Replenishment Planning Article – Summer 2003

Low Costs and Short Lead Times Using *Planned Before Firm*

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When a part has more than one potential supplier, the buyer has some options: select the vendor with the lower cost and the longer lead time or the vendor with the higher cost and the shorter lead time? This dilemma is not easily resolved. Too frequently the buyer selects the vendor with the lower cost to improve the department's purchase price variance measurements. Unfortunately, inventory and service pay the price.

You do not have to sacrifice one for the other. By selecting both vendors and cleverly using an FGS Replenishment Planning feature called ***Planned Before Firm***, you can mix their schedules to get the bulk of the cost savings and still remain flexible, taking advantage of the shorter lead times. This is like having your cake and eating it too!

This technique is illustrated by an example of a company that can select from two different suppliers:

- An international vendor with low costs and very long lead times
- A domestic vendor with higher costs but short lead times

Example of a Buyer's Dilemma

An aftermarket wholesaler of heavy-duty truck parts purchased wheel nuts from a domestic supplier that required a four week lead time. An offshore wheel nut manufacturer offered the wholesaler a twenty percent cost savings, if the wholesaler would place orders for container load quantities of mixed wheel nuts with a six month lead time. The problem with accepting the offshore offer is that most of the cost reduction savings will be consumed by the carrying cost of the additional safety stock inventory required to protect customer service against forecast errors over the increase in lead time from four weeks to six months. How can you take advantage of the lower offshore cost without increasing the current inventory levels?

Supplier	Cost	Lead Time
Domestic	Current Standard Cost	4 Weeks
Offshore	20% Lower Cost for full container loads of mixed wheel nuts	26 Weeks

Initially the international vendor looked like the best alternative because of the 20% cost reduction. However, when the wholesaler measured the cost impact of the long lead time he decided it was not a good deal. The final solution yields low cost *and* short lead times.

First the wholesaler had to evaluate the impact of purchasing full container loads of mixed wheel nuts. To evaluate the offshore supplier's proposal the wholesaler determined a container's product mix using the Joint Orders tool within FGS' Replenishment Planning module (refer to the Fall 2002 FGS Newsletter).

Figure 1 – Gross Savings by selecting the Offshore Supplier

	Savings	Description	% Cost Savings
+	$13,192	Savings per container load (approx 20% off, but 6 month lead time)	20%
-	($438)	Extra inventory carrying cost from pulling in orders to meet full container quantities @ 20% / yr	0.6%
=	$12,754	Gross savings from joint order process.	19.4%

The offshore offer provided $13,192 of savings, while the cost (based on a 20 percent carrying charge) to pull in the planned orders to meet the container load minimum was $438 (Figure 1). Therefore the offshore proposal could provide the wholesaler with approximately $12,000 per container or a 19.4 percent cost reduction – still a pretty good deal.

The potential problem with accepting the offer is that the lead time for any product purchased from the offshore supplier would have to be increased from four weeks to six months. The company used FGS to investigate the inventory impact of an increased lead time. Recall the effect of lead time on safety stock:

$$SafetyStock = SafetyFactor \times FcstErr \times \sqrt{Leadtime}$$

The analysis showed that the safety stock increased from $35,025 to $94,720, a $59,695 increase! The annual 20% carrying cost associated with the $59,695 increase is $11,939 (Figure 2). This additional cost reduced the $12,754 savings, yielding a net savings of only $815 or about 1.2% savings per container. After this review, the company decided a 1.2% savings was not worth the effort.

Figure 2 – Net Savings after considering the long lead times

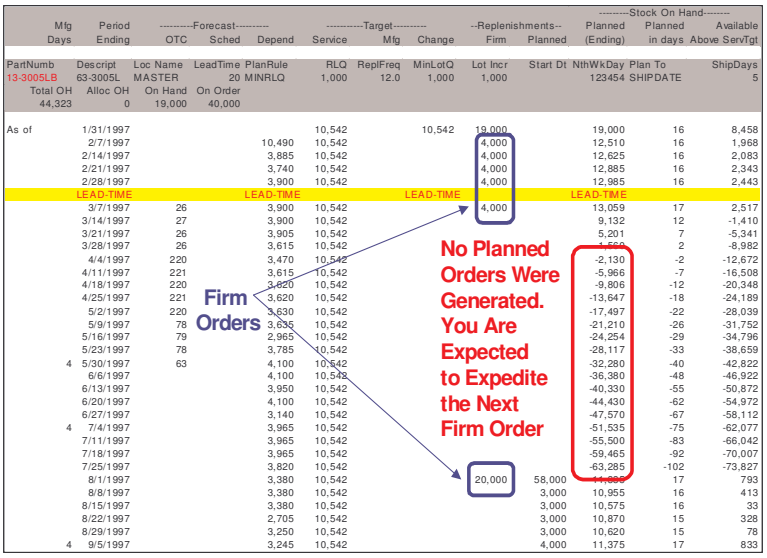
	Savings	Description	% Costs Savings
=	$12,754	Gross savings from joint order process.	19.4%
-	($11,939)	Additional safety stock carry cost to increase lead time from 4 weeks to 6 months	-18.2%
=	$815	Net saving per container load	1.2%

An Alternative Approach using *Planned Before Firm* Replenishment Logic

Another approach is to order containers from the offshore supplier while continuing to place orders with the domestic supplier until the first container arrives. Then the wholesaler could cover any stock outs that might occur before a container arrives by placing orders with the domestic wheel nut supplier. This approach covers any forecast error within the four week lead-time and thus eliminates the need to carrying the additional safety stock otherwise required to cover the six month lead-time.

The problem with this approach is that getting the order placed with the domestic supplier is a manual process because most replenishment planning systems' logic will not generate planned orders before an existing firm order (Figure 3). Most MRP systems would recommend expediting the 20,000 unit firm order due on 8/1/97. Unfortunately, this order is on the water. To expedite this shipment conjures up visions of helicopters landing on ships and flying the wheel nuts to the wholesaler. Not likely to happen. The expedite action message is worthless. All the typical MRP logic can do is warn you of how many units you will stock out.

Figure 3 Typical Replenishment Planning Logic

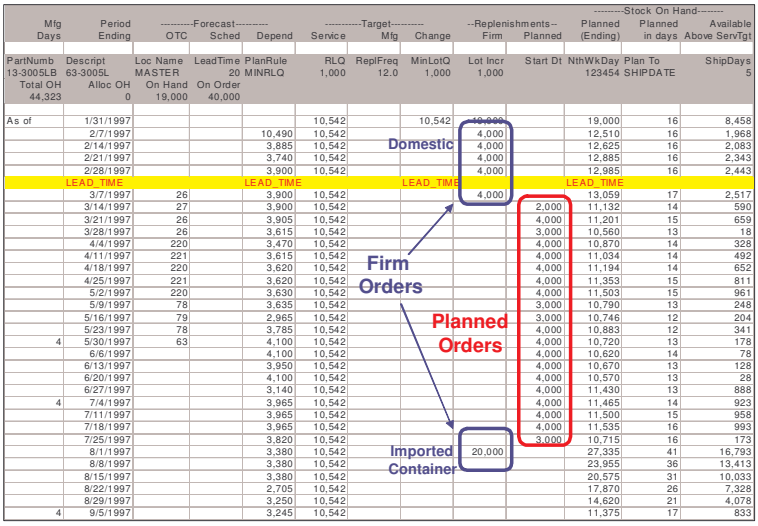


Mfg Days	Period Ending	Forecast OTC	Forecast Sched	Forecast Depend	Target Service	Target Mfg	Target Change	Replenishments Firm	Replenishments Planned	Stock On Hand Planned (Ending)	Stock On Hand Planned in days	Stock On Hand Available Above ServTgt
PartNumb 13-3005LB	Descript 63-3005L	Loc Name MASTER	LeadTime 20	PlanRule MINRLQ	RLQ 1,000	ReplFreq 12.0	MinLotQ 1,000	Lot Incr 1,000	Start Dt	NthWkDay 123454	Plan To SHIPDATE	ShipDays 5
Total OH 44,323	Alloc OH 0	On Hand 19,000	On Order 40,000									
As of	1/31/1997				10,542		10,542	19,000		19,000	16	8,458
	2/7/1997			10,490	10,542			4,000		12,510	16	1,968
	2/14/1997			3,885	10,542			4,000		12,625	16	2,083
	2/21/1997			3,740	10,542			4,000		12,885	16	2,343
	2/28/1997			3,900	10,542			4,000		12,985	16	2,443
	LEAD-TIME			LEAD-TIME			LEAD-TIME			LEAD-TIME		
	3/7/1997	26		3,900	10,542			4,000		13,059	17	2,517
	3/14/1997	27		3,900	10,542					9,132	12	-1,410
	3/21/1997	26		3,905	10,542					5,201	7	-5,341
	3/28/1997	26		3,615	10,542					1,559	2	-8,982
	4/4/1997	220		3,470	10,542					-2,130	-2	-12,672
	4/11/1997	221		3,615	10,542					-5,966	-7	-16,508
	4/18/1997	220		3,620	10,542					-9,806	-12	-20,348
	4/25/1997	221		3,620	10,542					-13,647	-18	-24,189
	5/2/1997	220		3,630	10,542					-17,497	-22	-28,039
	5/9/1997	78		3,635	10,542					-21,210	-26	-31,752
	5/16/1997	79		2,965	10,542					-24,254	-29	-34,796
	5/23/1997	78		3,785	10,542					-28,117	-33	-38,659
4	5/30/1997	63		4,100	10,542					-32,280	-40	-42,822
	6/6/1997			4,100	10,542					-36,380	-48	-46,922
	6/13/1997			3,950	10,542					-40,330	-55	-50,872
	6/20/1997			4,100	10,542					-44,430	-62	-54,972
	6/27/1997			3,140	10,542					-47,570	-67	-58,112
4	7/4/1997			3,965	10,542					-51,535	-75	-62,077
	7/11/1997			3,965	10,542					-55,500	-83	-66,042
	7/18/1997			3,965	10,542					-59,465	-92	-70,007
	7/25/1997			3,820	10,542					-63,285	-102	-73,827
	8/1/1997			3,380	10,542			20,000	58,000	14,793	17	793
	8/8/1997			3,380	10,542				3,000	10,955	16	413
	8/15/1997			3,380	10,542				3,000	10,575	16	33
	8/22/1997			2,705	10,542				3,000	10,870	15	328
	8/29/1997			3,250	10,542				3,000	10,620	15	78
4	9/5/1997			3,245	10,542				4,000	11,375	17	833

FGS has a feature, not seen in typical MRP systems. By setting a configuration option: ***Allow Planned Orders Before Firm Orders***, the wholesaler was able to edit the **SKU.PLNB4FIRM** field to 'YES' for the wheel nuts supplied by the offshore supplier. FGS generates planned orders before any firm order for offshore products (Figure 4). Since the lead time remains at 4 weeks, near- term smaller orders are planned from the domestic vendor

Figure 4

FGS Generates Planned Orders Before the First Firm Container



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As of	1/31/1997				10,542		10,542	19,000		19,000	16	8,458
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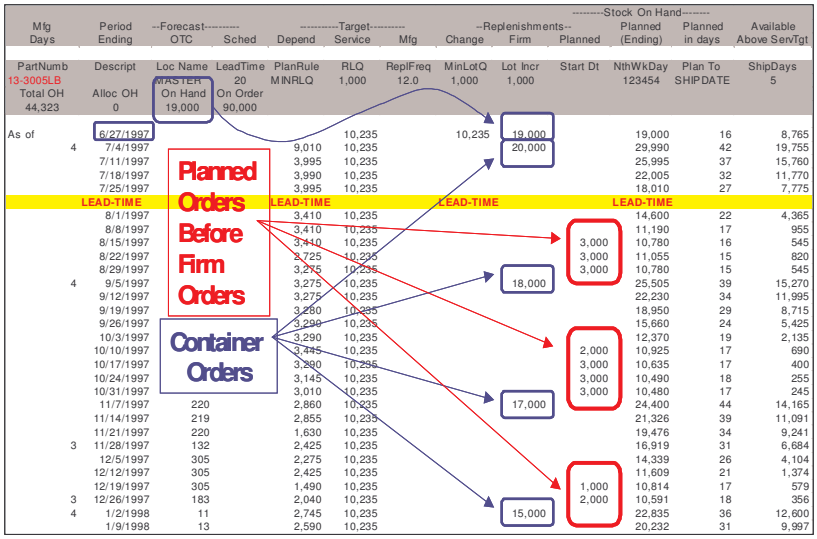
	LEAD_TIME			LEAD_TIME			LEAD_TIME			LEAD_TIME		
	3/7/1997	26		3,900	10,542			4,000		13,059	17	2,517
	3/14/1997	27		3,900	10,542				2,000	11,132	14	590
	3/21/1997	26		3,905	10,542				4,000	11,201	15	659
	3/28/1997	26		3,615	10,542				3,000	10,560	13	18
	4/4/1997	220		3,470	10,542				4,000	10,870	14	328
	4/11/1997	221		3,615	10,542				4,000	11,034	14	492
	4/18/1997	220		3,620	10,542				4,000	11,194	14	652
	4/25/1997	221		3,620	10,542				4,000	11,353	15	811
	5/2/1997	220		3,630	10,542				4,000	11,503	15	961
	5/9/1997	78		3,635	10,542				3,000	10,790	13	248
	5/16/1997	79		2,965	10,542				3,000	10,746	12	204
	5/23/1997	78		3,785	10,542				4,000	10,883	12	341
4	5/30/1997	63		4,100	10,542				4,000	10,720	13	178
	6/6/1997			4,100	10,542				4,000	10,620	14	78
	6/13/1997			3,950	10,542				4,000	10,670	13	128
	6/20/1997			4,100	10,542				4,000	10,570	13	28
	6/27/1997			3,140	10,542				4,000	11,430	13	888
4	7/4/1997			3,965	10,542				4,000	11,465	14	923
	7/11/1997			3,965	10,542				4,000	11,500	15	958
	7/18/1997			3,965	10,542				4,000	11,535	16	993
	7/25/1997			3,820	10,542				3,000	10,715	16	173
	8/1/1997			3,380	10,542			20,000		27,335	41	16,793
	8/8/1997			3,380	10,542					23,955	36	13,413
	8/15/1997			3,380	10,542					20,575	31	10,033
	8/22/1997			2,705	10,542					17,870	26	7,328
	8/29/1997			3,250	10,542					14,620	21	4,078
4	9/5/1997			3,245	10,542					11,375	17	833

When additional containers of offshore product were placed and loaded as firm orders, FGS generated planned orders for each week's requirements (Figure 5). It does not generate worthless expediting action notices for a container load order that cannot be expedited.

As these planned orders approach the ordering window outside of the four week lead-time, the planner firms them up with the domestic vendor.

Figure 5

As Containers Start to Arrive, FGS Plans Orders to Avoid Stock Outs



Mfg Days	Period Ending	--Forecast--- OTC	Sched	---Target--- Depend	Service	Mfg	--Replenishments-- Change	Firm	Planned	--Stock On Hand-- Planned (Ending)	Planned in days	Available Above ServTgt
PartNumb	Descript	Loc Name	LeadTime	PlanRule	RLQ	ReplFreq	MinLotQ	Lot Incr	Start Dt	NthWkDay	Plan To	ShipDays
13-3005LB		MASTER	20	MINRLQ	1,000	12.0	1,000	1,000		123454	SHIPDATE	5
Total OH	Alloc OH	On Hand	On Order									
44,323	0	19,000	90,000									
As of	6/27/1997				10,235		10,235	19,000		19,000	16	8,765
4	7/4/1997			9,010	10,235			20,000		29,990	42	19,755
	7/11/1997			3,995	10,235					25,995	37	15,760
	7/18/1997			3,990	10,235					22,005	32	11,770
	7/25/1997			3,995	10,235					18,010	27	7,775
	LEAD-TIME			LEAD-TIME			LEAD-TIME			LEAD-TIME		
	8/1/1997			3,410	10,235					14,600	22	4,365
	8/8/1997			3,410	10,235					11,190	17	955
	8/15/1997			3,410	10,235				3,000	10,780	16	545
	8/22/1997			3,725	10,235				3,000	11,055	15	820
	8/29/1997			3,275	10,235				3,000	10,780	15	545
4	9/5/1997			3,275	10,235			18,000		25,505	39	15,270
	9/12/1997			3,275	10,235					22,230	34	11,995
	9/19/1997			3,280	10,235					18,950	29	8,715
	9/26/1997			3,290	10,235					15,660	24	5,425
	10/3/1997			3,290	10,235					12,370	19	2,135
	10/10/1997			3,745	10,235				2,000	10,925	17	690
	10/17/1997			3,290	10,235				3,000	10,635	17	400
	10/24/1997			3,145	10,235				3,000	10,490	18	255
	10/31/1997			3,010	10,235				3,000	10,480	17	245
	11/7/1997	220		2,860	10,235			17,000		24,400	44	14,165
	11/14/1997	219		2,855	10,235					21,326	39	11,091
	11/21/1997	220		1,630	10,235					19,476	34	9,241
3	11/28/1997	132		2,425	10,235					16,919	31	6,684
	12/5/1997	305		2,275	10,235					14,339	26	4,104
	12/12/1997	305		2,425	10,235					11,609	21	1,374
	12/19/1997	305		1,490	10,235				1,000	10,814	17	579
3	12/26/1997	183		2,040	10,235				2,000	10,591	18	356
4	1/2/1998	11		2,745	10,235			15,000		22,835	36	12,600
	1/9/1998	13		2,590	10,235					20,232	31	9,997

As a result, wheel nut purchase orders can be generated with the offshore supplier to take advantage of the twenty percent cost savings yet *the lead-time for these products can remain at four weeks*. Thus the savings of ordering product from the offshore supplier will not be reduced by the cost of increasing the safety stock inventory to cover the offshore supplier's lead-time.

Additional required fields to run *Plan Before Firm*

When you setup FGS for this feature, we do not recommend turning this feature on for all of your SKUs. Typically most planners prefer to expedite the existing firm orders rather than inserting planned orders. Instead, we recommend you turn this feature on to selected SKUs only. To accomplish this you need to edit the Replenishment Planning configuration:

MAIN / Configure / Replenishment Planning / Planned Orders before Firmed Orders
Never allow them
Always allow them
Allow them unless SKU.PLNB4FRM='NO'
Save Configuration

Next you need the **SKU.PLNB4FRM** field defined in your database. Use the PLNB4FRM.CMD command file to create it. The default value for this field is 'NO'. For selected individual SKUs edit it to YES.

If you don't have this command, contact the FGS Help Desk. If you would like more information about this feature contact Nathan Boyd.

Link to the E/Step Software Web Site.