

A competitive Just-In-Time Manufacturing Process with PRODSim®

Why improve manufacturing processes?

Most manufacturing companies today face pressures to reduce lead-times, reduce operating costs and improve quality. However, many have difficulty breaking traditional mindsets which would enable them to introduce *World Class* manufacturing techniques. The result is that very few companies achieve the *World Class* operation they desire.

Batch production with long lead-times, high levels of inventory, quality by inspection and an inherently high cost is an accepted way of working for many manufacturing companies.

High quality, short lead times, low inventory levels and low costs are often viewed as mutually exclusive goals. For traditional companies the art of production is to optimise local trade-off's between these goals. In *World Class* manufacturing companies these same goals are managed so that they become mutually supportive.

But there are some barriers to changing the traditional mindset, based on assumptions highlighted below:

Maximise Machine Utilisation

Since we see the immediate cost of capital investments in machines we falsely assume that the best way to recover the investment is to keep the machine as busy as possible.

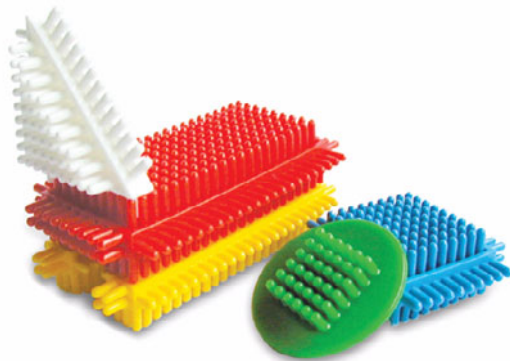


Figure 1: Example of simulation product

At a superficial level this may be true, provided there is a customer for the products being made. However, put into a business context the folly is rapidly exposed because the desire to maximise machine utilisation results in large batch sizes, long production cycle times, high WIP and high levels of finished goods inventory.

Quality is assured against Go/ No Go Criteria

Under a traditional quality regime, rejecting *bad quality* products means that quality to the customer can be assured. The cost of this quality equates to the costs of scrap, rework, lost capacity and inspection services needed to meet customer orders. Today, businesses focus more on prevention and the reduction of variances.

"The Change Works® simulation brings home the fundamental challenges our businesses face in developing our business processes" – Peter Powis, Training

Development Manager, Unilever plc

Inventory is an Asset

Many companies' accounting systems classify inventory as an asset. This forces the business to maximise production throughput, irrespective of demand. It is assumed that once you have made your products they are worth more but, it costs you money to hold stock in terms of actual storage, interest payments etc. and the risk is, the stock may never be sold and be written-off. *Any inventory then becomes a liability.*

Why PRODSim®

PRODSim® uses action learning to explore these issues and participants learn techniques that will expose and logically examine these assumptions as a whole and reveal them to be fundamentally flawed. It will assist participants to challenge their mindsets. In doing this it helps participants to understand



the Just-In-Time environment and equip them to implement the changes required in their own operations successfully.

In a Just-In-Time environment production is managed by a pull system that is defined as *An execution system driven by actual consumption and controlled by synchronised replenishment signals.*

Participants learn how to:

- design and implement the pull system
- structure replenishment Kanban methods
- improve machine changeovers

How PRODSim® works

PRODSim® is a role playing simulation in which a team of 9 to 15 people simulates the running of a repetitive manufacturing process with multi-option product throughput.

The simulation is played in 5 cycles with a facilitated debrief after each cycle. During each cycle of the simulation participants have to manufacture a product using construction bricks. They supply the products to meet customer demand and are measured against time, quality and cost targets. Multiple product lines can be simulated if desired.

The purpose of PRODSim® is to demonstrate and help people understand the concept of Just-In-Time processing of a task. It also demonstrates Kanban control of a Just-In-Time pull system in either a single product or multi-option environment. This is achieved in the following way:

During Cycle 1 the participants are exposed to:

- the problems and waste created by the traditional approach to production control:
 - batch production
 - material replenishment at minimum stock level
 - excessive material handling
 - high Work-In-Progress (WIP)
 - poor quality
 - large space requirements
 - high proportion of indirect labour

During the Cycle 1 debrief the participants:

- put into practice an improvement process whereby they:
 - identify and structure the problems and wastes
 - generate potential solutions
 - select and implement two changes

Through 4 more cycles & debriefs the participants:

- continue to apply the improvement process and move towards *World Class* manufacturing performance by:
 - improving assembly quality
 - applying group technology to factory layout

- introducing pull systems
- introducing Kanban production control
- reducing batch sizes
- introducing direct-to-line supplier delivery
- utilising customer forecast of product mix
- reducing costs

What it feels like to be a participant

The participative roles in PRODSim® are:

Customer	General Manager
Operation One	Operation Two
Operation Three	Operation Four
Quality Control	Line Inspection
Planning/ Transportation	Stores
Materials Handling (1 up to 3)	Observer (1 up to 2)

During each cycle the *Customer* places a variable demand for products on his supplier's production process. This demand consists of orders for quantities of 2 product options from a range of 4 product options.

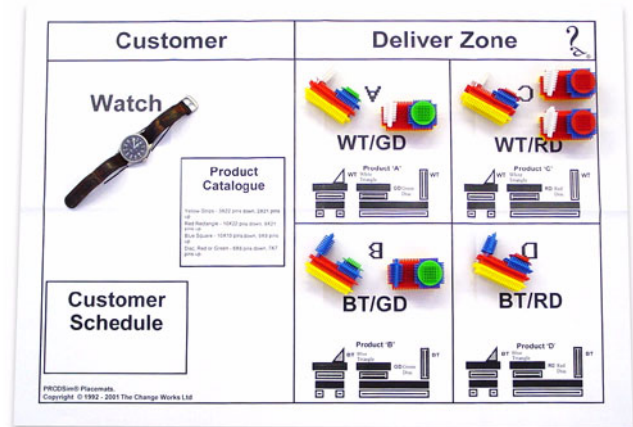


Figure 2: The Simulation's 'Customer Role' place mat

The production team must assemble the products to satisfy demand.

At the start of Cycle 1 the production process is:

- primed with good quality work-in-progress (WIP)
- constrained by poorly balanced batch sizes
- compromised by poor product and assembly specifications

These factors lead to severe quality problems and an inability to satisfy the customer demand.



Over the 5 cycles of the simulation the participants must understand the problems and implement changes so that customer demand is satisfied 100% in terms of quality, cost and time.

Simulation Contents

PRODSim[®] comes in a strong case and contains everything required to run the simulation, including:

- Role briefs for each participant
- Bricks, place mats and all necessary materials
- Consumables technology for quality reproduction
- Quickstart technology to allow fast start-up



Figure 3: PRODSim[®] Contents

We supply the simulation with a comprehensive handbook to help workshop leaders and contains chapters that cover the subject overview, how the simulation works, managing the simulation process, learning points, case studies and business examples, Quickstart storyboard, and event checklists.

PRODSim[®] Learning points

There are a number of detailed learning points that are brought out by each successive cycle of the simulation.

Quality

During PRODSim[®] several aspects of quality become clear:

- Operators should have training before being expected to meet the quality measures required by the process.
- Documentation provided to operators should be clear and easy to understand.
- There are a number of tools & techniques that can be used to attack quality issues.

Layout

The work centre layout causes excessive material handling and transportation that are non-value-adding. These all generate long production lead times and high work in progress inventory during Cycle 1. PRODSim[®] demonstrates the importance of an optimal layout.

Through the application of a Routing by Walking Around exercise participants learn how to analyse layout weaknesses and how to redesign optimum solutions.

Production Planning and Control

During PRODSim[®] participants learn that excessive production lead-times and work in progress (WIP) are due to the push system of control and large batch sizes.

Participants then design their own pull system and discover how to implement it successfully.

Batch Sizes

The main learning point is that since production lead time is directly related to batch size, large batch sizes will take longer to complete than smaller ones. In addition the work in progress increases with large batch sizes.

During PRODSim[®] participants learn how to calculate optimal batch sizes.

Raw Material Supply

Suppliers do ultimately have to be involved and PRODSim[®] allows participants to experiment with supplier deliveries direct to the manufacturing line.

Demand Visibility

As participants proceed through the simulation they will get the process well enough under control that the rate of production can exceed the customer's requirements. It is possible for them to experiment with demand forecasting to avoid surplus finished goods inventory being generated.

Space Usage

Once inventory reduction has been achieved with the introduction of pull systems and low batch sizes then it becomes obvious to the participants that costs can be reduced by cutting down on excessive use of space.

People Usage

It will also be obvious to most that in a Just-In-Time system of production there is a reduced need for the traditional roles of Material Handling and Quality.



However, new roles are created in training, forecasting, customer liaison, supplier liaison, product mix management etc. Many of the people released from the traditional roles will be available to re-train or, if your business is growing transfer to other production areas.

The Benefits of PRODSim®

PRODSim® shows that:

- Operating with reduced lead times leads to greater flexibility and opportunities to better satisfy the customers' needs which may be measured in several ways, e.g. lead-time, quality, cost, flexibility, etc.
- Examining how to reduce lead time identifies alternative methods of production that allow companies to:
 - eliminate waste (Route By Walking Around and visioning)
 - work more simply with visual control (pull systems, Kanban)
 - optimise production capacity (mix management)
 - apply rigorous analysis to get rid of problems that have existed for a long time (Cause & Effect analysis)
- Implementing any kind of change to traditional techniques needs:
 - a good process for unfreezing the people's ideas
 - a common language to change to
 - a clear new direction in which to go.

People need help to make Mindset shifts		
	<u>Today</u>	<u>Tomorrow</u>
Management	Functional	Process Orientation
Production Levels	Orientation Pushed	Pulled Mix/ day
Optimum order size	Larger Batch size	Reduce changeover time
Non-Quality	Increased inspection	Master processes
Maintenance	Curative	Predictive
Work Flow	Functional Grouping	Cells
Scheduling	Forecast-Based	Replenishment-Based
Suppliers/ Customer Involvement	Not Involved	Part Of Value Chain/ Involved Throughout

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Figure 4

Who Uses PRODSim®?

The Change Works simulations are designed to be used by those implementing changes inside a business or external companies engaged to provide expertise and implementation skills. These could be Trainers, Managers or Consultants.

Accreditation training is provided by The Change Works to assure the quality of the simulation play and to ensure the workshop leaders are capable of facilitating a first class event that achieves its objectives

PRODSim® Vital Statistics

- PRODSim® is designed to illustrate manufacturing issues, unfreeze mindsets, educate, develop teams, and illustrate improvement opportunities.
- The simulation is provided with material for simulating the manufacturing operation.
- The manufacturing operation has 8 roles; Customer, General Manager, Operators, Quality Control, Line Inspection, Planning, Stores and Material Handlers.
- Each simulation can accommodate 9 to 15 participants. Multiples of simulations can be played simultaneously.
- Quickstart presentations are provided for a 4 and 8 hour play. Workshop Leaders may adapt these lengths to suit needs.
- Workshop Leaders are trained and accredited to deploy the simulation.
- Language packs available.



Figure 5: The Simulation in action

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TCW Simulations

- KANSim® Visible production control
- LAYSim® Cellular Manufacturing
- NPISim® New Product Introduction
- OFFSim® Office & Service Processes
- PDM Pack Product Data Management
- PRODSim® Just in Time Manufacturing
- SCMSim™ Supply Chain Management
- SETSim® Machine Change-over Reduction