Simulating DDMRP Buffers

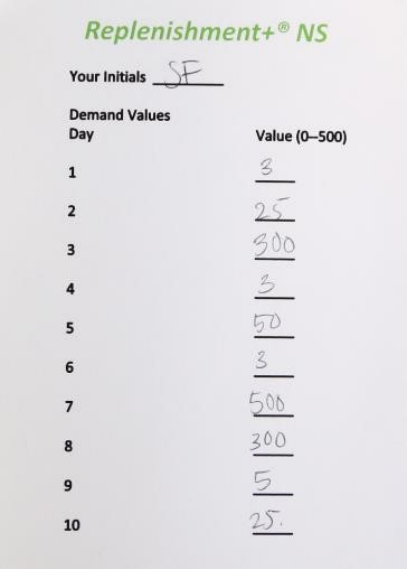
Just how robust are DDMRP Buffers? We used completely random data supplied by 55 different sources to test the resiliency of the DDMRP method in both long and short lead time environments. The results speak for themselves.

Erik Bush
Co-founder

Simulating a DDMRP buffer based on random demand from SuiteWorld 2015

Overview

Demand Driven Tech was an exhibitor at SuiteWorld 2015 – NetSuite's global user conference. As a demonstration of the resilience of Demand Driven MRP buffering, Demand Driven Tech collected random demand values from visitors to our booth. The goal of the study was to illustrate how a DDMRP buffer could achieve very high customer service and strong inventory turnover without the use of a forecast.



Replenishment+® NS

Your Initials SF

Demand Values

Day	Value (0–500)
1	3
2	25
3	300
4	3
5	50
6	3
7	500
8	300
9	5
10	25.

Each participant in the study was handed a card and asked to provide 10 days of demand records which could be of any value from 0 to 500. There were no other restrictions placed on the input provided by the study participants. The completed cards were sequenced as they were submitted by the visitors and then inputted to Demand Driven Tech DDMRP simulation tool. On the right is an example of a completed card.

Details of the Simulations

With 55 participants in the study we were able to model Part 1 for a full year. We modelled part 2 using the 195 days of demand not used in Part 1 and repeated the first 170 days of Part 2 demand to complete a full year analysis. Details of key parameters for each part were as follows:

Part 1 – Widget

- Lead Time – 90 days
- Minimum Order Qty – 0
- Variability – Medium
- Opening ADU (average daily usage) – 80
- Safety % for Red Zone
  - Med – 50%
  - High – 120%

Part 2 - Gazoonk

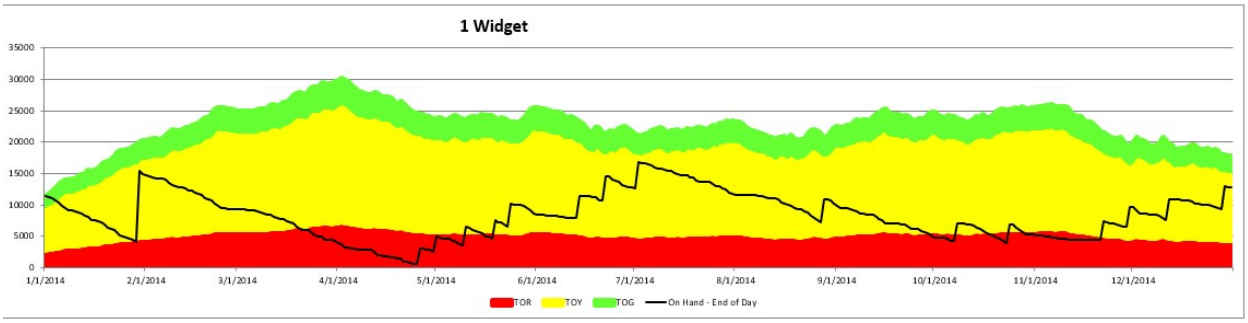
- Lead Time – 90 days
- Minimum Order Qty – 0
- Variability – Medium
- Opening ADU (average daily usage) – 80
- Safety % for Red Zone
  - Med – 50%
  - High – 120%

In addition, we did not include Order Spike Qualification for the base simulations. The result is that the buffer was responding entirely on the basis of demand orders due on the current day with no forward visibility. We later altered this assumption to understand how using Order Spike protection would help improve the service level performance.

Part 1 – Widget Simulation Results

The simulation of the demand for Part 1 – Widget resulted in 100% customer service and an excellent 7.21 inventory turns for a part with a 90 day lead time. The buffers rapidly increased in size during the first few months of the simulation as the demand provided by the participants was much higher than the starting assumption for ADU of 80 units per day.

Simulation Results			
Avg on hand	8,323	Minimum on hand	604
Annual Turns	7.21	Max on hand	16,721
Total Demand	60,035	Service Level	100.0%
Peak Demand	500	Days Stocked Out	0
Supply orders	17		
Average Order Size	3353		



Summary of key results for Part 1 – Widget

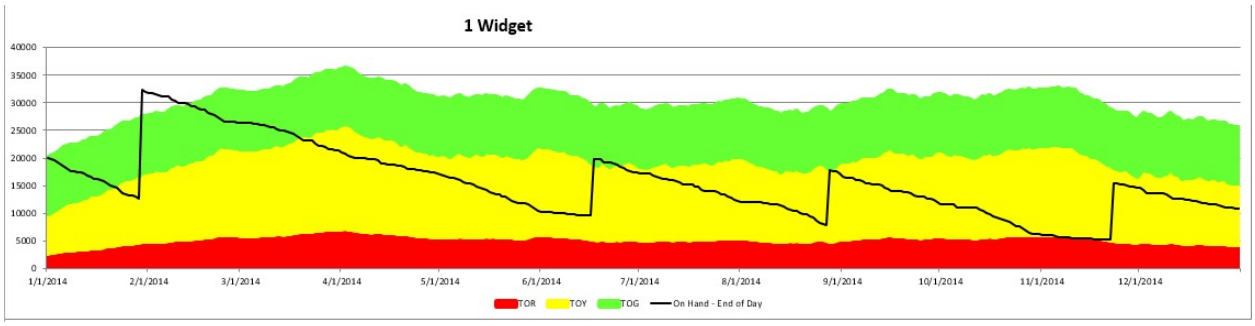
The buffer trend graph demonstrates how quickly the buffer adjusted to the greater rate of demand of 164 units per day versus the starting assumption. The actual ADU rate was double the opening assumption and pressured the on hand position early in the simulation which bottomed out at 604 units. However, the incoming supply from orders generated early in the year put the buffer back into a strong position to maintain service the balance of the year.

Average supply order size was 3353 units which resulted in 17 supply orders being generated during the year-long simulation.

How Minimum Order Quantities impact Inventory Turns and Flow

We then modified the simulation to utilize a much larger minimum order quantity for this item. We changed the MOQ to 10,000 which resulted in substantially degraded inventory turns:

Simulation Results			
Avg on hand	15,636	Minimum on hand	5,193
Annual Turns	3.84	Max on hand	32,452
Total Demand	60,035	Service Level	100.0%
Peak Demand	500	Days Stocked Out	0
Supply orders	4		
Average Order Size	10353		



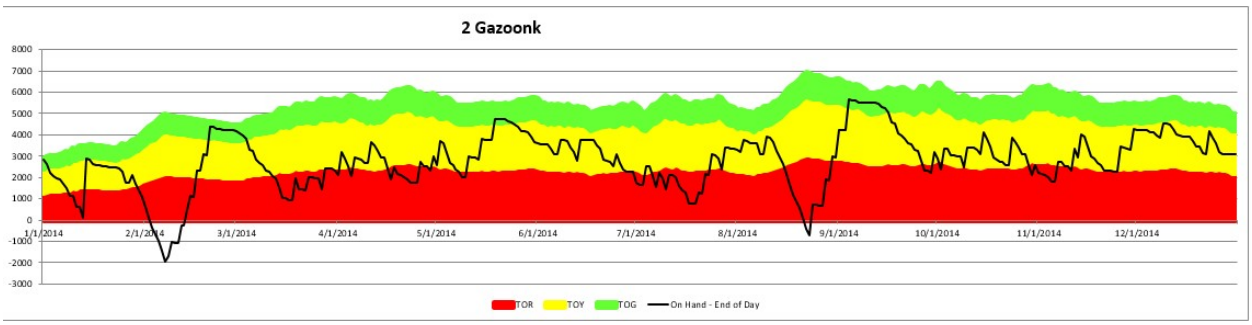
The larger MOQ reduced the number of supply orders to 4 and nearly halved the inventory turnover performance. The issue of large MOQs is commonly found with companies using outsourced or 'contract manufacturing' business models. DDMRP can be effectively used to shape client relationships with their contract manufacturing suppliers as it illustrates the substantial impact the elements such as MOQ or lead time will have on resulting flow in the supply chain.

Part 2 – Gazoonk Simulation Results

The simulation for Part 2 resulted in 96.4% customer service and inventory turns of 19.96. The minimum on hand balance was -1955 units and suggests that using order spike qualification and increased red zone safety coverage would be appropriate to further reduce the risk of stock outs.

Summary of key results for Part 2 – Gazoonk

Simulation Results			
Avg on hand	2,910	Minimum on hand	(1,955)
Annual Turns	19.96	Max on hand	5,642
Total Demand	58,081	Service Level	96.4%
Peak Demand	500	Days Stocked Out	13
Supply orders	54		
Average Order Size	1065		

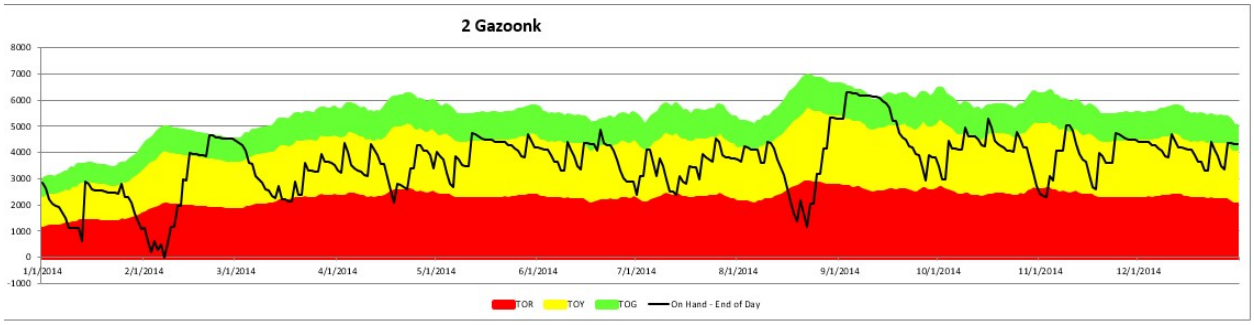


In the simulation for Part 2 we experienced a greater level of variability than in Part 1. The overall service level of 96.4% was driven by several days of stock out early in the simulation and one day later the year.

We then applied Order Spike Qualification using a 7 day forward window with 10% order spike threshold. The threshold represents the percent of the red zone that would be used to determine whether order spike protection would engage.

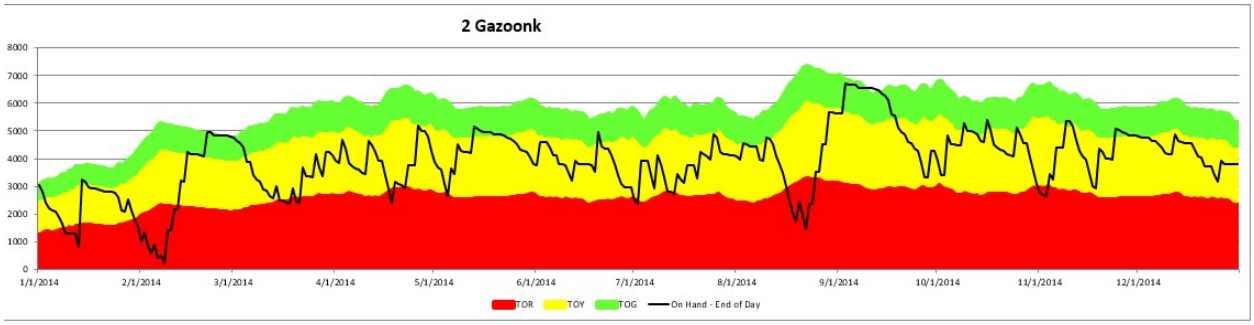
The result was a dramatic improvement in customer service to 99.7 with only one stock out day for the year. Inventory turns were 16.01 which is exception for an item with a 14 day lead time. 55 Supply Orders were generated during the year supporting the rapid turnover rate for the inventory.

Simulation Results			
Avg on hand	3,627	Minimum on hand	(15)
Annual Turns	16.01	Max on hand	6,321
Total Demand	58,081	Service Level	99.7%
Peak Demand	500	Days Stocked Out	1
Supply orders	55		
Average Order Size	1047		



While 99.7% customer service would be considered excellent in most clients we then addressed the one stock out day by increasing the Safety Percentage for the Red Zone from 120% to 150% with the following results:

Simulation Results			
Avg on hand	3,879	Minimum on hand	195
Annual Turns	14.97	Max on hand	6,710
Total Demand	58,081	Service Level	100.0%
Peak Demand	500	Days Stocked Out	0
Supply orders	52		
Average Order Size	1103		



Service improved to 100%. Minimum on hand increased to 195 units while inventory turnover rate declined slightly to 14.97 annual turns.

DDMRP provides a range of tactics that can be applied to ensure extremely high service levels while pacing materials to true market demand.

Summary

The simulation of buffer performance using random demand values provided by visitors to our booth was a very real and interesting test of the Demand Driven MRP methodology. Other than the upper limit of 500 we had no idea what demand input we'd be getting from the study participants.

Both parts that were modelled in the simulation achieved very high service levels of 100% and 96.4% while also driving very solid inventory turn-over rates. It's critically important to understand that this performance was achieved without order spike qualification and no forward visibility to demand.

We applied a range of red zone safety thresholds due to the unknown rate of demand which drove the excellent service levels achieved in the simulation. We also used the simulation to demonstrate how adjusting buffer parameters such as minimum order quantity affects buffer performance.

The core concept of Demand Driven MRP buffers is that they are designed to achieve constant material availability. The resilience of the buffers was proven in the examples above. Supply orders were triggered based on actual sales and the penetration of the buffers. High inventory turn rates were achieved without the prevalent inventory distortions seen in forecast driven methodologies.

DDMRP also provides users with a very easy to follow signaling system for planning and supply chain execution.

Simulate your own materials!

Demand Driven Tech provides free simulation analysis to companies interested in gaining a better understanding of the impact that DDMRP tactics and technology can have on their supply chain performance. If you're interested please feel free to contact us at:

demanddriventech.com

info@demanddriventech.com

Where to learn more about Demand Driven MRP

There is a rapidly growing body of knowledge regarding Demand Driven MRP. Please refer to the following links for more information

www.demanddrivenmrp.com www.demanddriveninstitute.com

Thanks!

We'd like to thank the large group of SuiteWorld attendees who visited us in the Expo and participated in the simulation. We greatly appreciate their time and interest without which this study would have been impossible.

We look forward to working with you on your demand driven journey!

Erik Bush

Co-founder

DEMAND DRIVEN TECHNOLOGIES

ebush@demanddriventech.com