

Uniform Load Scheduling

Mini-tutorial

Group 7

Ben Robison
Carli Richards
Dan Nebeker
Josh Taylor
Sam Hobbs

One of the biggest questions that a manufacturing firm faces is the question of how much to produce. Should a manufacturer wait for a customer order before beginning production, or should they produce in anticipation of demand and possibly be left with excess inventory?

If a particular production line is responsible for production of more than one type of product, these concerns are compounded. How many units should be produced in each batch? How much time is consumed by setup when we switch to producing unit B after we're done producing unit A? We don't want to run out of unit A while we produce unit B, so how many of unit A do we have to produce in order to meet demand while we produce unit B?

Uniform Load Scheduling Defined

Uniform Load Scheduling

Producing enough of each unit each day to meet daily demand.

Uniform Load Scheduling, also called mixed-model sequencing, is a method of manufacturing that tries to simplify and then solve these types of questions. In its most basic form, it is simply a type of batch processing for manufacturing facilities.

Uniform load scheduling can be simply described as the process of manufacturing in small lot sizes. The goal of having a uniform load schedule is to produce enough of each unit each day so that you can meet daily demand.

Old Times Manufacturing: Traditional Scheduling Approach

Let's look at a hypothetical situation where Old Times Mfg uses the traditional scheduling method. Old Times must produce two types of products, widgets and gadgets, in two-week periods. In one cycle, Old Time must produce enough widgets and gadgets to meet next period's demand. At the end of each period, Old Times ships out all the widgets and gadgets they've produced, and starts the cycle over.

Let's assume that demand for both products is equal and constant. At the beginning of week 1, laborers would come in, setup the facility for production of widgets and begin producing widgets. They would produce widgets all week long and stockpile all the widgets.

At the beginning of week 2, the laborers would setup for production of gadgets and produce gadgets all week long, stockpiling the finished product. At the end of the two week period, they have enough widgets and gadgets to meet demand for the upcoming period, ship out all finished goods inventory, and begin production for the next upcoming period.

Old Times Mfg: Uniform Load Schedule Approach

Now let's look at Old Times Mfg in a new light. We'll keep our assumptions from the traditional structure, meaning that we must still produce the same amount of widgets and gadgets and demand

remains constant. But rather than scheduling production in two week cycles, we'll reorganize it to use a uniform load schedule.

Two Steps:

1. Calculate average daily demand
2. Arrange production to meet daily demand

Since we know the demand for both widgets and gadgets, we can calculate the average daily demand. The object of uniform load scheduling is to produce this average daily demand every day. Said differently, we want to reduce our two-week period into a one-day period.

So in the morning, Old Times sets up the facility to produce widgets. Production of widgets continues until daily demand has been met. Then the facility is setup to produce gadgets, and gadgets are produced until we have enough to meet daily demand. At the end of the day, everything is shipped out, and we start again the next day.

**3M:
Real-life Application**

In 1982, one of 3M's product lines consisted of magnetic recording tape. There were about 100 different variations of the end item needed. Case, length, cartridge, and speed are some of the things that varied on demand, not including the labels for different customers. 30-40 variations were fairly common, and 3M only shipped 40-50% of their orders on time.

Realizing that change was needed if they wanted to stay in the market, 3M began to examine its options. Product engineering changes were not an option, so 3M began to examine the scheduling process. They took a Just-in-time/Total quality approach, addressed several issues, and implemented many changes to correct their problems:

- They changed the layout of the production process.
- They examined their quality delays and took steps to minimize them.
- They modified their tooling and equipment.
- They modified the locations and containers that were used in the production process.

Key

Not every variation was needed all the time. They scheduled several high-volume repeaters then mixed in the others.

During the first two weeks of production under the new system, 95% of orders were shipped correctly and on time. During the first year, 98.5% were shipped on time, the major cause of delay being unavailability of the customer's label. Their WIP inventory decreased dramatically, and finished goods inventory was also released.

3M's scheduling period was cut in half to one week, down from two. They were able to regularly deliver small and large orders. Even same day shipments were possible for smaller orders under the new system.

So what changed? One key was that not every variation was needed all the time. 3M was able to schedule several high-volume repeaters in every schedule, and mix oddball orders in the leftover

spaces. This new approach allowed 3M to always produce enough to meet the regular demands, but also gave it enough flexibility to produce the less popular products in record time. Ironically, by adopting a uniform schedule, they became more responsive to customer needs.

Benefits

So what benefits did 3M realize from switching to their new system? Let's define and measure some obvious advantages that were gained by switching to a uniform load schedule.

Benefits

1. Simplified production schedule
 2. Level demand for components
 3. Reduced lead times
 4. Reduced inventory levels
 5. Flexibility
1. **Simplified production schedules.** Many firms have highly competent employees who specialize in scheduling production so that all demand is met. Uniform load schedules drastically reduce the complexity of this process. We don't have to worry about market fluctuations over long periods; instead, we simply produce enough units every day.
 2. **Levels demand for component parts.** Since we know how many widgets or gadgets need to be produced each day, we uniform demand for the parts that are needed to feed our production process. This helps us smooth things out along our supply chain.
 3. **Reduce lead times on customer orders.** Since we are now producing some of everything each day, customers don't have to wait so long. Most operations that have been developed for JIT are robust enough to handle swings of 10% either way in daily loads.
 4. **Drastically reduces WIP & finished goods inventory.** With a uniform load schedule, everything produced in a day is shipped that day. At the end of the day, nothing is left partially completed. Nothing is left completed but stockpiled in the corner, thus drastically reducing or completely eliminating WIP and finished goods inventory.
 5. **Accommodates major mix changes as long as the load is uniform.** Another way to look at this uniform process is simply this: increased flexibility. By streamlining production operations, a firm can increase its capacity to meet changing demands. At one point in time, 3M allowed 20% of the daily schedule to be phone-in orders not filled from stock. As long as the load is uniform, mix changes are simple to handle.

Other Considerations

One point that needs to be discussed is that uniform load scheduling is not made to stand on its own. The 3M example illustrates that using a uniform load schedule is only one aspect of quality improvement.

3M mgmt realized that they could not change their product from an engineering standpoint, so they turned to the production process. They did adopt a uniform load schedule, but to support that, they had to reengineer the production process. They had to modify the tooling and equipment used, change locations of machines and parts, and retrain their employees.

Adopting a uniform load schedule is not child's play, but may require significant investment on the part of the firm. Before making the investment, managers should carefully weigh the expected benefits against the estimated costs.

Key

A uniform load schedule affects every aspect of a company, not just the operations dept.

A related point that needs mention is that there is more to uniform load scheduling than a mixed model assembly and a good pull system. It affects all of a firm's processes, right down to order entry. You cannot encourage sales by offering discounts on large lots without careful planning on the volume surge.

If possible, everyday low prices should be encouraged. Here we point out that average cost is lower over time than when demand surges and dies due to promotions.

All departments within an organization must be involved in the adoption of a uniform load scheduling process if the system is to be effective. Although the operations department will cope with the most change, finance, accounting, marketing, and all other departments will be required to make adjustments in order to handle the new system.

Conclusions

Uniform load scheduling is a strategy designed to improve the efficiency of the markets in which we do business. For many companies, the adoption of this flexible strategy provides a competitive advantage that becomes an order winner. Manufacturers that do not implement these strategies must find another competitive advantage for their own firms.

We must remember, however, that although there are great benefits that can be realized by producing with a uniform load schedule, it is not the best choice for all manufacturers. Managers understand the issues, carefully weigh the pros and cons, and make informed decisions regarding their own operations.

Additional References

1. Attaining Manufacturing Excellence. Robert W. Hall. 1987.
2. The Technology Management Handbook. Editor-in-chief Richard C. Dorf. 1998.
3. Innovations in Competitive Manufacturing. Editor Paul M. Swamidass. 2002.