

## CUSTOMER STORY

Nature's Bounty

# REINVENTING THE PRODUCTION SCHEDULING WHEEL

*Nature's Bounty worked with Zinata to unlock hidden production capacity.*

## IN A NUTSHELL

### Industry

Retail/Dietary Supplement Manufacturing

### Challenges

- Scheduling complexity
- Overtime

### Solution

Structured planning and scheduling process with Product Wheels.

### Outcome

- Better sequencing
- Fewer line changeovers
- Less overtime
- Transfer of skills and knowledge

For supply chains to be fully effective, manufacturing links must be stable, predictable, agile and responsive. One way to accomplish these goals is with product wheels. These scheduling tools organize the variety of products made on any asset in order to optimize campaign lengths and sequences and therefore improve throughput and customer fill rate while reducing cost and inventory.

Product wheels can be applied to a major piece of process equipment – for instance, a resin reactor, a paint mixer, a polymer extruder or a ketchup homogenizer – or to an entire line, such as one for shampoo bottling or potato chip packaging. With product wheels, production is arranged in fixed, repeatable cycles to provide stability and predictability. Likewise, the overall cycle time is fixed based on business priorities. For example, if the business strategy is to be agile and responsive, very short wheels can be designed. If cost is the main driver, wheel cycle time can be based on the optimum balance between changeover cost and inventory cost.

With product wheels, high-volume products are made every cycle, and lower-volume products may be made every second or fourth cycle. The point is to make each product only as frequently as the run length will justify the changeover.

Product wheels are designed from forecasts, but actual operation centers around lean consumption-based replenishment (in other

words, pull). Therefore, on any specific cycle, some campaigns (or spokes) will be larger than designed and some smaller. At these points, the wheel is said to breathe. Although the pluses and minuses will generally balance each other out, it's wise to design some extra breathing room into each cycle to allow for cycles that have more increases than decreases (see Figure 1).

Make-to-order (MTO) products can coexist with make-to-stock products on the same wheel. When ordered, MTO items are produced at a predetermined slot on the wheel where they are most compatible with their neighbors. The sequence is fixed for each cycle and designed to give the shortest or least expensive path through all the products to be made on a particular cycle.

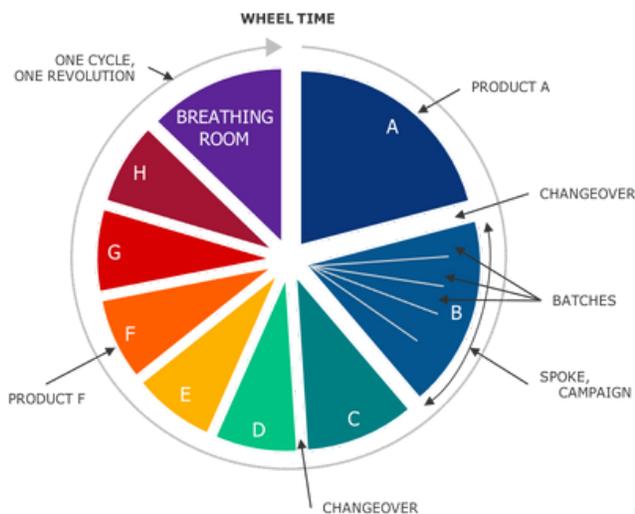


Figure 1

## THE BENEFITS OF PRODUCT WHEELS

*The benefits of product wheels generally include the following:*

- Changeovers are simplified because fewer parameters must be adjusted.
- By setting the ideal cycle frequency for lower-volume products, the total number of changeovers is reduced.
- Overall equipment effectiveness and throughput capacity increase.
- Production is levelled, eliminating peaks and valleys in the schedule.
- Inventory goes down and is closer to the desired mix, so customer delivery performance (fill rate) goes up.
- Overtime goes down. In some cases, lines are completely idled.
- Overall lead times are reduced, which makes the manufacturing operation a more responsive, agile link in the supply chain.
- The repeatability and predictability enable better long-range supply chain planning.
- Scheduling chaos and churn are reduced or eliminated.



# THE PRODUCT WHEEL CONCEPTION IN ACTION

Nutraceutical manufacturer Nature's Bounty has significantly improved throughput at one of its packaging sites by using a product wheel scheduling optimization process. The increased throughput enables the business to run all needed products on 20 percent fewer packaging lines, is saving 15 percent in direct manufacturing labor, and has made scheduling more stable and predictable. Impressively, all of this was achieved with no capital investment. These success have driven Nature's Bounty to apply product wheels to other packaging sites and move the concept upstream to manufacturing as well.

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*Grouping the products run on a line dramatically reduced the number of bottle sizes – the most time-consuming change over parameter.*

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Nature's bounty is a global manufacturer with \$3 billion in annual sales. The company has six plants in North America where tablets, capsules, and gelcaps are manufactured and four packaging operations. Company leaders first decided to apply product wheels to the Deerfield Beach, Florida, packaging site to improve scheduling stability, line operability and overall equipment effectiveness. They engaged value chain solution provider Zinata to teach them the product wheel methodology, guide them through design and implementation, and coach them through the initial operation.

Because a main feature of product wheels is the optimization of changeovers, Nature's Bounty professionals first needed to understand what parameters would vary on a changeover. They found as many as 14 possibilities, including bottle diameter, height and colour; cap type; allergen content; whether the item is retailed as individual bottles or bundled in pairs or triples; and so forth. A spreadsheet of all 700 products and their relevant parameters was created to organize the variety.

With that understanding, it was possible to group all products into families with similar changeover characteristics and then allocate each family to a specific packaging line. With guidance from a team leader, a planning manager and a setup mechanic, the changeover parameters were listed in order of difficulty and then grouped. Nature's Bounty found that grouping the products run on a given line dramatically reduced the number of bottle sizes – the most time-consuming changeover parameter – and contributed several points of overall equipment effectiveness Improvement.

On Line 4, for example, which had traditionally run as many as 10 bottle sizes a month, only two sizes are run now that the product wheel schedule has been implemented. Line 9 had been running seven sizes and now is down to one, so it no longer experiences a size change or any of the rail and height modifications that normally would accompany that.

The next step was to determine the overall cycle time for the lines. In a plant with several lines, each can run a different overall cycle if the product volumes and other considerations warrant it. In this case, the cycle times were set so that the higher-volume products on a line would run an eight-hour campaign per cycle (or something close to that). Of the running lines, one had a one-week wheel, several had two-week wheels, and a few had four-week wheels.

Then Nature's Bounty professionals designed each cycle. If a line runs its higher-volume products on a one-week cycle, it's medium-volume products every second cycle and it's lower-volume products

every fourth cycle, then there are four unique cycles on that line, which all repeat every four weeks.

Optimizing the sequence of each cycle came next. The objective was to group products by similar characteristics to minimize the number of aspects that needed to be adjusted on any changeover.

Taking another look at line 4: it was noted that this line has two bottle sizes: 400 cubic centimeters (cc) and 500 cc. To simplify changeovers, the 400 cc bottles were grouped together, and the 500 cc bottles because the setup mechanics found it easier to reconfigure the line to adjust from larger to smaller bottles. Next, bottle types were grouped because their different forms require a slight rail adjustment. Bottle colors were next, with sequencing priority – size, type, desiccant, color and so on – determined by the team leader, planning manager and setup mechanic.

When determining the overall wheel cycle time and frequency of the lower-volume products, the main goals were reasonably long campaign lengths and avoiding excessive inventories.

Nature's Bounty professionals worked to determine each product campaign, deciding if it would run monthly, biweekly, or weekly. To ensure that the product wheel can realistically be followed, all run times are based on demonstrated run rates and current line overall equipment effectiveness factors.

**In the end, the results at Nature's Bounty were striking. The planning and scheduling professionals have found the new process to be much more stable and predictable because most of the production now follows standard patterns. This provides more time to focus on rush orders and other disruptions and thus can enable better decision-making. The product wheels led to an overall equipment effectiveness uptick of 12 points, which represented a 34 percent increase in throughput. As noted previously, it now is possible to get the same production from 20 percent fewer packaging lines, which saves 15 percent in direct manufacturing labour costs. Best of all, these savings were realized simply by optimizing scheduling processes.**

## A BOUNTY OF SCHEDULING ADVANCES

Since implementing product wheels at Nature's Bounty, schedulers are enjoying considerable progress. Because they now receive a workbench of orders to be packaged over two-week periods each Monday, they have eliminated the need to process individual order-by-order tasks. They also have found that they no longer need a massiveness library of key information. Working with a set of orders as a group – and then scheduling each line to the product wheel as a whole – means that 90-95 percent of orders require no adjustment when entering a line. It also leaves more time for them to handle expectations, emergencies and Improvements.

**Changeovers and incorrect inventory levels waste significant time and money and affect customer service. Phenix planning and scheduling software uses Aligned Product Wheels to minimize waste and align production with the business's customer service, throughput and inventory goals. Visit us at [www.phenixps.com](http://www.phenixps.com) to find out more.**

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