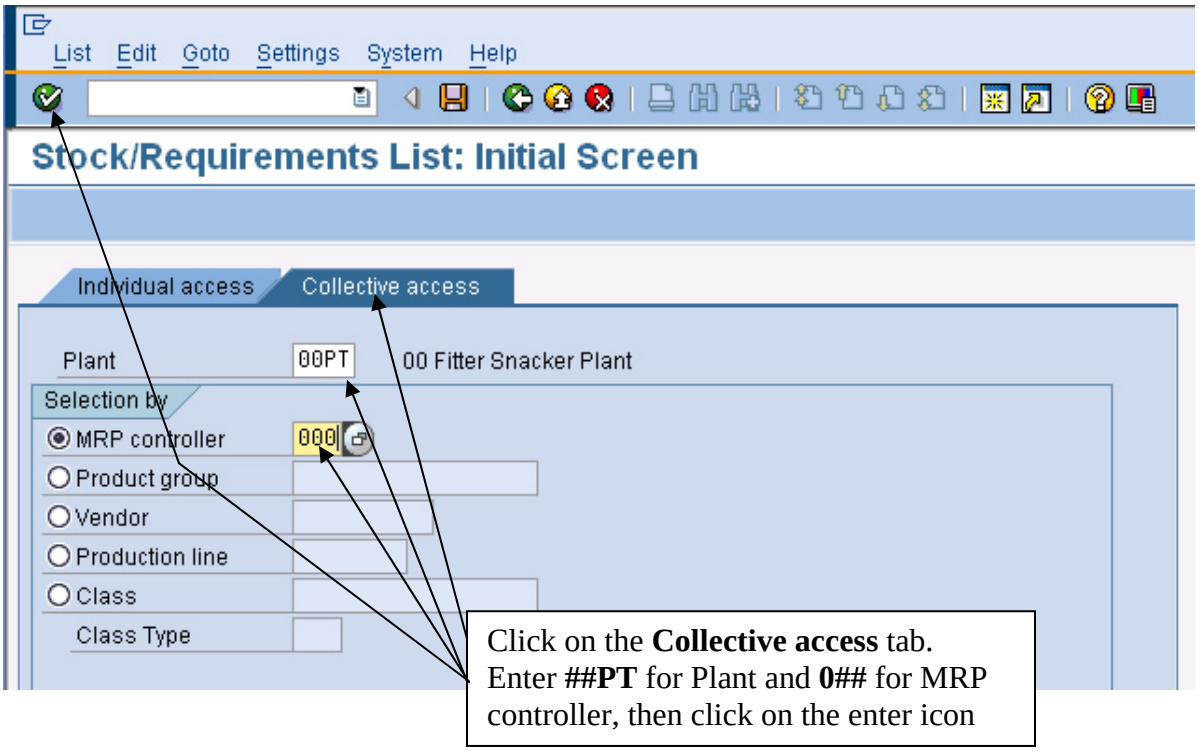
Enter **##F100** (NRG-A bars) and **##PT** for Plant, then click on the enter icon ( ). This will produce the following screen:



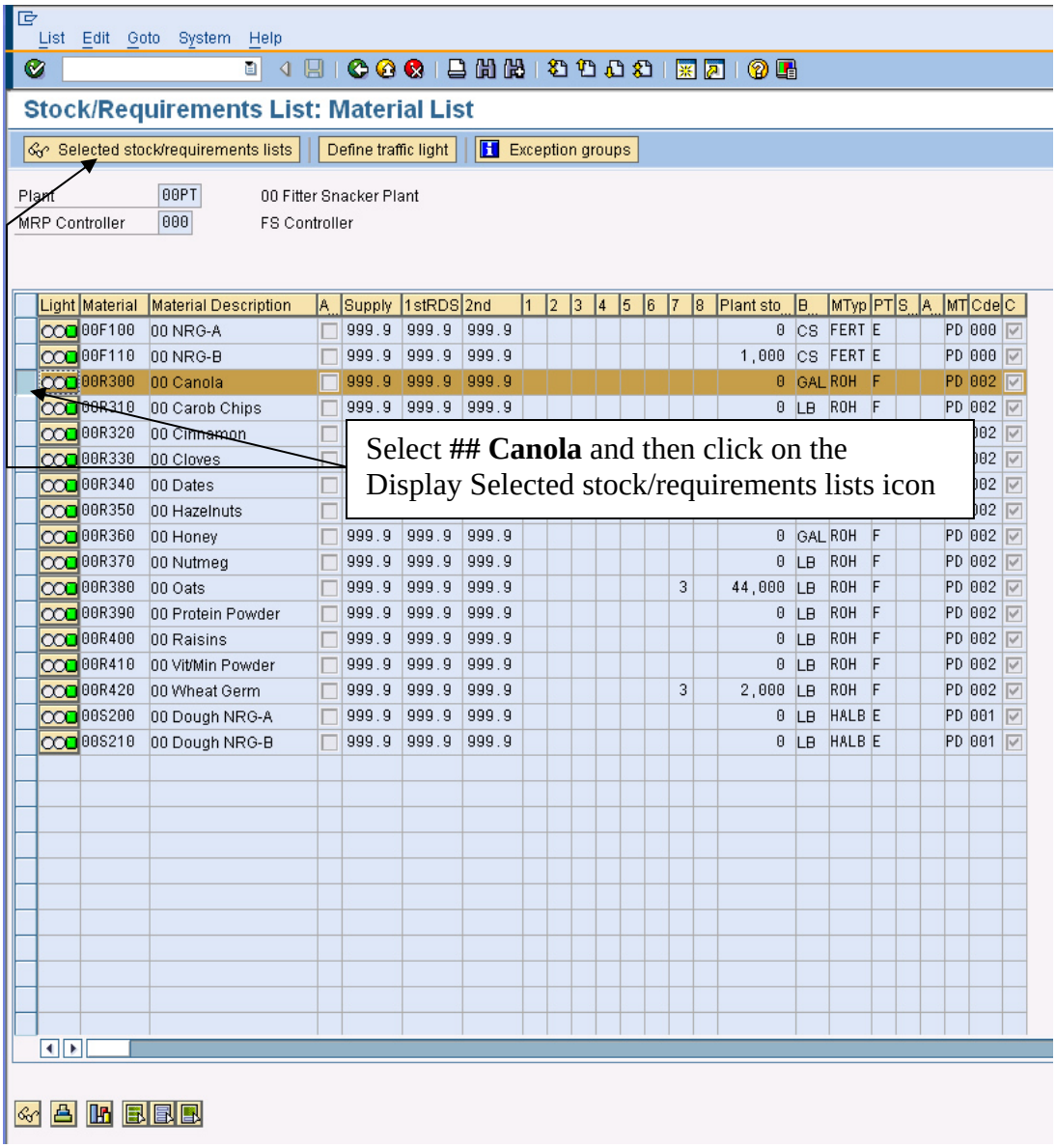
This screen shows that we have no material on hand, no sales orders and, as we haven't specified a safety stock level, we have no production orders planned. We can look at a different material by entering a new material in the Material field. For example, enter **##S200** (dough for NRG-A bars), click on the enter icon ( ):



There is an easier way to view the Stock/Requirements list for different materials. Use the back icon ( ) to get to the first screen of the Stock/Requirements list:

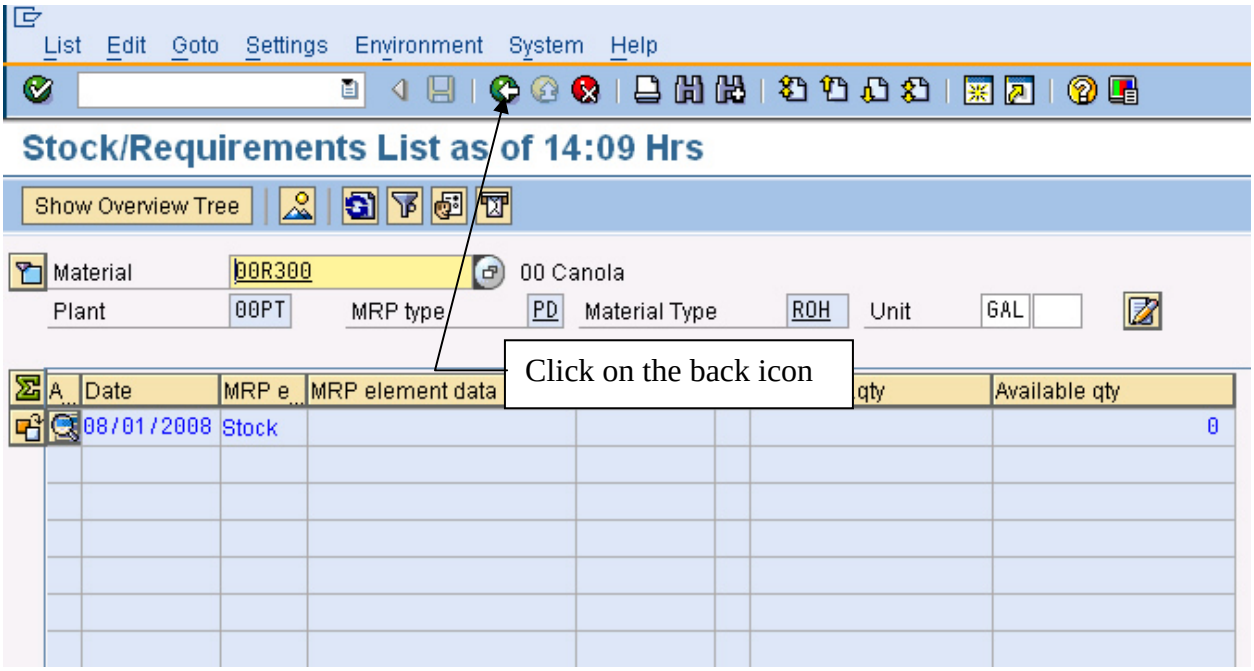


Enter **0##** for MRP controller, then click on the enter icon ( ), which will produce the following screen:

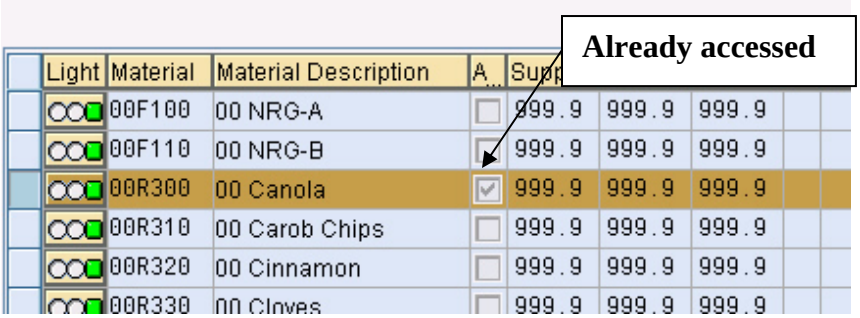


Light	Material	Material Description	A	Supply	1stRDS	2nd	1	2	3	4	5	6	7	8	Plant sto	B	MTyp	PT	S	A	MT	Cde	C
	00F100	00 NRG-A		999.9	999.9	999.9									0	CS	FERT	E			PD	000	
	00F110	00 NRG-B		999.9	999.9	999.9									1,000	CS	FERT	E			PD	000	
	00R300	00 Canola		999.9	999.9	999.9									0	GAL	ROH	F			PD	002	
	00R310	00 Carob Chips		999.9	999.9	999.9									0	LB	ROH	F			PD	002	
	00R320	00 Cinnamon																				002	
	00R330	00 Cloves																				002	
	00R340	00 Dates																				002	
	00R350	00 Hazelnuts																				002	
	00R360	00 Honey		999.9	999.9	999.9									0	GAL	ROH	F			PD	002	
	00R370	00 Nutmeg		999.9	999.9	999.9									0	LB	ROH	F			PD	002	
	00R380	00 Oats		999.9	999.9	999.9							3		44,000	LB	ROH	F			PD	002	
	00R390	00 Protein Powder		999.9	999.9	999.9									0	LB	ROH	F			PD	002	
	00R400	00 Raisins		999.9	999.9	999.9									0	LB	ROH	F			PD	002	
	00R410	00 Vit/Min Powder		999.9	999.9	999.9									0	LB	ROH	F			PD	002	
	00R420	00 Wheat Germ		999.9	999.9	999.9							3		2,000	LB	ROH	F			PD	002	
	00S200	00 Dough NRG-A		999.9	999.9	999.9									0	LB	HALB	E			PD	001	
	00S210	00 Dough NRG-B		999.9	999.9	999.9									0	LB	HALB	E			PD	001	

Select ## **Canola** and then click on the Display Selected stock/requirements lists icon (Selected stock/requirements lists), which will take you to the standard Stock/Requirements list:

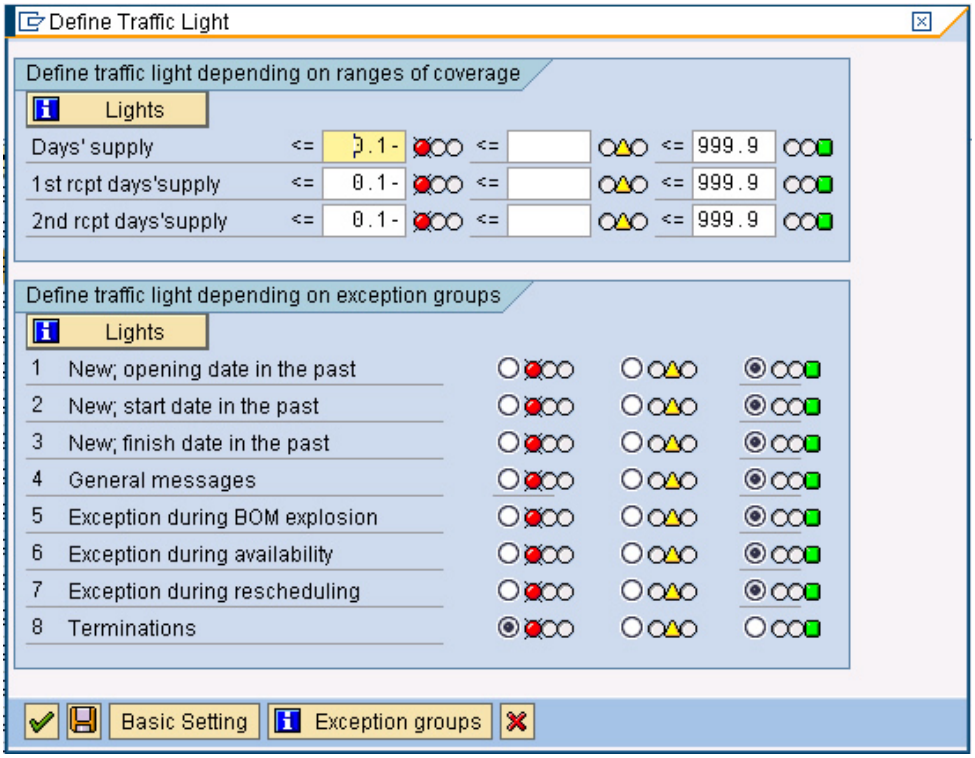


Click on the back icon, which will bring you back to the list of your materials. Note that there is now a check mark next to **## Canola** in the column **Already accessed:**



This feature helps the MRP controller keep track of which materials they have already reviewed. The traffic lights also help the MRP controller focus on critical materials. The traffic light concept is used in many areas of the SAP system to help the user prioritize tasks. In our case, the materials with a red traffic light have a non-zero safety stock specified. As there have been no goods receipts for these materials, they are below their safety stock levels and, hence, the red lights.

It is possible to customize the traffic lights. Click on the Define traffic lights icon (Define traffic light), which will produce the following icon:

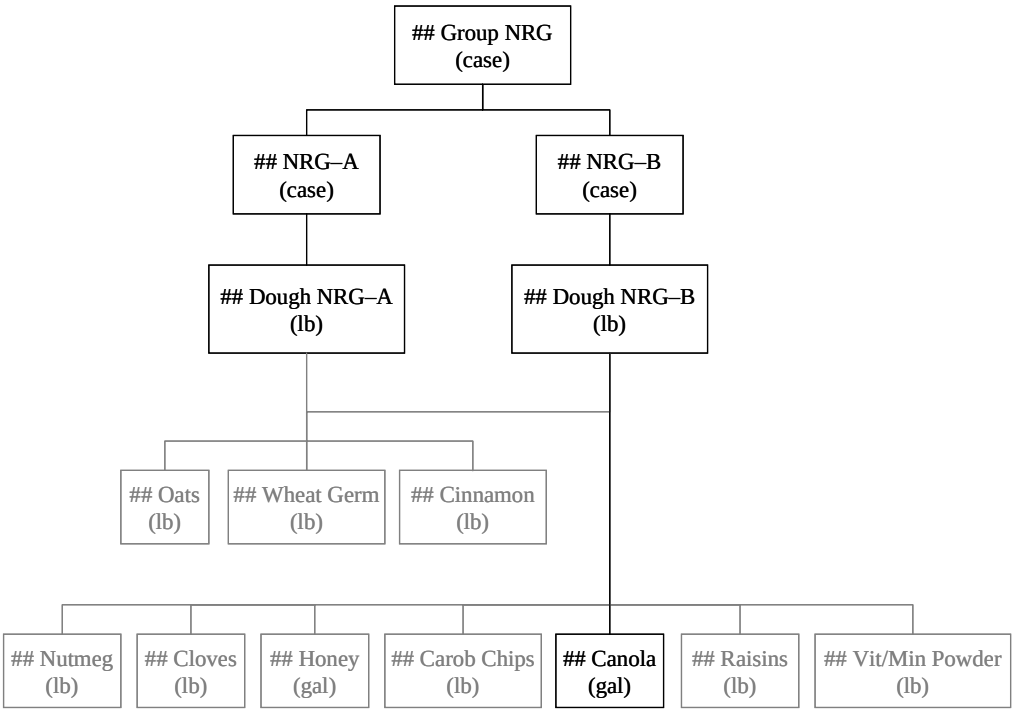


This screen shows that the SAP system provides the user with a great deal of flexibility in how to configure the traffic light system. Click on the cancel icon (✖) to close this window.

We will keep the Stock/Requirements list open so that we can easily review the results of the MRP process. We will use the following materials to evaluate the MRP process:

NRG-A
NRG-B
Dough NRG-A
Dough NRG-B
Canola

Which are illustrated in the following figure:



At this point, the Stock/Requirements list for these materials is pretty boring as there is no production scheduled.

5. Create Sales and Operations Plan

In SAP, the Sales and Operations Planning process is one way to create demand for the MRP process. In practice, Sales and Operations Planning is the process where operations and marketing agree on a demand forecast and a production plan to meet that demand. Ideally, this Sales and Operations Plan should optimize profit for the organization.

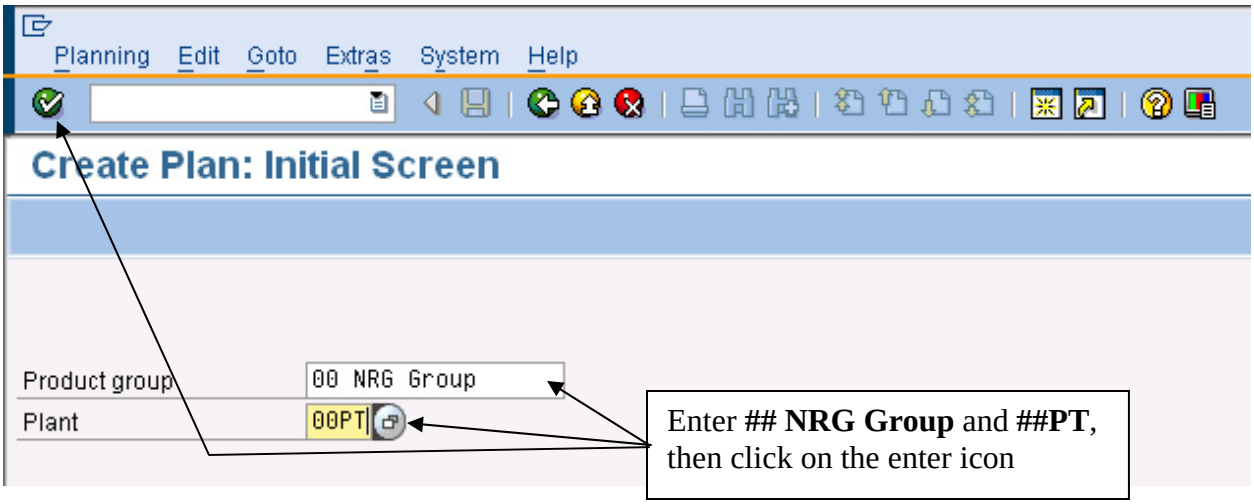
To perform Sales and Operations Planning, open a second session by following the pull-down menu path:

System→Create session

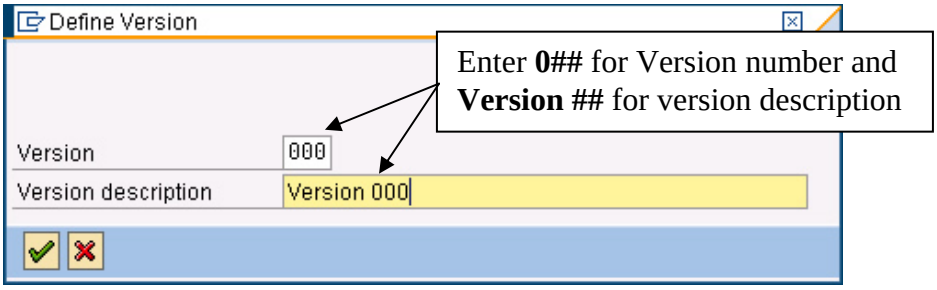
In this second session, follow the menu path:

Logistics ▷Production ▷SOP ▷Planning ▷For Product Group ▷Create

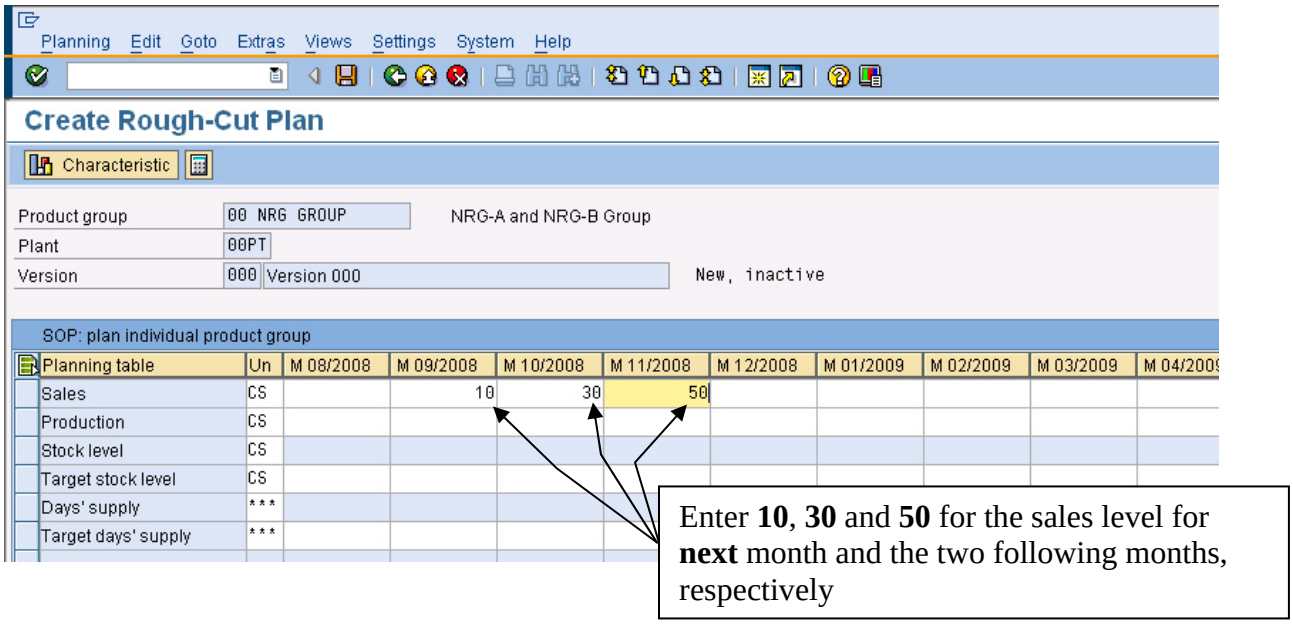
which will produce the following screen:



Enter **## NRG Group** and **##PT**, then click on the enter icon (), which will produce the following pop-up window:



Click on the enter icon (), then the following screen will appear:

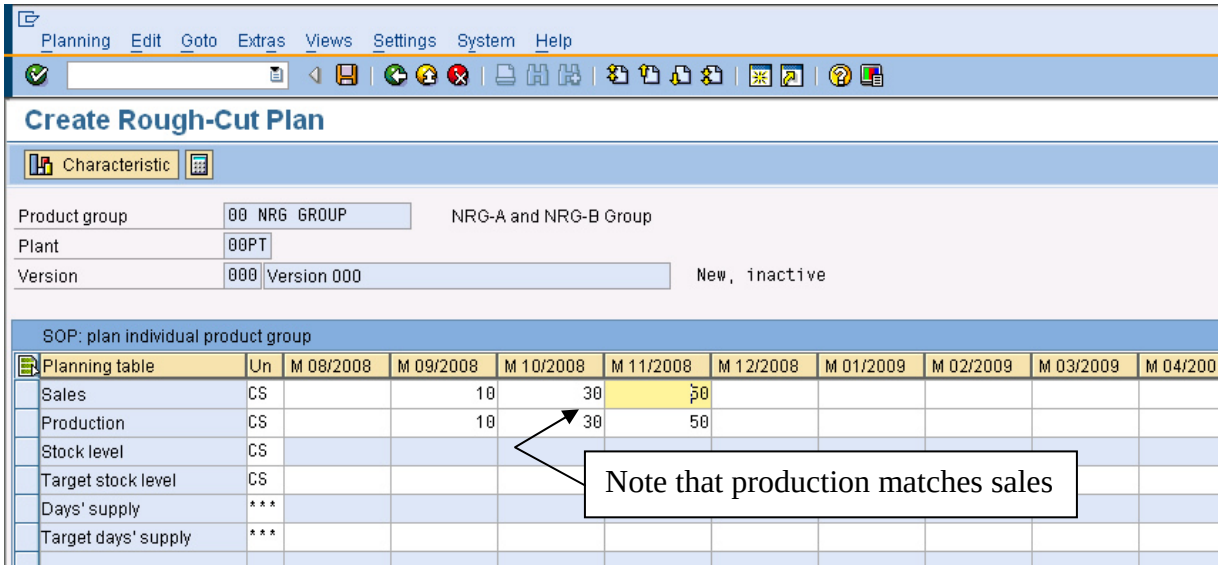


There are a number of ways to develop a sales forecast in the SAP ERP system, however, we'll just enter the values **10**, **30** and **50** as the sales level for **next** month and the two following months, respectively.

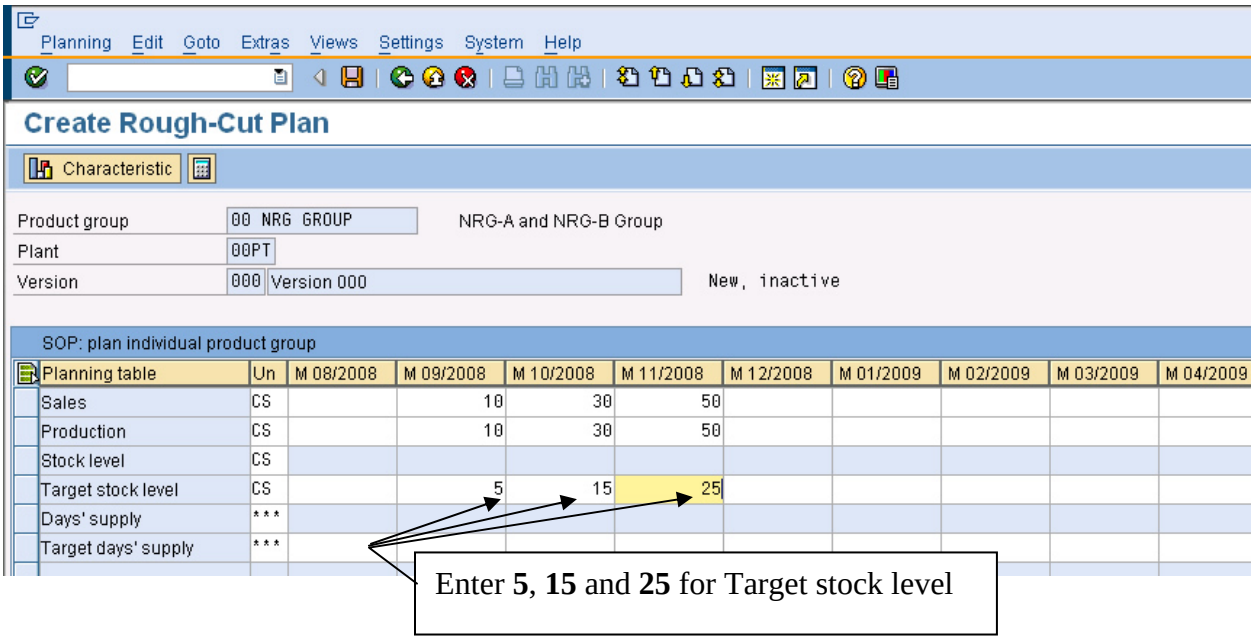
There are also a number of ways to develop a production plan—for example, we can have production match sales. To do this automatically, follow the pull-down menu path:

Edit→Create productn plan→Synchronous to sales

and the system will create a production plan that exactly matches sales:



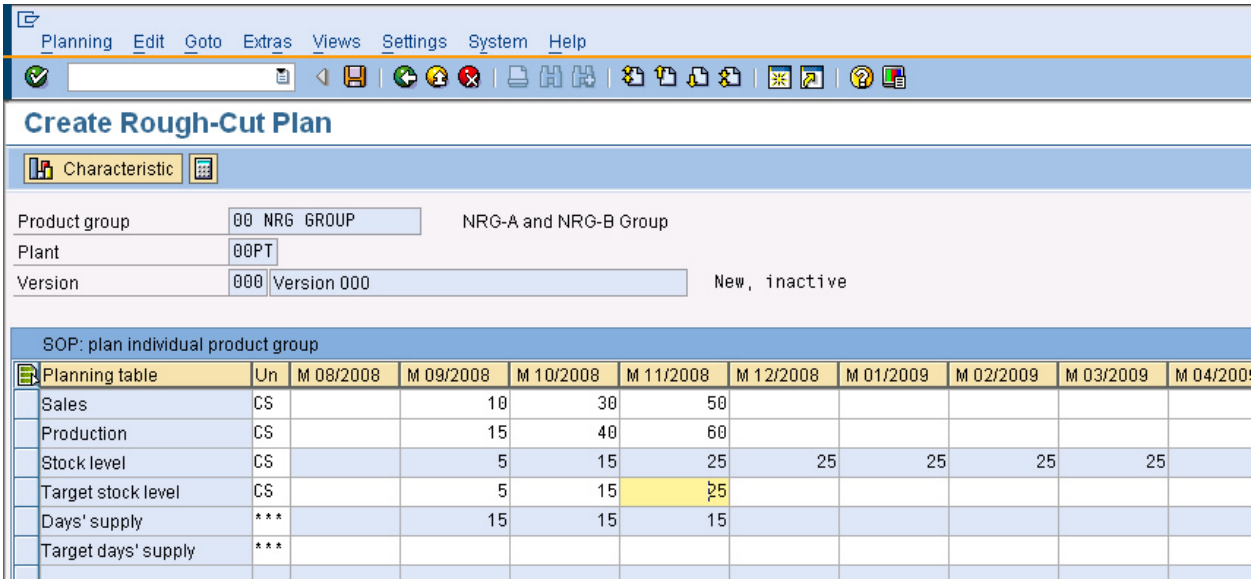
Note that the production plan matches the sales level, which is just what we expected. We can also develop a plan that allows for a safety stock—a stock level above the expected sales level.



To do this, enter **5**, **15** and **25** for Target stock level, then follow the menu path:

Edit→Create productn plan→Target stock level

and the system will create a production plan that allows for a Target stock level:

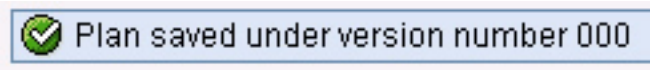


Note that the system calculates a production plan that will produce enough to meet the sales level and have the appropriate Target stock level. The system will also calculate the **Day's supply**, which is calculates as:

$$\text{Day's supply} = \frac{\text{Days in month}}{\text{Sales}}(\text{Target stock level})$$

Note that **Days in month** is taken from the factory calendar, which considers weekends, holidays and number of days in the month.

Click on the save icon ( ) to save the Sales and Operations Plan (SOP). You should get a message like the following:

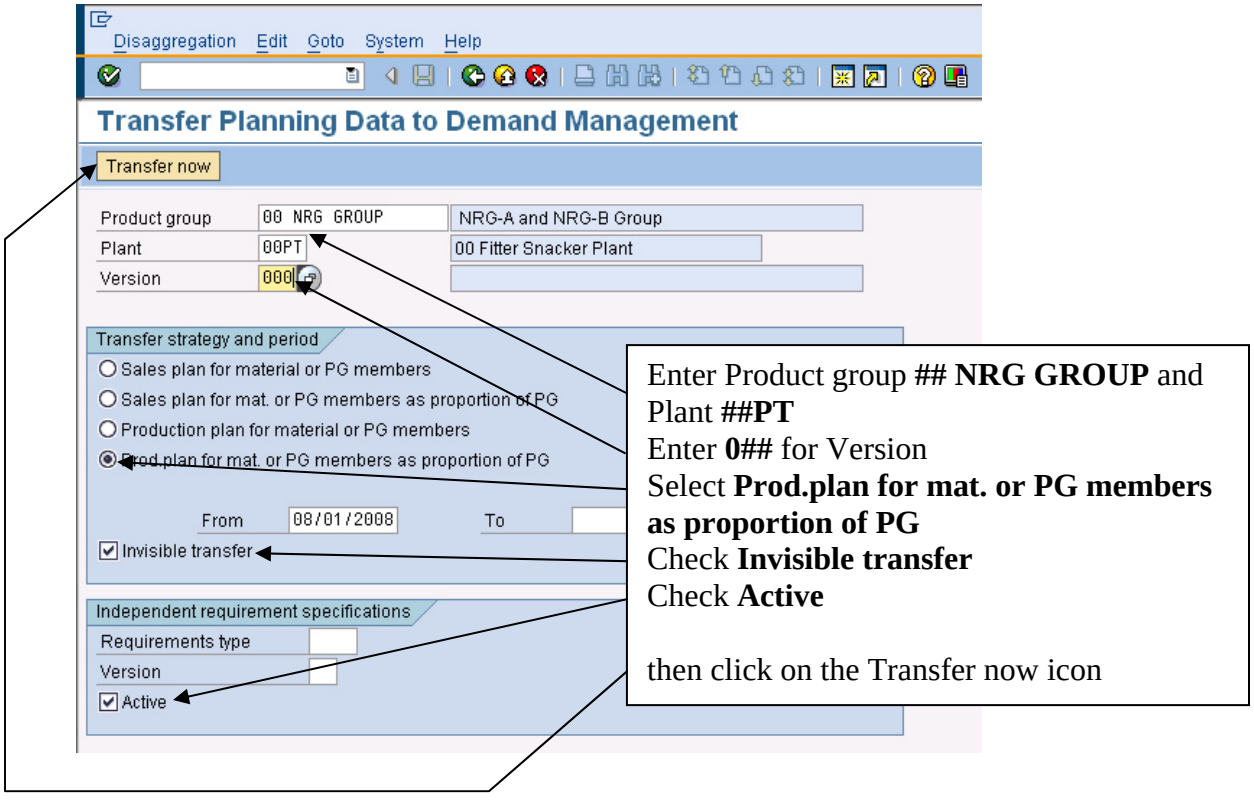


6. Transfer Sales and Operations Plan to Products

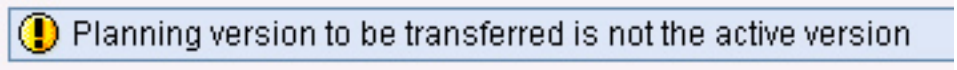
Next, we have to transfer the production plan developed in the **SOP** transaction to the products in the product group. To do this, follow the menu path:

> **Logistics ▷Production ▷SOP ▷Disaggregation ▷Transfer Product Group to Planning**

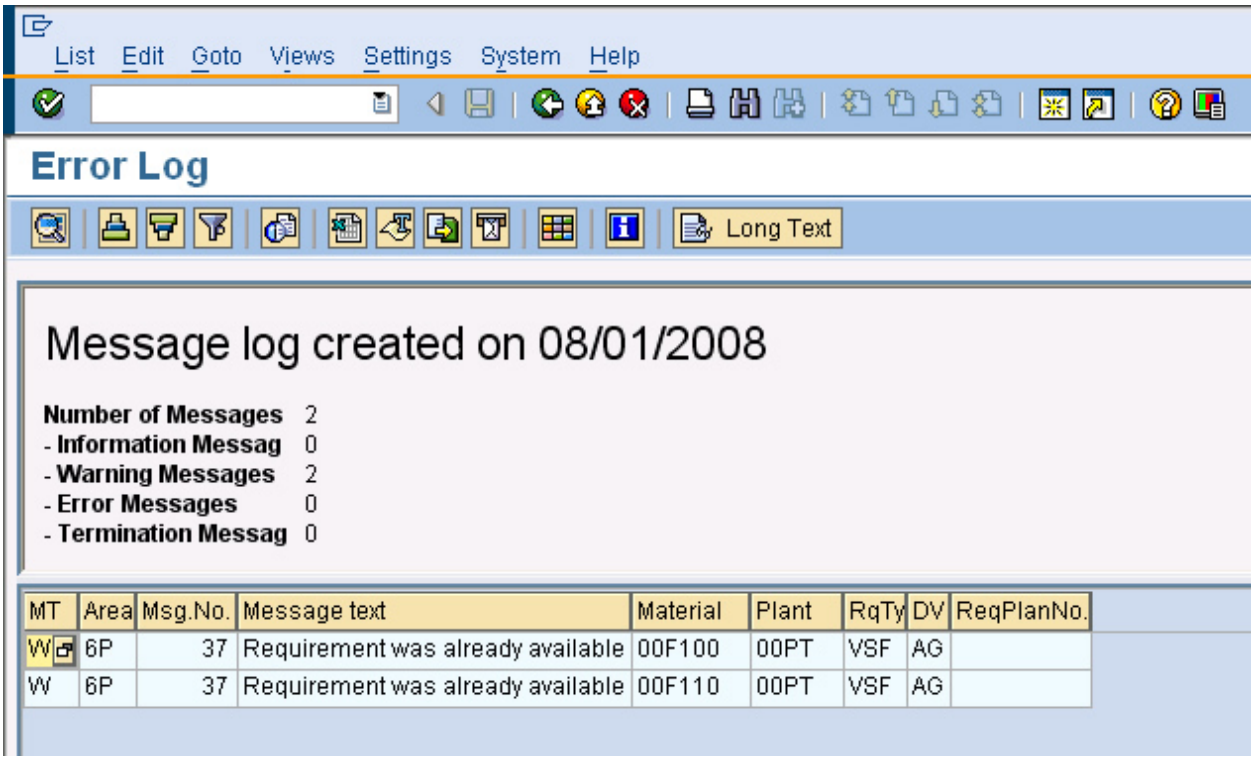
which will produce the following screen:



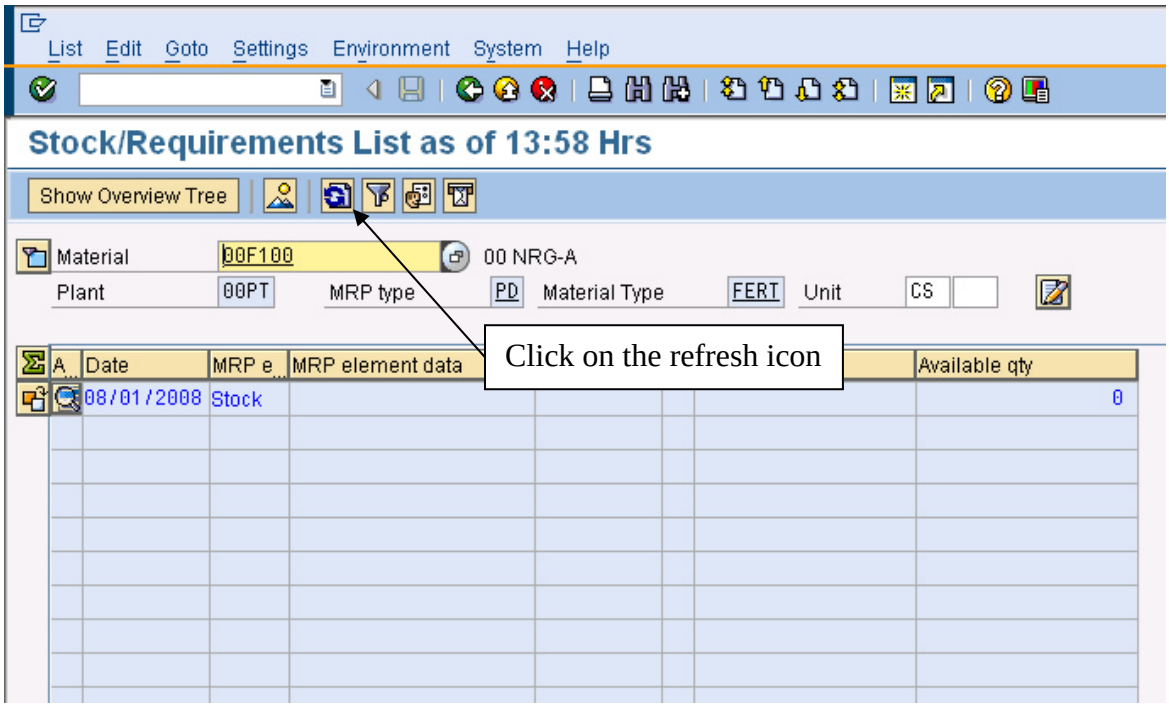
Enter the information shown above, then click on the **Transfer now** icon (Transfer now). This will produce the following screen:



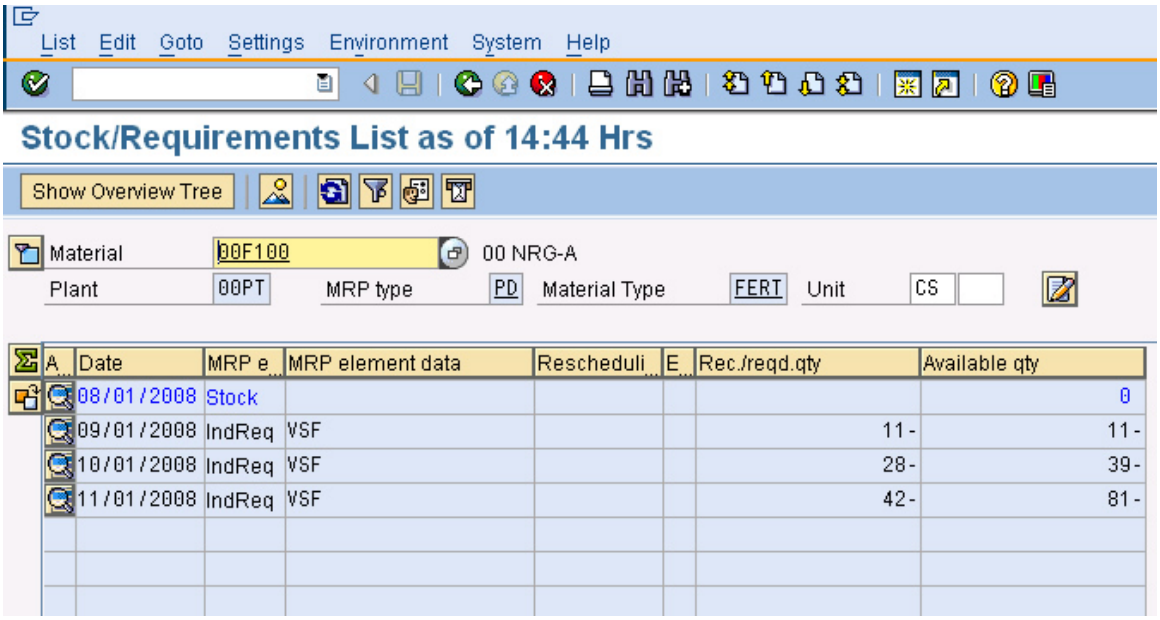
Double-check that you entered **0##** for the Version, then click on the enter icon ( ), which will produce the following message:



While this sounds ominous, ignore it (it's just a warning). Switch to the other session, make sure you have selected the material **## NRG-A** and are in the Display Stock/Requirements list screen:

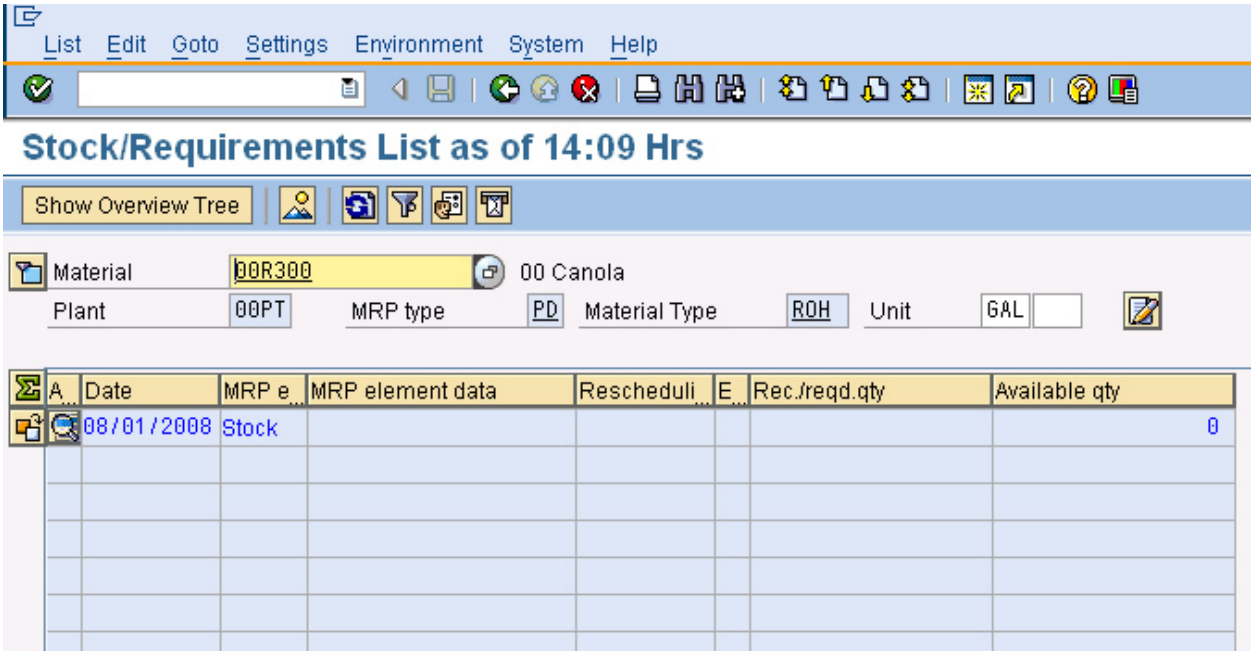


The results from transferring the Sales and Operations Plan are not yet displayed. To update the Stock/Requirements list, click on the refresh icon ( ):



Note that there are planned independent requirements for three months. Where did the quantity 11 come from in this month? In the Sales and Operations plan, the production quantity planned for NRG bars in this month was 15 (10 for sales, 5 for the target stock level). Seventy percent of 15 is 11 (actually, 10.5). Thirty percent of 15 is 4 (actually 4.5).

Check on **## Canola** to verify that it has remained unchanged:

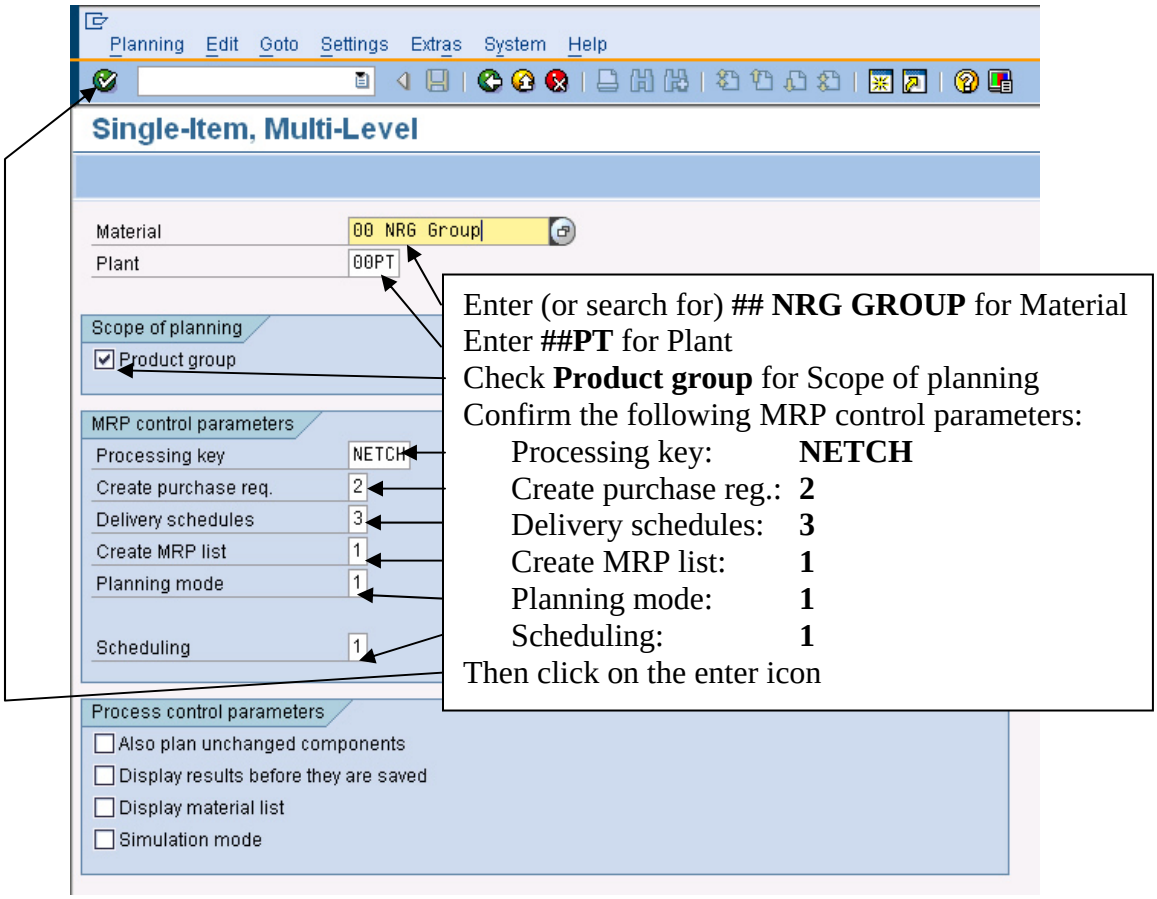


7. Create Planned Orders with MRP

To meet the demand that is predicted by the SOP process, the MRP process will create planned orders. These planned orders can be converted into production orders (for internally manufactured materials) and purchase requisitions (for externally procured materials). To do this, we will repeat the MRP process as we did before. To run MRP, switch back to the other session (the one without the Stock/Requirements List) and follow the menu path:

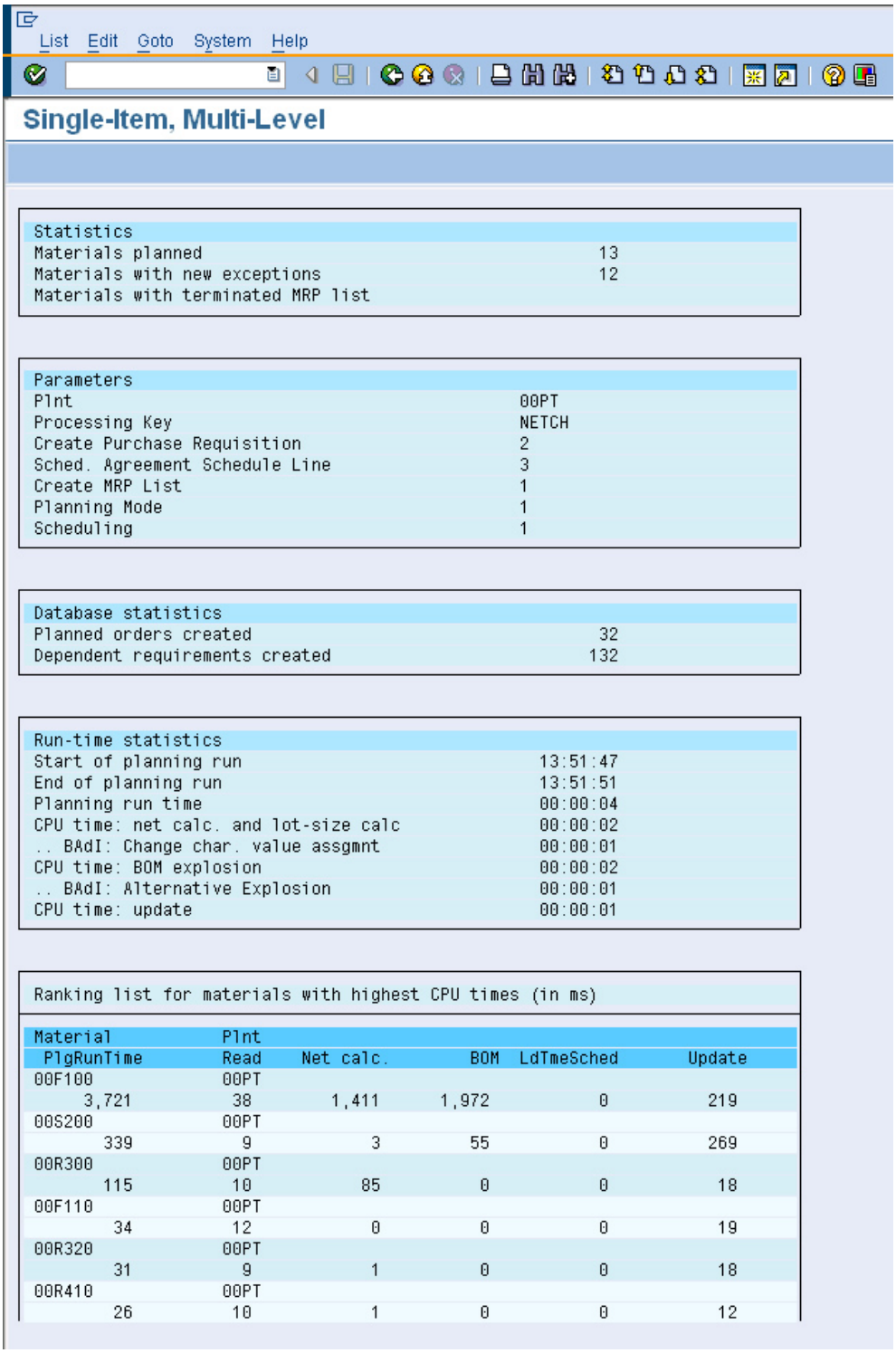
Logistics ▷Production ▷MRP ▷Planning ▷ Single-Item, Multi-Level Planning

which will produce the following screen:



Enter the information shown above, then click on the enter icon (). This will produce the following message:

Click on the enter icon () again and you should get a report like the following:



List Edit Goto System Help

Single-Item, Multi-Level

Statistics	
Materials planned	13
Materials with new exceptions	12
Materials with terminated MRP list	

Parameters	
Plnt	00PT
Processing Key	NETCH
Create Purchase Requisition	2
Sched. Agreement Schedule Line	3
Create MRP List	1
Planning Mode	1
Scheduling	1

Database statistics	
Planned orders created	32
Dependent requirements created	132

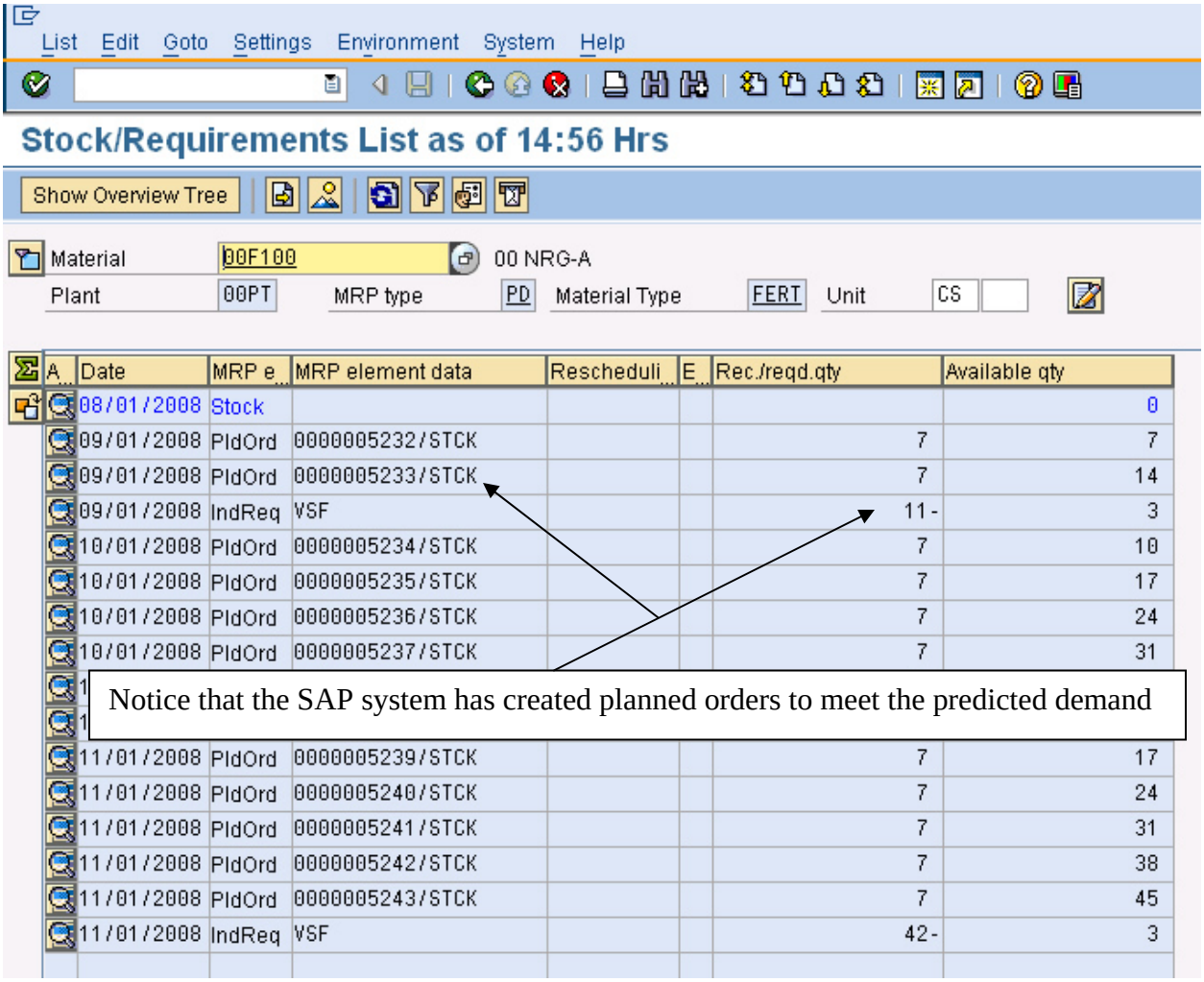
Run-time statistics	
Start of planning run	13:51:47
End of planning run	13:51:51
Planning run time	00:00:04
CPU time: net calc. and lot-size calc	00:00:02
.. BAdI: Change char. value assgmnt	00:00:01
CPU time: BOM explosion	00:00:02
.. BAdI: Alternative Explosion	00:00:01
CPU time: update	00:00:01

Ranking list for materials with highest CPU times (in ms)

Material	Plnt				
PlgRunTime	Read	Net calc.	BOM	LdTmeSched	Update
00F100	00PT				
3,721	38	1,411	1,972	0	219
00S200	00PT				
339	9	3	55	0	269
00R300	00PT				
115	10	85	0	0	18
00F110	00PT				
34	12	0	0	0	19
00R320	00PT				
31	9	1	0	0	18
00R410	00PT				
26	10	1	0	0	12

This message shows that, because of the demand we created in the SOP process, there have been a number of calculations made in the MRP process.

Switch to the session with the Stock/Requirements list, and look at the material **##F100** (dought for NRG-A bars). Remember to use the refresh icon ( ):



A	Date	MRP e	MRP element data	Rescheduli	E	Rec./reqd.qty	Available qty
	08/01/2008	Stock					0
	09/01/2008	PldOrd	0000005232/STCK			7	7
	09/01/2008	PldOrd	0000005233/STCK			7	14
	09/01/2008	IndReq	VSF			11-	3
	10/01/2008	PldOrd	0000005234/STCK			7	10
	10/01/2008	PldOrd	0000005235/STCK			7	17
	10/01/2008	PldOrd	0000005236/STCK			7	24
	10/01/2008	PldOrd	0000005237/STCK			7	31
	11/01/2008	PldOrd	0000005239/STCK			7	17
	11/01/2008	PldOrd	0000005240/STCK			7	24
	11/01/2008	PldOrd	0000005241/STCK			7	31
	11/01/2008	PldOrd	0000005242/STCK			7	38
	11/01/2008	PldOrd	0000005243/STCK			7	45
	11/01/2008	IndReq	VSF			42-	3

Note that the SAP system has created production orders of 7 cases (which is the fixed lot size for NRG-A bars) to meet the demand. Check on the material **##S200** (dough for NRG-B bars) by entering the material number (##S200) and clicking on the refresh icon ( ):

List Edit Goto Settings Environment System Help

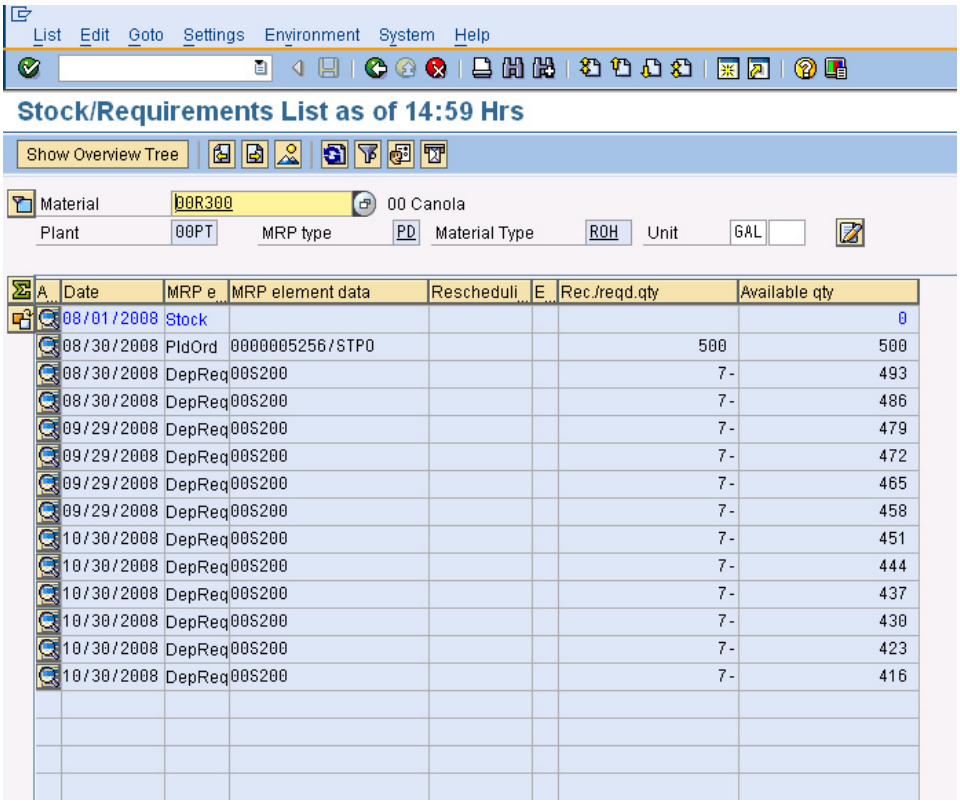
Stock/Requirements List as of 14:58 Hrs

Show Overview Tree

Material 00S200 00 Dough NRG-A
Plant 00PT MRP type PD Material Type H&LB Unit LB

A	Date	MRP e	MRP element data	Rescheduli	E	Rec./reqd.qty	Available qty
	08/01/2008	Stock					0
	08/31/2008	PldOrd	0000005244/STCK			500	500
	08/31/2008	PldOrd	0000005245/STCK			500	1,000
	08/31/2008	DepReq	00F100			500-	500
	08/31/2008	DepReq	00F100			500-	0
	09/30/2008	PldOrd	0000005246/STCK			500	500
	09/30/2008	PldOrd	0000005247/STCK			500	1,000
	09/30/2008	PldOrd	0000005248/STCK			500	1,500
	09/30/2008	PldOrd	0000005249/STCK			500	2,000
	09/30/2008	DepReq	00F100			500-	1,500
	09/30/2008	DepReq	00F100			500-	1,000
	09/30/2008	DepReq	00F100			500-	500
	09/30/2008	DepReq	00F100			500-	0
	10/31/2008	PldOrd	0000005250/STCK			500	500
	10/31/2008	PldOrd	0000005251/STCK			500	1,000
	10/31/2008	PldOrd	0000005252/STCK			500	1,500
	10/31/2008	PldOrd	0000005253/STCK			500	2,000
	10/31/2008	PldOrd	0000005254/STCK			500	2,500
	10/31/2008	PldOrd	0000005255/STCK			500	3,000
	10/31/2008	DepReq	00F100			500-	2,500
	10/31/2008	DepReq	00F100			500-	2,000
	10/31/2008	DepReq	00F100			500-	1,500
	10/31/2008	DepReq	00F100			500-	1,000
	10/31/2008	DepReq	00F100			500-	500
	10/31/2008	DepReq	00F100			500-	0

As the dough has a lot size for dough is 500 lb., the SAP system has create planned orders in 500 lb. batches. Check on the material **##R300**, Canola:



A	Date	MRP e	MRP element data	Rescheduli	E	Rec./reqd.qty	Available qty
	08/01/2008	Stock					0
	08/30/2008	PldOrd	0000005256/STPO			500	500
	08/30/2008	DepReq	00S200			7-	493
	08/30/2008	DepReq	00S200			7-	486
	09/29/2008	DepReq	00S200			7-	479
	09/29/2008	DepReq	00S200			7-	472
	09/29/2008	DepReq	00S200			7-	465
	09/29/2008	DepReq	00S200			7-	458
	10/30/2008	DepReq	00S200			7-	451
	10/30/2008	DepReq	00S200			7-	444
	10/30/2008	DepReq	00S200			7-	437
	10/30/2008	DepReq	00S200			7-	430
	10/30/2008	DepReq	00S200			7-	423
	10/30/2008	DepReq	00S200			7-	416

Note that the SAP system has created a planned order for 500 gal. of Canola to meet the predicted demand.

Print the stock/requirements list for ## Canola oil to hand in by clicking on the print icon ( ).

Be sure to neatly print your name on a printout of the Stock/Requirements list for ##R300 (Canola) to hand in.