Australian Government
Australian Grape and Wine Authority

THE LEAN GUIDE

A PRIMER ON LEAN PRODUCTION FOR THE AUSTRALIAN WINE INDUSTRY

HOW TO NAVIGATE THIS GUIDE

This GUIDE is designed to help you access the information you need, as quickly as possible. It can be navigated in two ways:

1. If you are interested in a specific Step, you can get to it quickly by clicking its tab located on the top of the Guide page and following the links on the top for further information.
2. If you are interested in a specific Technique, you can get to it quickly by clicking its text hyperlink located on the top of each Step's page. Techniques are easy to identify - just look out for the toolbox icon - for example:

   SELECTING AND USING THE RIGHT METRICS FOR MEASURING LEAN & PRODUCTIVITY

3. If you want to scan through the entire Guide from start-to-finish, you can do so by scrolling down (like a normal electronic document) or use the buttons at the bottom-right of the document.

This document has been designed for easy on screen reading. However, it may be printed as any normal Adobe.pdf document.

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Whenever you roll your cursor over a button, an arrow (like the 'NEXT PAGE' button bottom right), or words that are underlined, you are able to jump to the hotlink - just like a web page.

ADOBE ACROBAT

The hyperlinks and internal navigation in this document are best utilised in Adobe Acrobat Reader - available for free download. Please click here to download the latest version for your system.

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ABOUT THIS GUIDE

What is the Lean Guide?

The Lean Guide offers a practical introduction to lean production concepts and techniques for Australian wineries. This guide will help wine businesses implement practices to improve their productivity, reduce their costs and improve their business resilience.

During consultation with industry, the need for a simple guide to the lean technique was identified as one way of improving profitability in the wine sector.

While some wineries have already sourced information about 'Lean' production principles, primarily through consultants or other sources, and then adapted the principles to their own circumstances, there is a view that many of these existing resources focus on the methods and language (e.g. jargon) rather than the outcomes, and this is barrier to uptake.

The development of this Lean Guide is intended to provide the wine industry with a tool that will allow all scales of operation to understand adopt and benefit from the principles of 'Lean' manufacturing.

The diagram on the following page provides a visual overview on the contents of the Guide.

Some important notes about the scope and structure of the Lean Guide:

- The Guide provides an introduction to Lean Production techniques and some initial guidance on how to apply them to a winery context
- It is not the intention of the Guide to convert operations and management staff into experts in Lean Production; instead the Guide aims to provide enough knowledge about Lean Production such that wineries can make more informed decisions about whether to pursue Lean, what tools/techniques might be relevant and what further steps may be required to implement Lean Production in their operations.
- The Lean Guide presents a core set of Lean techniques and tools that will be relevant to most wineries of all scales and business models. Wineries may discover, however, that some tools are less relevant than others – the Guide provides the means for wineries to 'pick and choose' the techniques they wish to use.
- The Guide is structured such that updates (such as case studies, templates, resources etc.) can be made to the 'Toolbox' section of the Guide, or uploaded to and downloadable from the AGWA website.

BRIEF INTRODUCTION TO LEAN PRODUCTION

- What's Lean Production?
- What's the business case for Lean Production?
- Guiding principles of Lean
- Overview of the techniques and tools

Fast implementation
Applicable to all wineries
Smaller gains

Slow implementation
Applicable to some wineries
Bigger gains

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BRIEF INTRODUCTION TO LEAN PRODUCTION

WHAT'S LEAN PRODUCTION?

DEFINING LEAN PRODUCTION

Lean Production is a system of tools and practices for improving production operations, suppliers, and customer relations such that the business requires:

- less human effort
- less space
- less capital
- less material, and
- less time to make products with fewer defects to precise customer desires.

Anywhere work is being done, waste is being generated. Waste could come in the form of non value-adding activities such as:

- Producing more than necessary
- Time in waiting
- Movement
- Re-work
- Unnecessary processing
- Mis-use of materials (hard waste)

Lean Production focuses on minimising these types of wastes and improving productivity through improved flow and relationship to the customer.

WHAT'S THE BUSINESS CASE FOR LEAN PRODUCTION?

All wineries share a common objective – to create more output (at the same or better quality) with less input. In regional Australia, this objective is becoming harder and harder to achieve, with the increasing cost of key inputs – such as materials, labour, utilities and compliance – compounding the overall cost base of the winery (Australia's cost of doing business is amongst the most expensive in the world). These costs, coupled with a strong Australian dollar, are resulting in a tighter profit margin for these businesses, and as a result, the pressure to re-engineer and improve productivity is squarely back on the radar for most SME wineries.

The adoption of Lean Production techniques and practices can help wineries reduce costs and improve productivity by delivering tangible outcomes including:

- Elimination of waste & non-value-adding activities
- Streamlining of processes (Flow)
- Shifting of business model from supply-focused to demand-focused
- Improved resource efficiency, elimination of waste and cost savings through reduced purchase of raw materials
- Faster production lead times
- Elimination of losses and deterioration of material while processing
- Reductions in the amount of information between processes
- Improvements in the use of limited physical space and machinery in the winery
- Improved distribution of work among operators.

Recent case studies have demonstrated that applying Lean Production practices to wineries can achieve, on average:

» Reduction in materials costs of between 8-16%,
» Reduction in production lead-time between 50-65%.

Asides from the productivity-related benefits, Lean Production can assist wineries with improving their environmental sustainability performance. Table 1 on the following page outlines the environmental impacts associated with key waste types that are typically eliminated through Lean Production techniques and practices.

TABLE 1: EIGHT TYPES OF WASTES TARGETED BY LEAN PRODUCTION

WASTE TYPE	DESCRIPTION
Overproduction	» More raw materials and energy consumed in making the unnecessary products » Extra products may spoil or become obsolete requiring disposal » Extra hazardous materials used result in extra emissions, waste disposal, worker exposure, etc.
Inventory	» More packaging to store work-in-process (WIP) » Waste from deterioration or damage to stored WIP » More materials needed to replace damaged WIP » More energy used to heat, cool, and light inventory space
Transportation and Motion	» More energy use for transport » Emissions from transport » More space required for WIP movement, increasing lighting, heating, and cooling demand and energy consumption » More packaging required to protect components during movement » Damage and spills during transport » Transportation of hazardous materials requires special shipping and packaging to prevent risk during accidents
Defects	» Raw materials and energy consumed in making defective products » Defective components require recycling or disposal » More space required for rework and repair, increasing energy use for heating, cooling, and lighting
Over processing	» More parts and raw materials consumed per unit of production » Unnecessary processing increases wastes, energy use, and emissions
Waiting	» Potential material spoilage or component damage causing waste » Wasted energy from heating, cooling, and lighting during production downtime

GUIDING PRINCIPLES OF LEAN

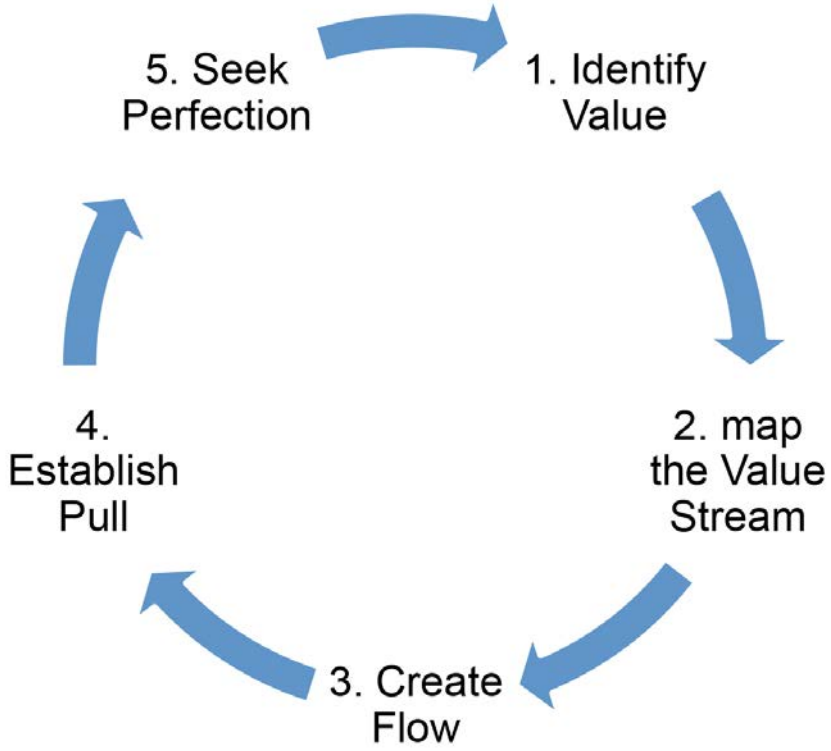


FIGURE 1: THE FIVE PRINCIPLES OF LEAN

The successful implementation of Lean Production can be achieved through adhering to five key principles:

1. For each product family, define value from the standpoint of the end customer.
2. Identify all the value-adding steps in the value stream for each product family, and eliminate the non value-adding steps.
3. Organise the value-creating steps to occur in a smooth flow.
4. Allow customers to 'pull' value from upstream activity.
5. As value is defined, value-adding steps are identified, non value-adding steps are removed, and flow and pull are introduced, repeat the process and foster continuous improvement towards the ultimate goal of creating perfect value with no waste.

LEAN TOOLS AND TECHNIQUES – TYPES AND VARIETIES

The Lean Production space is chock-full of tools and techniques commonly used by production-based businesses and consultants. While this Lean Guide focuses only on some of the core Lean techniques, it is worthwhile having an awareness of other tools that could be available.

- 5S Production
- A3 Reporting
- Continuous Improvement (Kaizen)
- Error proofing
- First In, First Out
- One piece flow/Just-In-Time
- Production leveling
- Production signalling
- Quality Function Deployment
- Quick changeover
- Root cause analysis
- Sequential Pull
- Seven Wastes Identification
- Six Sigma
- Standard Work
- Supermarket-based Pull Systems
- Theory of constraints
- Total Productive Maintenance
- Total Quality Control
- Value Stream Mapping
- Visual Management

STEP 1: START 'THINKING LEAN'

The simplest way for wineries to begin adopting Lean Production is to start 'thinking lean' – that is, getting in the right frame of mind to begin identifying opportunities to reduce waste and improve productivity.

To that end, Step 1 of the Lean Guide covers two important techniques that enable wineries to begin to 'think lean':

1. **Selecting and using the right metrics for measuring Lean & Productivity**
2. **Seven Waste Identification**

STEP 1: START 'THINKING LEAN'

The simplest way for wineries to begin adopting Lean Production is to start 'thinking lean' – that is, getting in the right frame of mind to begin identifying opportunities to reduce waste and improve productivity. To that end, Step 1 of the Lean Guide covers two important techniques that enable wineries to begin to 'think lean'.

The first technique relates to the selection of key metrics that define efficiency and productivity in wine production. Many businesses that have embarked on the journey of adopting Lean have jumped straight into the application of its tools and concepts without knowing what drives performance in each aspect of winery operations, or how this performance is measured. Without this knowledge, wineries won't know where best to apply the Lean tools or whether their application has made a positive impact on the business.

The second technique, Seven Waste Identification, is core to Lean Production and helps to identify, characterise and address seven types of waste that are used to describe non-value-adding activities in any winery operation:

1. Waste of Overproduction
2. Waste of Waiting
3. Waste of Transportation (Conveyance)
4. Waste of Over-processing
5. Waste of Inventory
6. Waste of Motion
7. Waste of Correction (Defects)

All key tools and practices of Lean Production relate to eliminating (or reducing) one or more of these types of waste. By having an understanding of these types of waste, wineries will have a better picture of how Lean Production techniques and tools applies to their operations.

LEAN TECHNIQUES

SELECTING AND USING THE RIGHT METRICS FOR MEASURING LEAN & PRODUCTIVITY

The first step in adopting a lean mindset is understanding 'which metrics matter' in tracking and improving productivity in winery operations, and ensuring that these metrics are considered front-of-mind when adopting Lean Production techniques and practices. Wineries can choose from a variety of metrics to use as indicators of how effective Lean techniques and practices are at improving overall business performance –

Production metrics commonly used by the wine industry, and worthy of consideration when implementing Lean Production practices include:

» Net operating profit ($)
» Operational Costs (OPEX$) per litre of wine
» Operational Costs (OPEX$) per $ of Revenue
» Litre (L) wine per work order
» Tonnes of grape crush per week (i.e. during vintage).

Lean Production tools such as use a variety of metrics to measure the performance of a production system, however two that are of particular importance are:

1. Takt time
2. Overall Equipment Effectiveness (OEE)

Takt time is how often one part or product should be produced, based on the rate of sales, to meet customer requirements. Takt time can be used as a reference to match the pace of work to the average pace of customer demand. Takt time is often used in Value Stream Mapping (refer to Step 2), Standard Work, Total Productive Maintenance (Step 3) and Pull Systems (Step 4). The basic calculation for Takt time is as follows,

$$\text{Takt time} = \frac{\text{Available working time per day}}{\text{Customer demand rate per day}}$$

Takt time can be used to calculate bottling and packaging rates. It can also be used for internal processes. For example, Takt time can be applied to receival, destemming, crushing, and pressing steps. Using the Takt formula the 'quantity of must pressed per day' becomes the 'customer demand rate per day'.

EXAMPLE

Assume the production team requires 16 tonnes of must pressed per day and the available working time is 8 hours per day (with a 30 minute break for lunch). The takt time would then be:

$$\text{Takt time} = \frac{450 \text{ minutes}}{16 \text{ tonnes per day}}$$

Takt time = 28.125 minutes

This takt time means that 1 tonne of must needs to be pressed every **28.125 minutes.** To suffice the pressing rate, the receival, destemming and crushing steps must have a cycle time equal to (or slightly less than) **28.125 minutes.**

Overall Equipment Effectiveness (OEE) can be used to indicate the overall effectiveness of a piece of production equipment, or an entire production line. OEE consists of three components:

- *Performance %*, which grades the actual output of the piece of equipment or production line, with what it should be producing (<100% means that there are speed losses).
- *Availability %*, which grades how much time is available to run the machine versus actual machine run-time (<100% means that there are losses associated with downtime e.g. from machine breakdowns or set-up time).
- *Quality %*, which compares the performance of the piece of equipment or product line in creating an output to quality specifications (for example <100% means that the machine or production line didn't make juice or wine to specification).

Together these components, when multiplied together, form the OEE,

OEE (%) = Performance% **x** Availability% **x** Quality%

In addition to these metrics, Table 2 below lists a variety of other production metrics that wineries may consider using when implementing and tracking the implementation of Lean Production practices and other productivity improvements.

TABLE 2: A SUMMARY OF RELEVANT METRICS FOR PRODUCTION-BASED BUSINESSES

METRIC TYPE	METRIC	DESCRIPTION
Improving productivity	Throughput	Measures how much product is being produced over a specified period of time (either at the equipment, process or plant-level).
	Capacity Utilisation	Indicates what proportion of total production output capacity is being utilised at a given point in time.
	Schedule	A measure of what percentage of time a target level of production is attained within a specified schedule of time.
	Productivity in Revenue per Employee	This is a measure of how much revenue is generated by a plant, business unit or company, divided by the number of employees.
	Energy Cost per Unit of Product	A measure of the cost of energy (electricity, steam, oil, gas, etc.) required to produce a specific unit or volume of production
Improving Quality	Yield	http://blog.Insresearch.com/blog/bid/170419/Manufacturing-Metrics-First-Pass-Yield-Benchmark-DataIndicates the percentage of product that is manufactured correctly and to specifications the first time through each stage of production without re-work
	Supplier's Quality Incoming	A measure of the percentage of good quality materials coming into the production process from a given supplier.
Reducing Maintenance	Percentage Planned vs. Emergency Maintenance	This ratio metric is an indicator of how often scheduled maintenance takes place, versus more disruptive/un-planned maintenance.
		This ratio of downtime to operating time is a direct indicator of asset availability for production.

SEVEN WASTE IDENTIFICATION

In order to identify wasteful activity, we need to understand what's useful versus non-useful in the wine production process, which can be described as being made up of three key of types of activities:

- Value Added (VA) – activities performed in the process that the customer is willing to pay-for (i.e. that directly relate to the product quality and characteristics)
- Business Value Added (BVA) – activities necessary to maintain the business
- Non-Value Added (NVA) – activities that do not add value to the output product, and don't have a valid business reason for being performed.

Lean Production techniques and practices focused on eliminating NVA activities and optimising BVA activities, such that the maximum amount of time, attention and resources can be focused on the VA activities.

Lean Production does this through addressing seven key types of waste in a winery operation:

1. Waste of Overproduction
2. Waste of Waiting
3. Waste of Transportation (Conveyance)
4. Waste of Over-processing
5. Waste of Inventory
6. Waste of Motion
7. Waste of Correction (Defects).

Adopting the right mindset for Lean means understanding these wastes and getting better at seeing them.

1. WASTE OF OVERPRODUCTION

There are two types of Overproduction waste:

1) Producing more output than is necessary

2) Producing output at a rate faster than is required.

Overproduction is arguably the most important type of waste for a winery to tackle as it usually compounds the occurrence of other types of wastes, such as a requirement to store more wine for longer periods of time (Waste of Inventory), or increased risk of quality issues (Waste of Correction). It's also one of the more difficult types of waste to deal with in the industry, as both the seasonal nature of wine and the commercial arrangements that many wineries have with vineyards (locked-in to long-term contracts to purchase a minimum amount of grapes) mean that wineries are obliged to make batch-volumes of wine, irrespective of projected demand in wine from year to year.

Causes of Overproduction in wineries include:

- Inaccurate forecasting based on varying customer demand
- Contracts with vineyards requiring the purchase of grapes at tonnage levels that are far in excess of projected demand
- Dealing with low-quality fruit, for which wineries convert into a saleable wine, however due to the lack of quality more time is required to sell the wine (and usually at lower margins)
- Making more wine than is needed 'in order to keep busy'
- Optimising one part of production (i.e. making it faster) without having a broader view of what the entire production process needs
- Bottling wine to reduce ullage.

EXAMPLES OF OVERPRODUCTION IN WINERIES:

- Producing extra cases of wine to cover forecast production or sporadic demand
- Producing more juice-in-tank and must-in-tank than required based on projected demand, due to contracted grape tonnages over vintage.

FIGURE 2: OVERPRODUCTION LEADING TO OTHER WASTES

2. WASTE OF WAITING

The waste of Waiting happens every time staff or operators experience idle time because certain information, equipment, processes, tools or instructions from senior management (e.g. from the winemaker) isn't ready for them to access. This waste is sometimes difficult to see, given that staff in particular usually find something else to do to 'keep busy'. This isn't necessarily a good thing – keeping busy on the wrong tasks can sometimes cause more trouble than simply doing nothing.

The waste of Waiting can affect the business through increased operating costs, strained capacity and higher overtime costs in situations where wine production needs to work harder to make-up for lost time and make weekly or monthly targets. This can ultimately affect the winery's ability to control quality, manage staff and reduce the winery's responsiveness to deal with changing customer demands.

Causes of Waiting in wineries include:

- Delays from suppliers (e.g. grape supply from vineyards)
- Mismanagement of production scheduling
- Equipment break-downs at key bottlenecks of wine production (e.g. pressing)
- Equipment at capacity
- Delays in arrival of tanker (for off-site bottling)
- Busy winemakers (e.g. resulting in delays with inspecting wine quality and advising on production schedule)
- Waiting for information to arrive
- Waiting for customers to arrive (e.g. cellar door).

EXAMPLES OF WAITING IN WINERIES:

- Production staff waiting for winemakers to be available to answer production- and quality-related questions
- Production staff waiting for equipment to be fixed so as to re-commence with production
- Sales staff waiting for wine to be bottled, particularly if bottled off site
- Tanker waiting for wine to be ready for loading (i.e. for off-site bottling)
- Production staff and winemaker waiting for lab test results (quality testing)
- Accounts department waiting for winery to have their books up to date by the end of each month
- Waiting for cellar door customers to arrive.

FIGURE 3: SIX PEOPLE WAITING FOR A JOB TO FINISH

3. WASTE OF TRANSPORTATION (CONVEYANCE)

The waste of Transportation is defined as the movement of wine and materials within production that adds no value to the product. This movement may be achieved via the use carts or forklifts, through conveyor belts, extended pipework or manually by staff.

This type of waste can have a significant impact on a winery's productivity, such as creating delays in production (due to transportation time), creating potential safety hazards, and costing the business through labour and equipment costs required to move the material around.

Causes of Transportation in wineries:

- Inefficient/outdated winery plant/production layout
- Reliance on forklifts or carts to move materials around site
- Warehousing with large inventories
- Off-site storage (requirement for additional transport).

EXAMPLES OF TRANSPORTATION IN WINERIES:

- Transferring of finished wine to storage tanks (which may be located some distance from the point of production)
- Transferring of finished wine onto tanker, and transported to off-site bottling facility
- Transportation of grape marc to offsite facility
- Warehousing (movement of finished wine to and from warehousing facility)
- Transportation and movement of product for sales events such as trade shows (including return of un-sold product).

FIGURE 4: FORKLIFT MOVEMENT

4. WASTE OF OVER-PROCESSING

The waste of Over-processing occurs when aspects of the wine production process are designed or operated in such a way that it uses more space, resources and/or time than what is actually required. This type of waste may result from equipment working faster than necessary, processes that use more production staff/operators than what is truly required, or even quality assurance or administrative processes that use more paper-work and man-hours than what is needed.

The cost of Over-processing waste can be measured in terms of operational costs consumed over the course of production (such as energy, space, labour or equipment utilisation). The less processing required to deliver wine to the customer, the more productive the winery.

Causes of Over-processing in wineries:

- Lack of formal process scheduling
- Lack of standards associated with production specifications, quality assurance
- No implementation of production and equipment control/automation
- Overly complex administrative procedures
- Lack of internal and external communication (expectations of what is required vs not required).

EXAMPLES OF OVER-PROCESSING IN WINERIES:

- Wine production finishing steps such as filtration are repeated or excessively conducted due to lack of formal or standardised monitoring/quality checks
- Critical equipment (e.g. refrigeration systems) running harder than they need to in order to meet the minimum acceptable product specifications
- Use of manual administration systems leading to complex and duplicated paper work, rather than making use of centralised customer relationship management systems (e.g. EasyWine, TallEmu) to provide a whole-of-business management package.

FIGURE 5: OVER PROCESSING USES MORE RESOURCES THAN REQUIRED

5. WASTE OF INVENTORY

The waste of Inventory relates to the excess amount of product (wine-in-tank, or wine-in-bottle) or material on-hand other than what's needed to satisfy current customer demand. Excess inventory has a significant impact on a winery's cash-flow position (essentially it's money tied-up in product that has not yet been sold). The better a winery can manage its inventory, the healthier the business will look on the balance sheet.

For wineries, Inventory can be sub-divided into three types:

» **Cycle stock** – inventory needed to cover normal demand. The amount of cycle stock to hold can be calculated by multiplying the average daily demand for product by the lead-time to replenish the stock.

» **Buffer stock** – this inventory is kept to account for any unexpected surges in customer demand. The amount of buffer stock to keep depends on a variety of factors, but can be estimated based on probabilities or historical records.

» **Safety stock** – this inventory is kept to protect supply to the customer from product spoilage/breakage, loss or other external factors.

FIGURE 6: INVENTORY WASTE

Causes of Inventory in wineries:

The main cause relates to overproduction of wine associated with excess grapes arriving during vintage, leading to significant stores of wine-in-tank, however there may also be other causes a winery should consider, such as:

» Unlevelled/choppy production schedules
» Transportation constraints
» Optimistic demand forecasts.

EXAMPLES OF INVENTORY IN WINERIES:

» Overproduction leading to significant levels of inventory – have to buy a certain amount of fruit regardless of quality
» Excessive levels of wine labels (old, out-of-date wine labels that are no longer useful)
» Additional materials (e.g. additions, or spare parts) ordered well-beyond the amount needed in the near future.

6. WASTE OF MOTION

The waste of Motion relates to all the manual activity that production or administration staff undertake to complete a task – whether it be managing equipment, searching for tools or materials, or accessing important information. Whatever it may be, any movement by staff that doesn't add value to the wine production process is a waste of time, and hence a waste of money to the business. Studies have shown that in a disorganised production-based workplace, up to 10% of the working day can be spent searching for items or changing-over equipment/product batches – eliminating this waste can result in significant improvements to staff productivity.

Causes of Motion in wineries:

- Poorly designed processes
- Lack of standard work methods
- Poor work area layout and design
- Disorganisation and clutter.

EXAMPLES OF MOTION IN WINERIES:

- Searching for misplaced tools or testing equipment during production
- Double-handling of materials and paper work
- Production staff walking the office to obtain production information (rather than having the information accessible in the production area and updated daily).

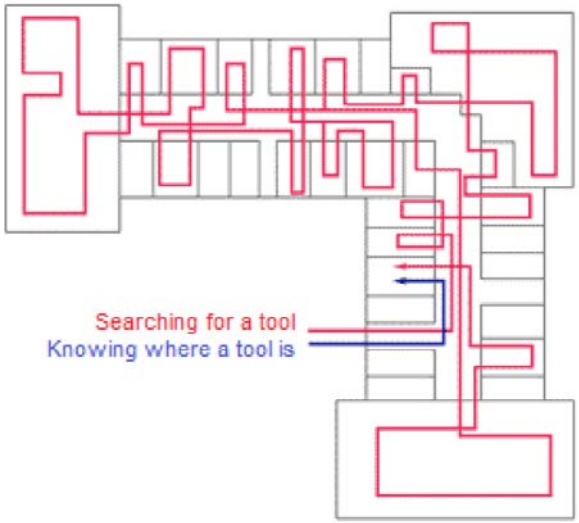


FIGURE 7:
UNNECESSARY MOTION

7. WASTE OF CORRECTION (DEFECTS)

The waste of Correction relates to the additional work and effort required to correct wine product that does not meet a sufficient standard of quality to suit customer and winemaker expectations.

Causes of Correction in wineries:

- Lack of process checks at all stages of wine production
- Low-quality materials from suppliers (e.g. grapes, dry goods)
- Inadequate training and work instructions.

EXAMPLES OF CORRECTION IN WINERIES:

- Poor fruit quality leading to increased effort to convert into a saleable wine
- Having to re-do jobs in the winery, such as filtration and stabilisation (if standard filtration practices and monitoring haven't been adhered to, and stabilisation has not worked properly)
- Relabeling wines
- Stock accuracy – having to write-off stock every time an inventory check is conducted creates a significant amount of re-work for administration staff – typically the result of staff not accurately logging stock.

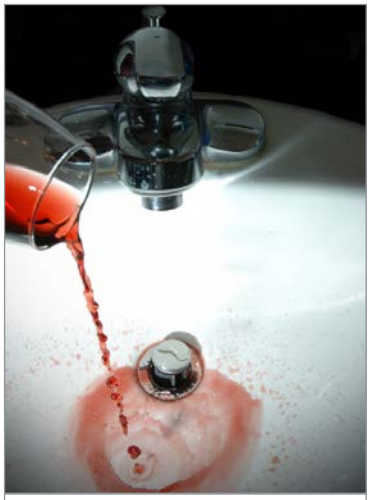


FIGURE 8: DEFECTIVE WINE – RESOURCES WASTED

STEP 2: IDENTIFY WASTE IN THE PRODUCTION PROCESS

Now that Step 1 has provided the means to start 'thinking Lean' in a winery, the next Step in the Lean Guide is to begin the process of identifying wasteful, non value-adding activities and practices in the wine production operation. Step 2 introduces two useful Lean techniques to identify waste in the wine production process:

1. **5S Workplace Productivity**
2. **Value Stream Mapping (VSM)**

STEP 2: IDENTIFY WASTE IN THE PRODUCTION PROCESS

Now that Step 1 has provided the means to start 'thinking Lean' in a winery, the next Step in the Lean Guide is to begin the process of identifying wasteful, non value-adding activities and practices in the wine production operation.

Waste identification is fundamental to Lean Production. Many of the key Lean Production tools and techniques focus on the identification and elimination of waste of one type or another, however there are two simple techniques that are ideal for wineries to begin using immediately, irrespective of their level of prior knowledge:

1. **5S**, which is a 5-step approach to achieve and maintain a high level of workplace organisation.
2. **Value Stream Mapping (VSM)**, which is a visual tool that helps to identify and communicate causes of waste and opportunities for improvement.

These techniques are easy and straightforward to use, and can be introduced immediately to a winery operation with little prior knowledge.

Applying these tools alone will lead to significant opportunities in reducing waste and improving productivity.

LEAN TECHNIQUES

5S WORKPLACE PRODUCTIVITY

5S is a Lean Production methodology that can be used by wineries to expose wasteful practices and inefficiencies, and achieve and maintain a high level of workplace organisation. It consists of 5 key steps that can be applied to any working area of a winery – from wine production and tank farms/storage through to warehousing and grape receival, administration and cellar door.

KEY STEPS OF 5S

1. **Sort** and eliminate items that are not needed
2. **Straighten** and organise all items that remain
3. **Sweep** and ensure the workplace is organised
4. **Standardise** to ensure that waste and inefficiencies are easily and consistently recognised
5. **Sustain** the previous four steps and make 5S a way of life in the business.

Each step is discussed below in further detail. Important to note is that 5S offers much more than good housekeeping and keeping things tidy – it provides the means to foster a workplace culture of efficiency, waste identification and to some extent, workplace pride. Successfully applied, 5S can deliver significant benefits to a winery, such as improved staff productivity, improved workflow and process efficiency, and a safer workplace environment.

1. SORT

The first step, Sort, essentially means to remove items from a working area that are not used or needed to conduct tasks specific to that work area. These items, even if they are causing no-harm by being there, create clutter and ultimately lead to a disorgnised work space that makes useful items harder to find. Such non-essential items may be as simple as misplaced tools or documents that belong somewhere else, to decommissioned equipment, or even random cases of wine and packaging located on the production floor rather than the warehouse or storage.

This step basically challenges us to remove from a work space the things we don't need or use, and by doing so we create a clutter-free workplace environment that results in improved productivity and safety (i.e. less risks associated with people tripping over items).

FIGURE 9: BEFORE SORTING - REMOVING UN-NEEDED ITEMS

FIGURE 10: AFTER SORTING – UN-NEEDED ITEMS REMOVED

Key steps to Sort:

1. Evaluate and (if possible) take pictures of the work area.
2. Identify and red-tag (see Figure 11 for an example) the items that are no longer needed. One must be careful with how far to take red-tagging, hence the following suggestions may be useful:
   - » Constrain the scope of the red-tagging exercise to a particular work area, and don't move outside of this area until red-tagging is complete
   - » Define a set of simple criteria for which an item will be red-tagged, e.g
     - Whether the item belongs in the work area
     - Whether the item is used on a regular/daily basis versus a weekly basis
     - Whether certain items will be used intensively in the coming month
     - Whether the item is no longer necessary.
   - » Include this criteria on the red-tag (refer to the Toolbox at the end of this Part for a Red-tag template), which can be used to explain to others as to why a particular item has been red-tagged.

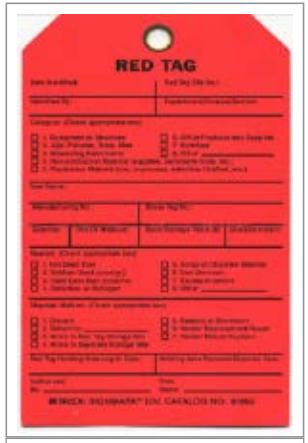


FIGURE 11: EXAMPLE OF A RED TAG

3. Decide what to do with the tagged items, such as
   - » Throw the item away,
   - » Transfer it to another area of the winery where it'll have more use,
   - » Sell it (be sure to check with senior management in the business before doing so!), or
   - » Place the item in a 'holding area' if the business is not sure whether it'll have a use in the business or whether to get rid of it.

2. STRAIGHTEN

The second step, Straighten, is about arranging remaining items in an organised and easy-to-access way, or 'a place for everything, and everything in its place'. Straighten is not necessarily about arranging items for the sake of being neat, as this approach can sometimes make accessing items and performing tasks more difficult than they need to be. Instead, Straighten is about finding the 'right' place for every item to be located, and ensuring that every item can be found in the exact place where it should be located. Done properly, the Straighten step makes items/tools easier to find and return, which in turn improves process efficiency, staff productivity and workplace morale.

Key steps to Straighten:

1. Check to confirm that the business has finished the Sort step.
2. Review the work area and get an understanding of what items (tools, equipment, supplies, information) are needed in the work area to complete the task consistently and successfully, and where they should be located in order to make the task as simple, streamlined and safe as possible. This will involve talking directly with staff responsible for conducting the task.
3. Once we have agreed to where items should be stored, the next step is to ensure that they're arranged in such a way so that they are as close as possible to the process for which they'll be used.

FIGURE 12:
A WELL STRAIGHTENED WORKSTATION

FIGURE 13: BEFORE AND AFTER STRAIGHTENING

3. SWEEP

The third step, Sweep, is essentially a daily combination of workplace tidiness, inspection and continuous improvement to ensure that each area is kept clutter-free, and areas of possible waste and inefficiency are identified. By doing Sweep, wineries will improve the workplace environment and safety for staff, ensure that each area is functioning and properly maintained, and possibly save on maintenance costs through the early detection of equipment not functioning properly.

FIGURE 14: A MANUAL FORKLIFT RETURNED TO ITS CORRECT LOCATION

Key steps to Sweep:

1. Begin by doing a thorough inspection and clean of each work area (clean the floors and windows, wipe equipment down, remove rubbish etc.). The main objective of this step is to restore each area to a desired condition that the business wants to maintain.
2. For each work area, assign a person with the responsibility for conducting a daily Sweep.
3. For each work area, set a standard checklist for cleaning and inspection, including a set timeframe for doing the daily sweep (e.g. 10 minutes).
4. Conduct a daily Sweep: have each person conduct a quick, visual inspection each day to identify and record sources of waste/contamination, suggest simple actions to rectify the situation, and assign someone the task of restoring each area to the desired condition. Doing this inspection each day will ideally reduce the need to clean as often.

FIGURE 15: A SWEEP REVEALS SEVERAL TOOLS ARE MISSING

4. STANDARDISE

The fourth step, Standardise, involves exactly that – standarising the way the workplace is organised so that any sources of waste, inefficiency and clutter are easily recognised in the future. Standardising improves efficiency and order in the work area, takes the guesswork out of key tasks, and empowers shop-floor staff to confidently complete work and make decisions without the constant need to have the winemaker or senior managers involved.

One way to Standardise is through the development of formalised procedures and checklists for key tasks associated with production – otherwise known as Standard Work documents (more detail on Standard Work is covered in Step 3 of the Lean Guide).

Examples of ways to Standardise in wineries:

Another way to think about the Standardise step is to provide 'visual' instructions and cues of what we want done, and where we'd like certain items to be placed. For example, visual instructions in a winery could include:

- Location markers for indicating where tools (e.g. shadow boards) and items should be placed on the wall or shelves of the production area
- Painting the floors to indicate where people should/shouldn't walk, or where materials should be placed prior to their use in key processes (e.g. making additions to juice fermentation)
- Painting guidance markers for trucks in grape receival, or tanker for despatch to offsite bottling
- Color coding standards
- Standardised filing/diagonal tape.

FIGURE 16:
STANDARDISED COLOUR CODED BINS

FIGURE 16:
STANDARDISED COLOUR CODED BINS

FIGURE 17: STANDARDISED
SHADOW BOARD FOR TOOLS

5. SUSTAIN

The final step, Sustain, focuses on putting in-place practices to maintain performance across the other four steps of 5S. This step is often the most difficult to achieve, because it is as much about shifting workplace culture as it is about implementing formal procedures. All staff – from senior management to the shop-floor – must be committed to continuous improvement, and held accountable to adopting 5S as part of core business. By doing so, the benefits of 5S will be realised long into the future.

Key tips to Sustain in 5S:

1. Make sure staff understand why 5S is important to business success – help them to understand the linkages between 5S and key business performance metrics in the winery operation (i.e. those related to cost, quality, safety, environmental performance etc.).
2. Ensure that 5S steps like Sweep are not too burdensome on staff e.g. have them keep their daily Sweep inspections to between 5-10minutes, and ideally have them schedule this activity at the same time, each day, every day.
3. Encourage peer-to-peer learning and idea-swapping between staff.
4. Set a goal for senior management to walk the production-floor at least once a day, to allow staff to ask questions, provide feedback or share ideas.
5. If possible, set a standard for the winery to be 'tour ready' at a moment's notice. For example if an important customer, Government Minister or another type of VIP arrives at the winery for an impromptu visit, the winery's reputation and profile would benefit from having the site clean, tidy and well-organised in advance to facilitate a site visit without concern.
6. Communicate staff success in 5S through visual aids such as noticeboards, posters, newsletters or performance reviews.

VALUE STREAM MAPPING

WHAT IS A VALUE STREAM MAP?

A **value stream** can be defined as all the steps taken – both value-adding and non value-adding – to convert grapes into a bottle or case of wine.

Value Stream Mapping (VSM) is a visual tool that can assist wineries with plotting all the activities required to receive and fulfill a request from our customer. It provides the visual means to:

- Identify causes of waste such as Overproduction, Waiting, Unnecessary Processing, Motion etc.
- Identify opportunities to reduce waste, improve flow and better balance production across equipment and labour, and
- Communicate the process, performance and characteristics of a winery's operations such that anyone across the business can understand and discuss using a common language.

The Value Stream Mapping (VSM) process consists of two types of maps:

1. Current-state VSM – describes the current performance and characteristics of the winery operation's value stream.
2. Future-state VSM – describes the future performance of the winery operation's value stream if improvements were made to the winery's production processes to smoothen flow, reduce waste and shift from a push-based production system to a pull-based production system.

WHAT DOES A CURRENT-STATE VALUE STREAM MAP LOOK LIKE FOR A WINERY?

Figure 19 provides an demonstrative example of a current-state VSM for a winery, and is followed by a brief description of the key components of the map.

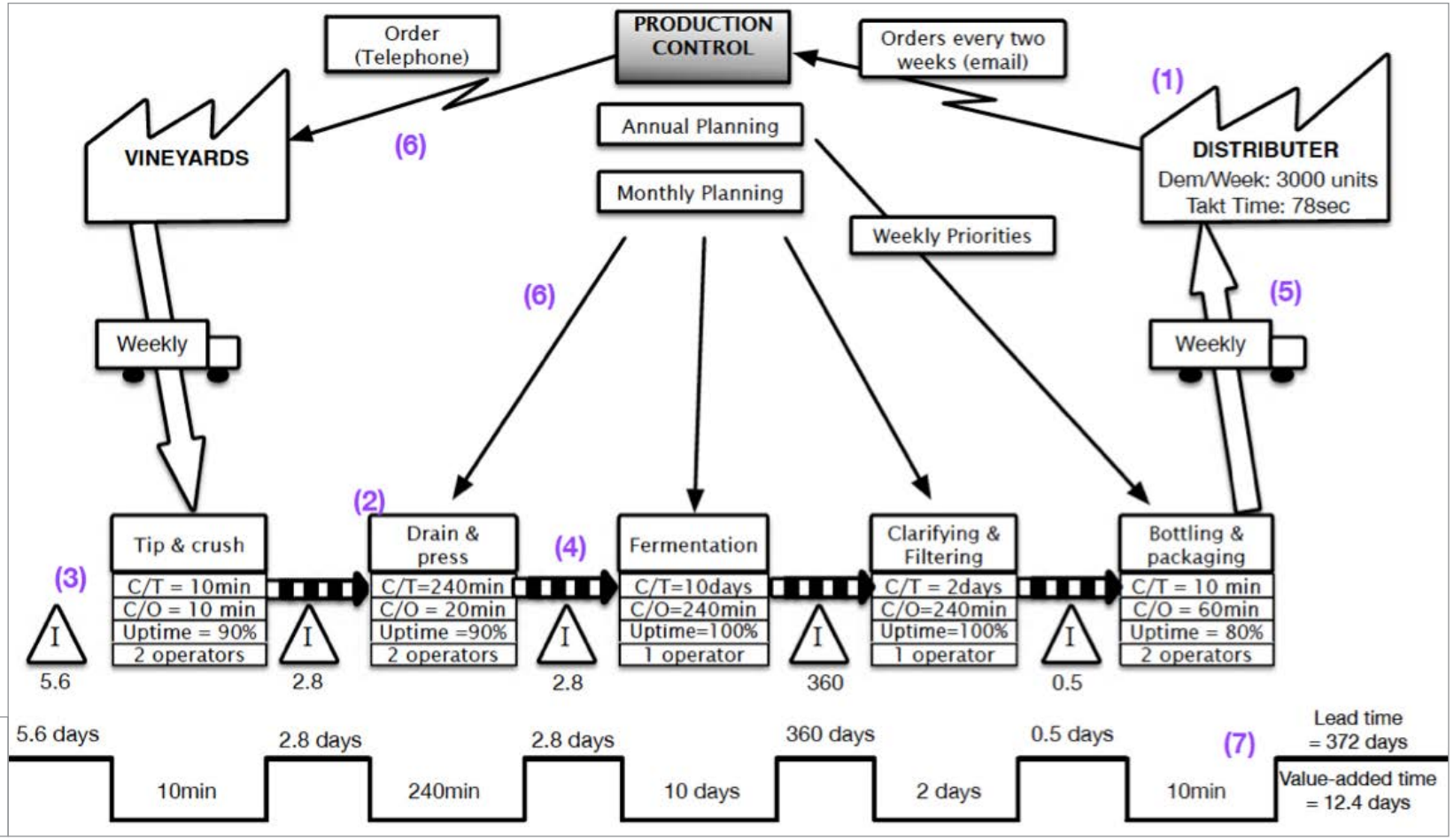
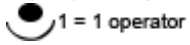
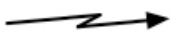


FIGURE 19:
EXAMPLE OF A CURRENT-STATE VALUE STREAM MAP FOR A WINERY

As depicted in Figure 19, drawing a current-state VSM for a winery can be done in a standard order with a pre-defined set of icons:

1. The customer (Distributer), as well as the winery's suppliers (such as Vineyards) are drawn using the factory icon. Information on the weekly production demands from the winery's clients are stated in a data box within the icon.
2. The key production processes of the winery are drawn with a process box. A process can be defined as one area of material flow; a process box ends (and other begins) wherever processes are disconnected and the material flow stops, resulting in accumulated inventory between work steps. Each process box consists of the following data for each process:
   - » **Cycle Time (C/T):** The time required between one batch of product coming off the process, and the next one coming off
   - » **Changeover Time (C/O):** The process of switching from the production of one product to another in a machine or a series of linked machines in a single process
   - » **Uptime%:** Measure of reliability of the process/equipment
   - » **# operators:** The number of people required to run the process (which can also be described using an icon i.e. 

Other information can also be included for each process if desired (such as process error rates (defects), or number of worker shifts required per process).

3. Accumulated inventory before and after each process is drawn with a triangle and the amount of inventory underneath (either in units of inventory, or days worth of inventory)
4. The 'push' movement of product from one process to the next is indicated with a striped arrow: 
5. The movement of finished goods is indicated with a broad arrow: 
6. The flow of information between the winery's production management (control) and its customers, suppliers and processes is indicated with two types of arrows:  for information flow by paper (manually), or  for electronic information flow.
7. Finally, the timeline at the bottom of the value stream map summarises two key performance metrics of production:
   - » The production lead time, which is the time taken for one batch of product (e.g. a 1/2 tonne bin of grapes) to make its way through production and into the end product to the customer (a case of wine); lead time is calculated as the sum of days worth of inventory indicated at each peak of the timeline)
   - » The value-added time (the sum of all C/T from each process).

The completed current-state VSM is then used as a baseline for identifying areas of overproduction (as well as other types of wastes), and exploring opportunities for productivity improvement through the development of a future-state VSM (discussed further in Step 4 of this Guide).

STEP 3: IMPLEMENT WASTE-ELIMINATING PRACTICES

Step 3 introduces six Lean Production techniques that the wine industry can implement within their existing operations to help or eliminate waste and non-value-adding activities:

1. **Standard work**
2. **Total Production Maintenance**
3. **Error proofing, tools, resources, steps**
4. **Fast changeovers**
5. **Visual Management**
6. **Quality and Total quality control tools**

STEP 3. IMPLEMENT WASTE-ELIMINATING PRACTICES

As we introduced in Step 1 (and further identified via Step 2), there are seven wasteful or Non Value Adding (NVA) activities that wineries can work on eliminating:

» Waste of Overproduction
» Waste of Waiting
» Waste of Transportation (Conveyance)
» Waste of Over-processing
» Waste of Inventory
» Waste of Motion
» Waste of Correction (Defects).

Step 3 introduces six Lean Production techniques that the wine industry can implement within their existing operations to help or eliminate these NVA activities:

1. Standard work
2. Total Production Maintenance
3. Error proofing, tools, resources, steps
4. Fast changeovers
5. Visual Management
6. Quality and Total quality control tools

LEAN TECHNIQUES

STANDARD WORK

STANDARD WORK CAN BE USED TO REDUCE THESE TYPES OF WASTE:	
Waste of overproduction	Waste of inventory
Waste of waiting	Waste of motion
Waste of transportation (conveyance)	Waste of correction (defects)
Waste of over processing	

Standard Work basically means developing and complying with a 'standard' at which the work should be undertaken. Another way of thinking about this is that 'work' will be undertaken to a certain '**standard**'. Wineries stand to benefit from standard work through:

» Reduced costs
» Waste elimination
» Stabilised workflow
» Increased productivity
» Simplifying processes for existing and new staff

Creating 'standard work' is not difficult to implement, just so long as two key objectives are met:

a) A standard is developed for the work
b) Staff and processes comply with the standard.

Creating standard work requires three components:
1. A work rate (Takt time)
2. A work sequence
3. Adequate resources for a smooth workflow (i.e. avoiding stops and starts).

Before a standard is implemented, it needs to be identified, confirmed as reasonable and fair by all involved in the process, needs to be understood and needs commitment by the organisation to maintain this standard. Once this standard work has been implemented, it is important to continuously monitor its effectiveness and incrementally improve on this standard.

STANDARD WORK PREREQUISITES

There are some pre-requisites for creating standard work:

1. A stable process: Standard work requires a stable process. By stable process we are referring to stable material, equipment and workforce. In the wine industry, seasonal and grape variety variations do have an impact on the volume of work, but not the stability of the process. Wine manufacture follows a standard pattern despite these minor variations.
2. Leadership prerequisites: Standardised work requires that four leadership prerequisites be met before standard work can be implemented.
   - » The organisation needs to adopt a blame free culture. This doesn't mean being accountability-free, but it does mean suspending all judgement and focusing on problems with the process, before looking at the person. Creating an environment where staff feel empowered to make decisions and are confident to contribute to the working environment is key for implementing standard work.
   - » The organisation requires a commitment to continuous improvement. This needs to be led from the highest level of leadership.
   - » Leaders need to be out on the floor to understand how the business is performing. The use of visual management controls can help leaders understand business performance.
   - » Leaders and staff need to quickly respond to issues and not be delayed in raising these issues.

Undertaking these leadership styles ensures standard work has the most chance of succeeding and reducing wastes within a winery.

TYPES OF STANDARDISED WORK

There are 3 main classes of standard work

Type 1 – Repetitive single cycle processes

Type 2 – Short but variable cycles

Type 3 – Long cycle standard work

The repetitive single cycle process work of a **Type 1** standard work may involve an operator or robot packing at a bottling line. The short but variable cycles of **Type 2** work may include large components of vintage production (crushing, pumping, filtering, etc). **Type 3** the long cycle standard work may include the yearly cycle of work that needs to be undertaken from vintage to vintage.

Understanding the type of standardised work helps select the appropriate metrics work rate (Takt time), work sequence, and adequate resources for a smooth workflow.

EXAMPLE 1

For a bottling line, a **Type 1** activity, the standard may include:

1. Bottles per minute
2. A simple pictorial image for the sequence of the work
3. Ensuring materials (bottles, wine, boxes, etc) are available to undertake the task (and reducing waiting time)

EXAMPLE 2

For a full vintage, a **Type 3** activity, the standard may include:

1. Production rate averaged per year
2. A higher level guide for the wine making process
3. Full site inventory management

TOOLS FOR STANDARDISED WORK

There are five main tools for developing standardised work. These are:

1. **Time Observation** record (Figure 21)
2. **Equipment process capacity** table (Figure 22)
3. Standardised **work/walk combination** sheet (Figure 23)
4. Standardised **work map** (Figure 24)
5. Standardised **Work Instruction** Sheet (Figure 25)

These tools rely on each other and the end goal is producing a standardised **Work Instruction Sheet**. This sheet forms part of a visual management tool that can help both operators and leaders maximise process efficiencies and eliminate waste. More details on visual management can be found later in this step.

The relationship between these five tools is provided in Figure 20. This shows that the time observation sheet provides data for both the '**work/walk combination**' sheet and the 'equipment process capacity' sheet. These two sheets with the '**work map**' make up the '**work instruction sheet**'.

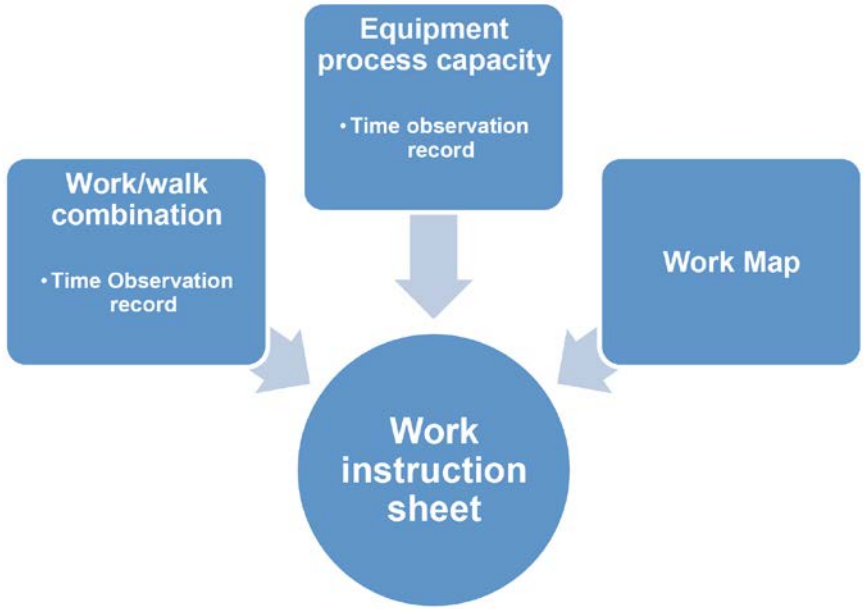


FIGURE 20: RELATIONSHIP BETWEEN STANDARD TOOLS

TIME OBSERVATION RECORD

Capturing process time is critical. This time forms the basis for the standard work and so needs to be accurate. To help ensure cycle times are accurate, a simple record can be created and used in subsequent tools. This record can also be used to compare process speeds before improvements and after improvements.

A time observation record does not need to be complicated, just enough to record useful data for analysis. An example of a Time Observation Record has been included in Figure 21. There are two key factors to learn from this table. 1) What is the lowest cycling time and 2) What is the average cycling time. Any change to the process needs to decrease the total cycle time. There are the questions needed for continuous improvement. What are the differences between the average and lowest cycle time? What was done differently in the lowest cycle time? Can it be done again?

Time Observation Record

Process: Manually boxing wine — Observer: Bob

Step #	Work step		1	2	3	4	5	6	7	8	9	10	Average Cycle Time	Lowest Cycle Time
1	Open box	Elapsed Time	0:06	0:03	0:03	0:08	0:03	0:03	0:03	0:04	0:03	0:03	0:03	0:03
2	Fill box with Insert	Elapsed Time	0:02	0:03	0:02	0:08	0:02	0:03	0:02	0:08	0:02	0:03	0:03	0:02
3	Load box with wine	Elapsed Time	0:08	0:09	0:08	0:12	0:14	0:08	0:09	0:08	0:12	0:14	0:10	0:08
4	Tape box closed	Elapsed Time	0:03	0:07	0:09	0:03	0:09	0:03	0:04	0:03	0:07	0:04	0:05	0:03
5	Stack box onto pallet	Elapsed Time	0:03	0:07	0:09	0:03	0:09	0:03	0:04	0:03	0:07	0:04	0:05	0:03
	Time for 1 Cycle		**0:22**	**0:29**	**0:31**	**0:34**	**0:37**	**0:20**	**0:22**	**0:26**	**0:31**	**0:28**	**0:28**	**0:20**

FIGURE 21 : TIME OBSERVATION SHEET

TIME OBSERVATION RECORD

The times needed for an operator boxing wine have been recorded for ten repetitions. This produces an average and lowest value obtainable. The objective is to find what the operator did during the lowest value times and make this the standard practice. This decreases the average time.

EQUIPMENT PROCESS CAPACITY TABLE

A critical component to standard work is to understand the capacity of equipment linked to a process. This helps to calculate the true process capacity, identify bottlenecks and where possible and improve the capacity. Once the **time observation** record (Figure 21) has recorded down critical times, an equipment **process capacity** sheet (Figure 22) can be generated. This capacity table records both the equipment time and direct operation interaction **excluding** walk time.

Equipment Process Capacity Table

Process Name	Part Number	Customer Demand (shift)	Prepared By
Manually boxing wine (12 bottles)	Standard 12 x 750ml Bottle into 12 bottle box	4,545	Bob
		Net Operating Time In sec: 27,000	Date: 16-Jul-14
		Seconds per part: 5.94	

			Basic Time in sec			Tool Change Time in sec			Summary in sec	
#	Operation Name	Machine Name	Manual Time A	Auto Time B	Machine CT C = A+B	Change Time D	Pcs per Change E	Time per Piece F = D/E	Total Time per Piece G = C+F	Process Capacity H = I / G
1	Load empty bottles	Bottle hopper	1	2	3					9000
2	Bottle air clean	Air cleaner	0	3	3					9000
3	Bottle fill	Bottle filler	0	5	5					5400
4	Capping	Bottle capper	0	3	3					9000
5	Labelling	Bottle Labelling	0	3	3					9000
6	Packaging open box	Manual	3	0	3					9000
7	Packaging place insert	Manual	3	0	3					9000
8	Packaging bottles (individual)	Manual	0.84	0	0.84					32143
9	Closing box	Box sealer	2	4	6					4500
10	Stacking pallets	Manual	5	0	5					5400
		Total:	14.84	20					Max Output	4500

FIGURE 22: EXAMPLE OF AN EQUIPMENT PROCESS CAPACITY TABLE

PROCESS CAPACITY TABLE

From the above example:

- The orders needed to fulfill customer requirements (100,000 bottles per month or 4,545 bottles per shift)
- The time per shift (7.5 hours or 27,000 seconds)
- The equipment and manual time to process one bottle.

The maximum output of the process is 4500. This is 45 bottles less than the customer requirements. From this it can be seen manually packaging bottles is the bottleneck and needs improvement to fulfill customer requirements.

STANDARD WORK/WALK COMBINATION SHEET

A standard work combination table (Figure 23) combines manual work time, walk time and machine processing time for one operator in a task. This provides an overview on the exact time required for a process and this can be represented graphically. Once this standard work combination sheet has been created, it allows the work to be re-combined to maximise efficiencies.

This standard work combination table provides a visual management guide so operators understand how long a process should take, and what the steps are in the work flow. This also provides a visual management aid to leaders to ensure the process is being undertaken appropriately by operators.

Standard Work/Walk Combination Sheet

Process Name	Part Number	Customer Demand	Takt Time in sec
Manually boxing wine (12 bottles per box)	Standard 12 x 750ml Bottle into 12 bottle box	380	71
Prepared By		**Net Operating Time in sec**	**Date**
Bob		27,000	16-Jul-14

Walking
Manual
Automatic
Waiting

	Work Sequence	Basic Time		
	Operation	Man	Auto	Walk
1	Open box	3		2
2	Packaging place insert	3		
3	Packaging bottles (12)	10		1
4	Closing box	2	4	2
5	Stacking pallets	3		2
6				
		21		7
	Sum of Man CT	28		

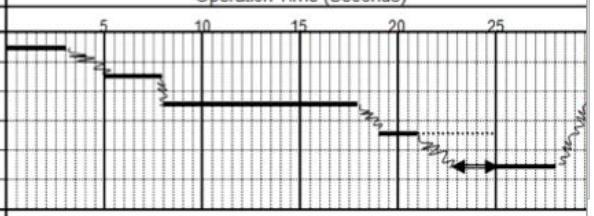


FIGURE 23: STANDARDISED WORK/WALK COMBINATION TABLE

STANDARD WORK MAP

A standard work map (Figure 24) shows operator movement and material location in relation to machinery and the process layout. The form needs to show the four components that make up the standardised work. These are:

1. takt time
2. cycle time
3. sequence of the work
4. required standard Work In Process (WIP) stock

These standard work charts need to be displayed at workstations as a visual tool to provides a guide for the most economical way to undertake a task. As with the process capacity tables, it is important these standard work charts are continuously reviewed and updated as the condition of the worksite change and improve. This review provides an opportunity to check work process for efficiencies, and provide a visual aid to leaders to ensure the task is performed according to the standard.

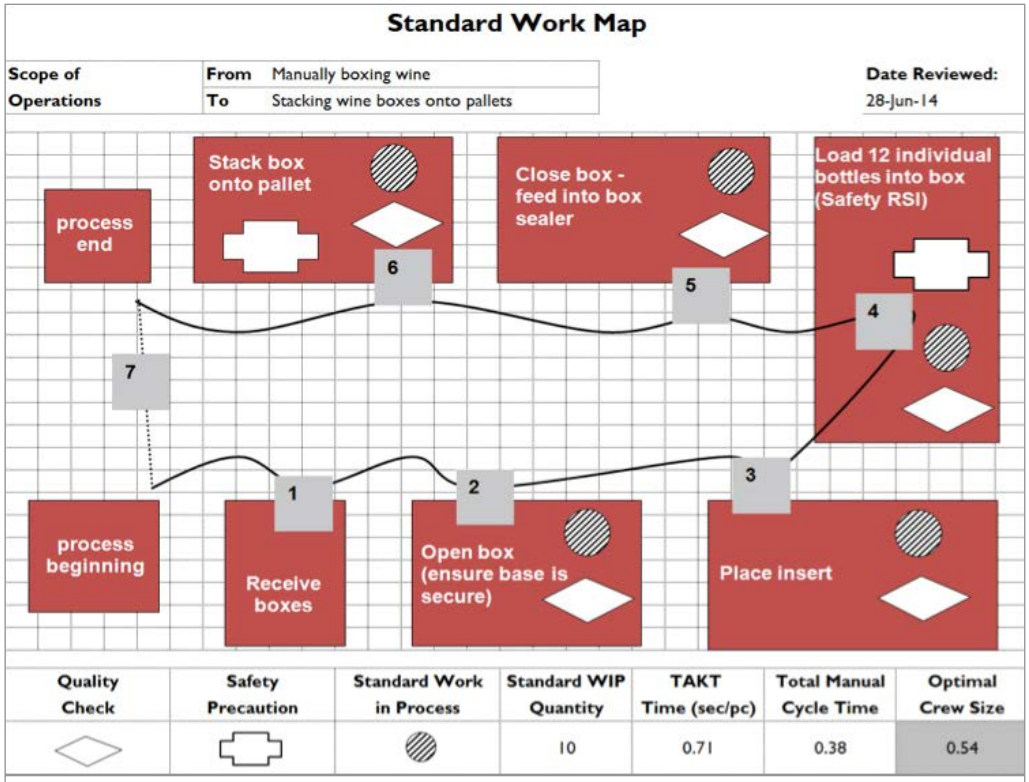


FIGURE 24: STANDARD WORK MAP FOR BOXING WINE

STANDARD WORK INSTRUCTION SHEET

As mentioned earlier, these above three sheets are summarised into a single Standard Work Instruction Sheet (Figure 25). This single sheet provides the best visual management tool for both operators and leaders to ensure the process is being undertaken to standard, and as a source for continuous improvement.

The Standard Work Instruction Sheet provides a one-stop-shop for both operators to understand the process, and leaders to ensure the process is being followed. It also provides an opportunity for all staff to improve the current work flow and increase efficiency.

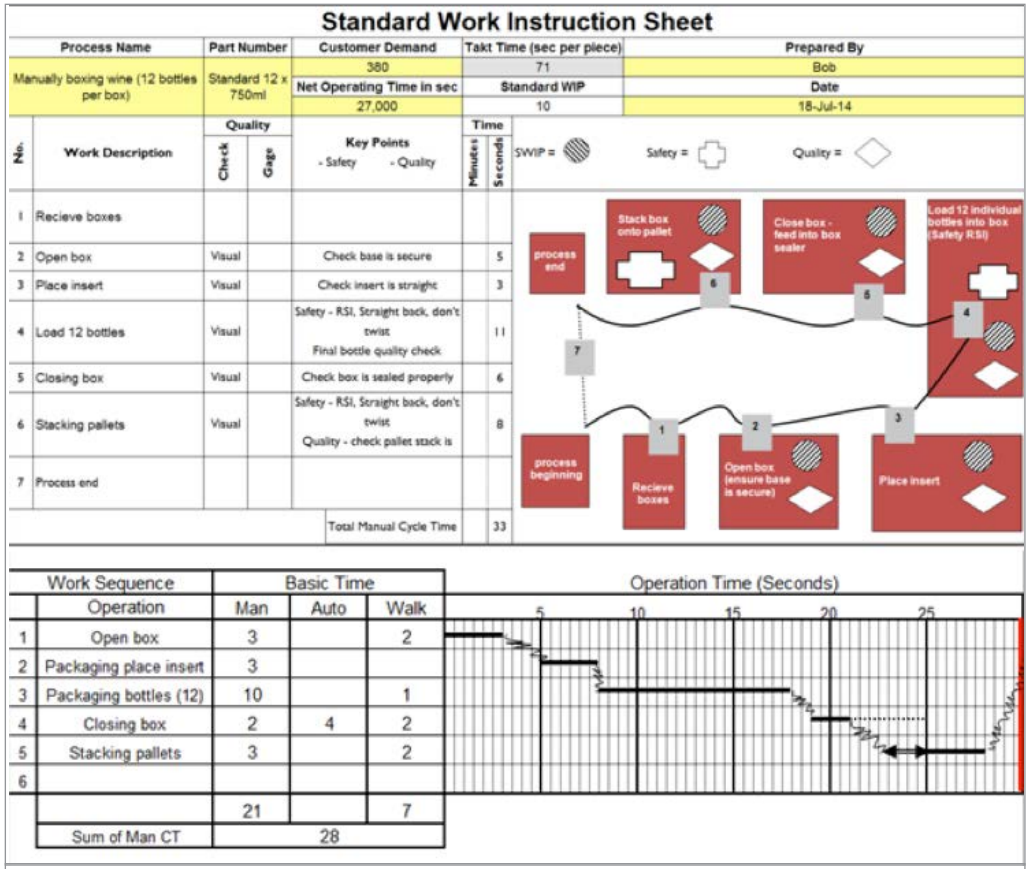
There are two additional terms that need to be understood to make full use of the Standard Work Instruction Sheet. These are WIP Stock and WIP Calculations.

WORK IN PROCESS STOCK (WIP STOCK)

WIP stock is important for ensuring the task has at least the minimum amount of resources to ensure the work process flows smoothly. This means production lines do not stop due to lack of materials. The objective is to ensure the line is always running.

EXAMPLE 1

Having a supply of empty bottles loaded into the bottling line provides stock. This means the production line won't stop because more bottles need to be loaded. Now think of the reverse situation: The process line stops, an operator fills the hopper, the process starts again until it runs out of bottles. How much production time does this waste?



Standard Work Instruction Sheet

Process Name	Part Number	Customer Demand	Takt Time (sec per piece)	Prepared By
Manually boxing wine (12 bottles per box)	Standard 12 x 750ml	380	71	Bob
		Net Operating Time in sec	Standard WIP	Date
		27,000	10	18-Jul-14

No.	Work Description	Quality: Check	Quality: Gage	Key Points - Safety - Quality	Time: Minutes	Time: Seconds
1	Recieve boxes					
2	Open box	Visual		Check base is secure		5
3	Place insert	Visual		Check insert is straight		3
4	Load 12 bottles	Visual		Safety - RSI, Straight back, don't twist Final bottle quality check		11
5	Closing box	Visual		Check box is sealed properly		6
6	Stacking pallets	Visual		Safety - RSI, Straight back, don't twist Quality - check pallet stack is		8
7	Process end					
				Total Manual Cycle Time		33

SWIP = Safety = Quality =

Work Sequence		Basic Time		
	Operation	Man	Auto	Walk
1	Open box	3		2
2	Packaging place insert	3		
3	Packaging bottles (12)	10		1
4	Closing box	2	4	2
5	Stacking pallets	3		2
6				
		21		7
	Sum of Man CT	28		

FIGURE 25: STANDARD WORK INSTRUCTION SHEET

WORK IN PROCESS CALCULATION

As mentioned earlier, part of a 'standard' workflow includes 3 core elements

1. Takt time (or rate)
2. A work sequence
3. Required standard Work In Process (WIP) stock

The basic Work In Process (WIPC) Calculation follows the following calculation:

$$\text{Work in Process} = \frac{\text{Manual cycle time} + \text{Automatic cycle time}}{\text{Takt time}}$$

EXAMPLE 1

Assume a task involves loading 12 bottles into a box, then the box being automatically sealed. The operator takes 20 seconds to fill the box and the box sealer takes 10 seconds to seal the box and deliver to the next area. The total time take for this cycle is 30 seconds. If the takt time is close to 30 seconds, then the Work in Process Calculation will be 1.

In the Standard Work examples, the WIPC = 1. This indicates the cycle time is matched to the require production rate (or takt time) from the customer. Keep in mind that 'customer' in this example may include the next step in the production line.

If the WIPC was greater than 1, this would indicate that this process is a bottleneck and not producing goods at a rate fast enough for the next customer. This may require additional staff to decrease the manual cycle to keep up with demand, or a full review of the standard work to reduce cycle times.

If the WIPC was less than one, this would indicate that the process is operating at a rate faster than the required rate. This too can be problematic as it then requires storage of goods while the next process catches up to the backlog. Imagine a bottling line where the final finished bottle boxing step is not operating fast enough. This would require the full bottling line to stop while the boxing step catches up.

As can be seen, for a smooth process flow, the ideal WIPC should be close to 1.

TOTAL PRODUCTIVE MAINTENANCE (TPM)

TPM can be used to reduce these types of waste:

- Waste of waiting
- Waste of inventory
- Waste of transportation (conveyance)
- Waste of motion

Total productive maintenance (TPM) is a set of techniques to ensure that machines in a production process are always able to perform their required tasks. This technique involves getting all staff involved in maximising equipment running time. TPM is more than just keeping a good maintenance schedule, but another way of looking at increasing process efficiencies and minimising waste and downtime. The simple rule for TPM is that it refuses to accept that machines will inevitably fail.

The main goal of TPM is to enhance the volume of the production, employee morale and job satisfaction.

BENEFITS OF TPM

There are five main benefits that wineries can gain from TPM:

- A reduction in the total life-cycle costs of equipment
- Operators become equipment maintainers
- Maintainers become improvers
- It is a reminder that equipment should not fail
- It reduces downtime and waste.

TMP consists of five elements for total productive maintenance:

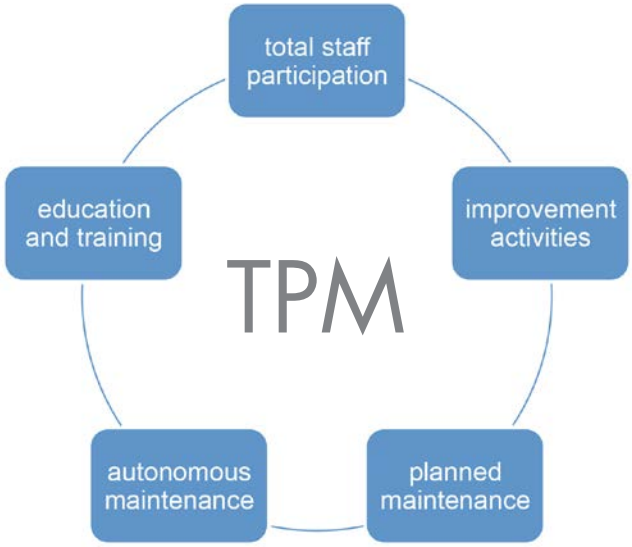


FIGURE 26 : TPM ELEMENTS

The main component of TPM is total staff participation. Total staff participation means maintenance doesn't fall down to just maintenance personnel, but also line managers, engineers, wine makers, quality staff and most importantly, operation staff. This doesn't mean maintenance personnel are no longer required – their expert skills more towards an **improvement role**. TPM means staff take greater ownership for equipment maintenance.

EXAMPLE 1

An operator begins work and notices the pump they are using is leaking. The operator is busy and the leaking pump is an inconvenience that can be fixed by getting a new pump from storage and ignoring the leaking pump. Total participation would involve the operator examining the pump and rectifying the issue. This may involve the operator tightening a seal or replacing a washer if the problem is an easy fix. If the operator cannot rectify the issue, the operator would take ownership to find someone with the skills to fix the problem AND learn where possible so they can fix the problem if it happens again.

This increase in **education and on the job training** is beneficial for the both developing and retaining good staff. In this example, the focus shifts from 'not my problem – this is why we have maintenance' to 'I will do what I can to fix the issue'. The onus is on all staff to take ownership of equipment and treat it as their own.

Operators have a particularly important role in this system as they are constantly using the equipment. Operators tend to know when equipment isn't running quite right. It may be making a new noise, running slightly slower, or getting hot. Any small deviation from the norm is more likely to be picked up by an operator well before a maintenance teams discover the problem. As with any situation, early intervention can prevent catastrophic failure, excessive downtime. Ideally, **planned maintenance** would prevent a situation from reaching this level and hopefully now that maintenance staff have more time, this can be carried out more effectively.

Total staff participation is not only about fixing breakdowns, but also about simple systems like ensuring areas are correctly lubricated, and basic housekeeping and cleaning. This system is also known as Autonomous Maintenance.

The benefits for this are numerous, but more commonly, operators fixing problems results in lower downtime, higher levels of maintenance, and more efficient processes.

ERROR PROOFING

Error proofing can be used to reduce these types of waste:

- Waste of overproduction
- Waste of inventory
- Waste of waiting
- Waste of motion
- Waste of transportation (conveyance)
- Waste of correction (defects)
- Waste of over processing

Error-proofing refers to the implementation of fail-safe mechanisms to prevent a process from producing defects or other problems. The idea behind error proofing is even very small numbers of defects are not acceptable. The only way to achieve this goal is to prevent mistakes from happening in the first place.

Error-proofing becomes a method of inspection at the source instead of down the line at final product quality control. By the time an error is detected in the final product, many resources have already been wasted in creating a final, but unacceptable product. Achieving high levels of process capability requires this type of focus on prevention rather than detection.

Everyday examples

There are lots of examples from everyday life for error-proofing devices

- Plugging a cord into a power point
- Most computer cables
- Automatic stop when you open a microwave door
- Childproof caps on medicine bottles
- Different nozzles on petrol and diesel pumps
- Not being able to start an automatic car out of 'park'

They are everywhere! They stop people from making careless mistakes and more importantly, protect people, processes, equipment, quality, and reduce waste.

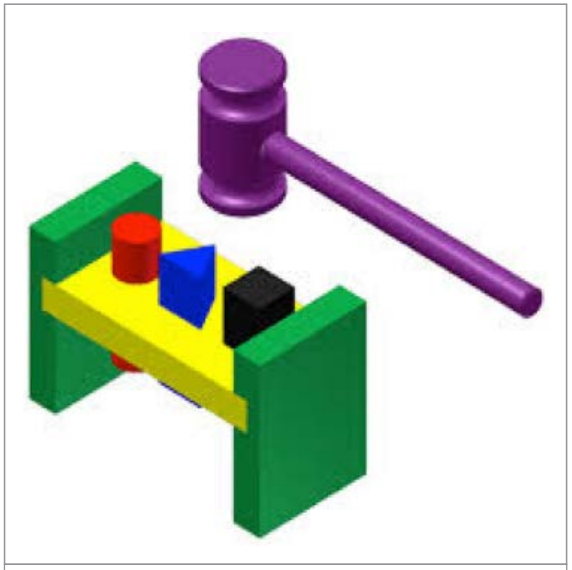


FIGURE 27:
ERROR PROOFING: ONLY THE CORRECT SHAPES WILL GO INTO THE CORRECT HOLES

Examples in wineries

- Optical checking for wine levels in a bottle
- Bar code readers to track batches
- 'Lock outs' that prevent equipment being activated if conditions are not correct
- Hose connections to ensure only the correct medium is transported (e.g. gas, water, wine, etc)

EXAMPLE

A new winemaker did not close the rotating fermenter door properly. As a result, 6 tonnes of grapes were dropped on the floor. Error proofing may have included an interlock on the door to prevent fermenter rotation = unless the door was closed properly, or the door could have been constructed so that it automatically locked if rotation occurred.

When choosing to error proof, is it important to identify if this will be necessary. Not all processes can or need to be error-proofed. A three-step analysis of the risks can help both identify the need for a) error proofing and b) the form of the error proofing. These three steps are:

1. identification of the need
2. identification of possible mistakes
3. management of mistakes before satisfying the need.

Undertaking these three steps allows methods to be used to identify the need and the control for a situation.

Error proofing needs to be related to the magnitude of the risk. For example, connecting a pump the wrong-way-round is unlikely to cause any issues – the wine wont pump, but time will be lost by needing to reconnect the pump the correct way.

Connecting a red wine pump to a white wine tank however can cost hundreds of thousands of dollars in both lost material and disposal costs. Both of these systems need controls, but the consequence for one outweighs the other.

FAST CHANGEOVERS

Fast changeovers can be used to reduce these types of waste:

- Waste of waiting
- Waste of inventory
- Waste of transportation (conveyance)
- Waste of motion

FIGURE 28: A VERY FAST FORMULA 1 CHANGEOVER

A fast changeover is the process of converting a line, machine or tank from running one product to another. Changeover times can last from a few minutes to as much as several weeks depending on the process.

The purpose for reducing changeover time is not to increase production capacity, but to allow for more frequent changeovers. This increases production flexibility.

BENEFITS OF FAST CHANGEOVERS

The benefits for fast changeovers include:

1. A reduction of lead time. This means goods can be created (i.e. wine transferred from tank to a finished bottle) in a short amount of time when an order is placed by the customer. This is in contrast to having a large inventory of boxed finished wine in anticipation of a customer order.
2. Reduced lot sizes. If the changeover is fast, a winery can switch from one product to another with little time loss. If the changeover is long, a business is more likely to change products only once every few days. This can be a challenge when customers want different varieties and not high volumes of one stock.
3. Fast changeovers increase flexibility. A dynamic winery can deal with changes more rapidly than a static winery. This can lead to significant increases in performance.
4. Fast changeover greatly reduces inventory. Products are only created on demand and so inventory is low. This significantly reduces inventory costs and increases cash flow.
5. Quick changeover increases production flow leveling. Processes are more constant and less interrupted.

STEPS TO ENSURE FAST CHANGEOVERS

1. Machines cannot be idle
2. The best setup time is no setup time
3. Tools needed for changeover are ready to be used
4. Sufficient staff are available to minimise changeover time
5. A shared goal for all team members is reducing setup time
6. If possible and safe, start changeover while equipment is still active (i.e. prepare tools, parts etc ready for changeover while line is running). This is also known as an external setup.

The following are general guidelines that can improve changeover time:

» **Identify internal setups** – these are steps that are undertaken when a machine has stopped (e.g. physically changing a hose connection). Where possible, try and convert these to external setups or reduce the time that equipment will be idle (e.g. get the next hose connection ready for changeover so the only internal step is changing a coupling).

» **Eliminate non-essential operations** – this may include only changing one side of a guard rail instead or replacing the guard rail altogether.

» **Perform the external setup ready for changeover** – this may include getting tools, guides, and staff ready for changeover and ensuring all equipment is present and ready.

» **Simplify the internal setup** - this may mean changing screw connectors to clamps or quick grips systems.

» **Measure** – The only way to understand if a change in process has decreased or increased the setup time is to measure the new process.

VISUAL MANAGEMENT

Visual management can be used to reduce these types of waste:

- Waste of overproduction
- Waste of inventory
- Waste of waiting
- Waste of motion
- Waste of transportation (conveyance)
- Waste of correction (defects)
- Waste of over processing

Visual management is a broad concept that relies on that fact that people generally understand conditions better when they are represented visually. Simple information representation is more likely to be understood by staff than complicated information.

FIGURE 29: COCKPIT SPACE SHUTTLE ATLANTIS - PUSH THE BUTTON

For example, put someone in a room with 1 button and 1 red light. Give them the instructions to push the button when the red light turns on. This is fairly simple and requires very little instruction. Now, put someone in the cockpit of the space shuttle Atlantis.
Ask them to fire thrusters to correct orbit for re-entry trajectory. A few questions come to mind. Which button is that? How do I know what my current orbit is? When do I stop? How do I wake up from this nightmare?

For a trained astronaut, this process may be relatively simple, but this takes years of training. Visual management removes the clutter and helps people make clear decisions on the steps needed for the situation on hand.

KEY BENEFITS OF VISUAL MANAGEMENT

The key benefits to visual management include:

- Highlighting critical information in ways that cannot be ignored.
- Help expose, prevent and eliminate waste.
- Prevent information overload so employees can see their results.
- Significantly reduce the time needed to understand information.
- Increase a company's profitability.

FIGURE 30: INFORMATION OVERLOAD - I'LL TAKE THE BUS!

Many of the standard tools are visual management guides. These are presented for the purpose of visually guiding an operator's work flow and time to perform tasks. It is also a visual tool to allow leaders to ensure work is being performed to standard and to look for ways to improve the process. As mentioned above, visual management may be as simple as a red light which lets an operator know when to act. It is important not to overexpose staff to visual management tools, otherwise we can get lost in the information again. Too much information is just as bad as too little.

Examples of visual management may also include tools like shadow boards which indicate where a tool is located and if a tool is missing. The main objective of visual management is to clarify information to allow then to work efficiently.

VISUAL MANAGEMENT EXAMPLES

Which tools are missing in the below pictures?

FIGURE 31: CLUTTERED TOOL BOX

FIGURE 32: CLEAR SIGNALS

Using the examples in Figure 33 and Figure 34, where would you prefer to look for a stored good?

FIGURE 33: VISUALLY MANAGED CLEAN WORKSHOP

FIGURE 34: A MESS

FIGURE 35: VISUAL SIGNAL (& PHYSICAL BARRIER) TO NOTIFY PEOPLE IT'S NOT SAFE TO CROSS

Using Figure 35, do you know if it is safe to cross this roadway?

As can be seen in the above examples, visual management goes hand in hand with other Lean Production techniques such as 5S. Visual workflows can help maintain and improve 5S performance.

There are no hard and fast rules for visual workflows, only that they are there to provide staff with the information they need to undertake their work.

QUALITY CONTROL TOOLS

Quality control can be used to reduce these types of waste:

- Waste of overproduction
- Waste of inventory
- Waste of waiting
- Waste of motion
- Waste of transportation (conveyance)
- Waste of correction (defects)
- Waste of over processing

In this context, quality is about delivering products that customers will purchase at an optimum cost effectiveness. Quality is more than just inspecting goods at the end of a production line, but is the sum of tasks throughout a process which leads to quality. In the pursuit of quality, an organisation needs commit to continuous improvement. Quality throughout an organisation decreases costs as no rework needs to be undertaken. When quality is applied through all aspects of an organisation, it may also be referred to as Total Quality Management (TQM).

Data can be captured throughout the wine making process to deliver important information as to how the winery is performing. To a large extent, the chemical changes within a winery are usually captured through the laboratory or via remote testing. Other areas of a winery may require additional data to be recorded such as the number of barrels washed per day, the number of breakdowns per month, etc. An important step in quality is capturing this data so it can be measured, managed, and visually communicated for all to see.

GRAPHS

Graphs are important as they provide a visual display comparing given values that can be interpreted at a glance. For example, a yearly profit graph or even a production graph can quickly provide valuable information. Refer to Figure 36 : Graph of wine stock on hand.

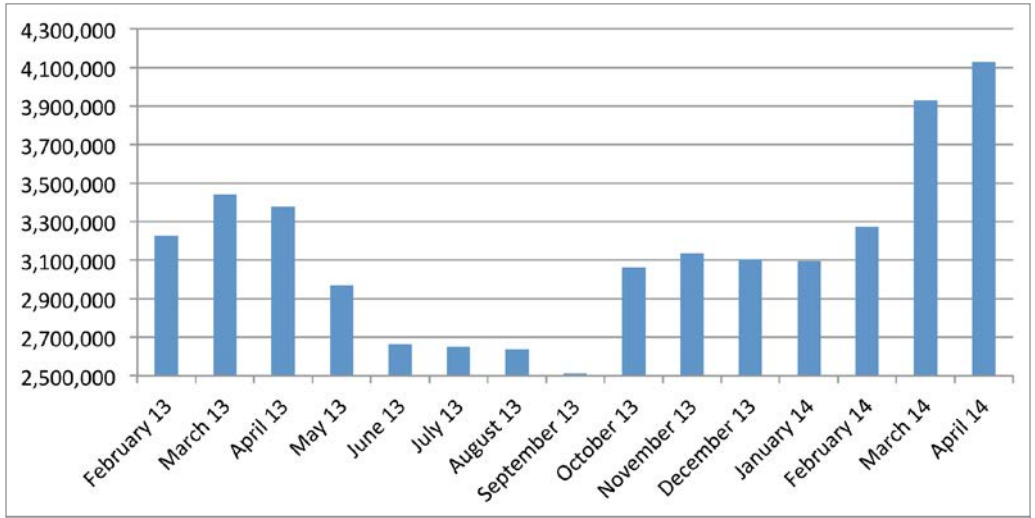


FIGURE 36 : GRAPH OF WINE STOCK ON HAND

Checklists

Checklists are a simple way to arrange data for easy entry and reviewing. They can prompt an operator to undertake a task or provide a quick visual check to leaders to ensure steps have been undertaken. An important step is that checklists remain useful and are used properly – far too often checklists are created that form no real purpose and the sheets become a 'tick and flick' exercise that becomes a Non-Value Adding Activity (NVA). This is where total staff participation becomes important. Refer to Figure 37: Forklift pre-use checklist.

FORKLIFT PRE-USE CHECKLIST

Daily Lift Truck Inspection Checklist

Operator's Name:	**Date:**
Operator's Signature:	**Type:**
Lift Truck Number:	**Hour Meter:**

OPERATOR MUST COMPLETE CHECKLIST AT START OF SHIFT

Maintain in files

Check each of the areas that pertain to your lift truck

Visual Checks	OK	Service Date	N/A	Operations Checks	OK	Service Date	N/A
Tire Condition				Horn			
Head/Tail Lights				Steering			
Warning Lights				Service Brake			
Fluid Levels/Battery				Hydraulic Controls			
Battery Plug Condition				Hose Reel			
Battery Indicator				Engine			
Seatbelts				Mast			
Forks				Attachment			
Mirrors							
Overhead Guard							
Other Gauges							
Fluid Leaks							

FIGURE 37: FORKLIFT PRE-USE CHECKLISTHAND

Fishbone diagram

Fishbone diagrams are used to understand cause and effect. They also classify causes so it becomes possible to understand how this would lead to an effect.

The six classifications are:

- Equipment
- Process
- People
- Materials
- Environment
- Management

An example of a fishbone diagram is present in Figure 38.

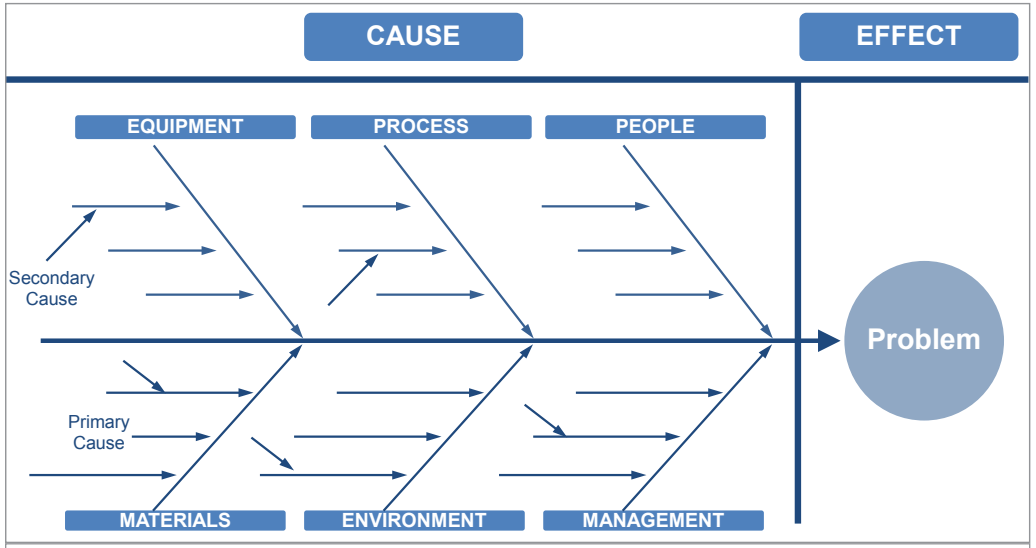


FIGURE 38: FISHBONE DIAGRAM

Scatter plot

Scatter plots compare two variable data sources. In the below example, a scatter plot has been used to compare the scrap generated with the line speed. The scatter plot takes one additional step by comparing two production lines.

Histogram

A histogram provides a count or frequency for a given measured parameter. This provides data including the variation of results or batches. In the graph below the variation of titratable acidity (TA) in barrel stock is demonstrated.

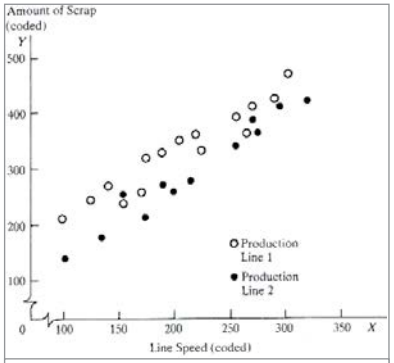


FIGURE 39: SCATTER PLOT

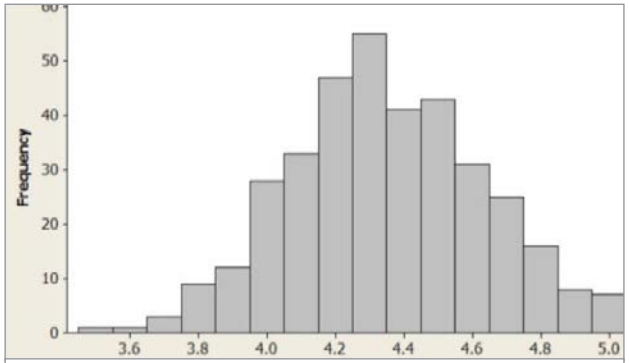


FIGURE 40: HISTOGRAM OF TITRATABLE ACIDITY

Control chart

One of the most important tools for wineries is a control chart. A control chart lets an operator know both the current value, and if this is within control limits. This provides a valuable visual tool to maintain a constant quality of work, and more importantly, identify errors in the system.

As with any control system, it is important that the team reacts when these quality parameters are outside of specification.

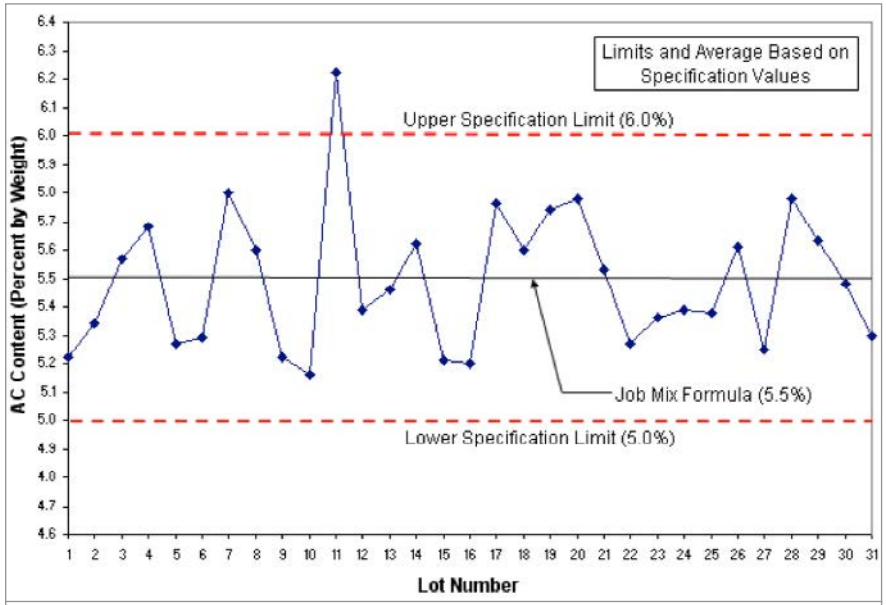


FIGURE 41: CONTROL CHART FOR QUALITY PARAMETER

STEP 4: RE-THINKING PRODUCTION FLOW

In Step 4, we will introduce a more challenging set of techniques that, if used appropriately, can shift the production model towards one that is pull-based, where the winery is only producing wine at the pace that the customer demands it. These techniques are:

1. **Producing to Takt Time**
2. **Supermarkets and production signalling**
3. **Controlling the 'pacemaker' process**
4. **Leveling production**
5. **Future-state Value Stream Mapping**

STEP 4. RE-THINKING PRODUCTION FLOW

The ultimate objective of Lean Production is to provide maximum value to the customer with zero waste. In previous Steps of the Lean Guide, a variety of relatively simple concepts, techniques, practices and tools were covered that assist with identifying and eliminating waste within the existing "batch-and-push" production model that is inherent in the winemaking process. In Step 4, we will introduce a more challenging set of techniques that, if used appropriately, can shift the production model towards one that is pull-based, where the winery is only producing wine at the pace that the customer demands it. Specifically, the techniques covered in this Step include:

- Producing to Takt Time
- Supermarkets and production signalling
- Controlling the 'pacemaker' process
- Leveling production
- Future-state Value Stream Mapping

It must be noted that there are some inherent characteristics of wine production that can make the introduction of pull-based production systems very challenging, and in some cases impossible. Some of these characteristics include:

- The fact that vintage only happens for a few months of the year, meaning that supply of grapes occurs in batches (creating Waste of Overproduction)
- Many wine variants require a period of maturation before final filtration and bottling/packaging, which disrupts the continuous flow of wine production from grape to bottle and leads to big inventories
- Transport of finished wine can only happen in batches, due to the distance from the winery (regional) to distributors and end-customers (typically metropolitan).

Hence for some wineries, the techniques described in Part 4 may not be considered suitable. Having said this, wineries can still benefit from investigating and hypothesising how they may apply – the investigation process alone usually yields opportunities for improvement. In particular, wineries with significant bottling and packaging facilities will tend to get the most out of these techniques.

LEAN TECHNIQUES

PRODUCING TO TAKT TIME

In Step 1 of the Lean Guide (Productivity and Lean Production Metrics), we introduced **Takt Time** a metric that states how often a winery should produce one unit of wine product (say a standard 9L case of wine), based on the rate of sales to meet customer requirements.

'Producing to Takt Time' means to work towards matching the pace of work (wine production) to the average pace of customer demand, through making improvements in efficiency. By doing this, wineries can begin shifting production flow away from a high-inventory, batch-and-push system and towards demand-based, just-in-time production where the winery is only producing wine at the pace that the customer demands it.

Matching the pace (or Cycle Time) of every process in wine production with the pace of sales is virtually impossible, given that maturation processes have long cycle times and the contract-based relationship with vineyards means that set batches of wine are usually made, irrespective of existing customer demand.

On the other hand for some processes, such as bottling and packaging, producing to Takt Time seems more realistic. In this case, we must make sure that the Cycle Times for each process of the bottling line are less than the Takt Time, or we won't be able to meet customer demands without overtime or delays to the customer. We can check this by drawing a simple graph to compare process Cycle Times to Takt Time (refer to Figure 42).

As we can see from the example in Figure 42, the Packing process in the bottling line has a Cycle Time of 100 seconds, and the Takt Time is 80 seconds, meaning that the bottling line presents a bottleneck issue in the wine production process and should be investigated further to see how the process Cycle Time can be reduced by at least 20 seconds to meet the Takt Time. This may be achieved through various means – from implementing Lean techniques such as Fast Changeovers (refer to Part 3 of the Lean Guide) or Total Productive Maintenance, through to investment in new Packing technology.

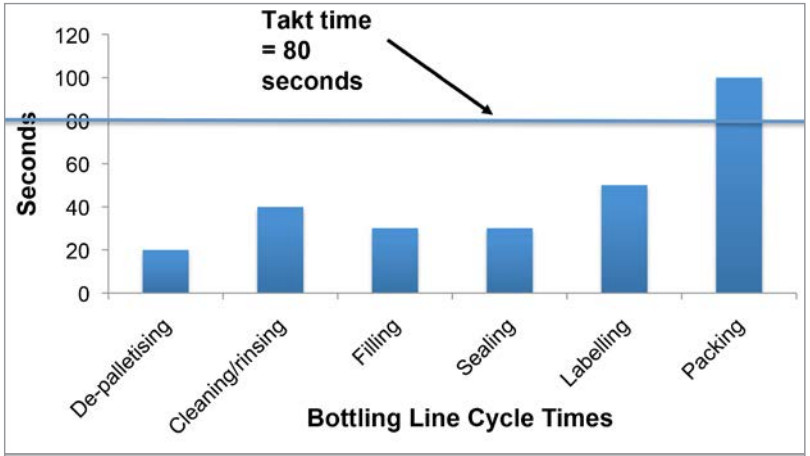


FIGURE 42: EXAMPLE - BOTTLING LINE CYCLE TIMES VS TAKT TIME

PULL SYSTEMS – SUPERMARKETS & PRODUCTION SIGNALING

The purpose of using a pull system is to provide the means for improving production control through giving accurate production instructions to up-stream processes based on actual customer demand, rather than having to predict customer demand (which can be inaccurate) and schedule production accordingly. Wineries can introduce 'pull' into their operations through the use of a 'supermarket-based' pull system, which consists of two components:

1. **Supermarket**, which in Lean Production speak, is essentially a location where a standard set of inventory is kept to supply down stream processes.
2. **Production/Withdrawal Signal Cards** (otherwise known as 'Kanban'), which are a signaling device that gives authorisation and instructions for the production or withdrawal of items from the Supermarket.

Figure 43 and the description below explain the supermarket-based pull system in further detail.

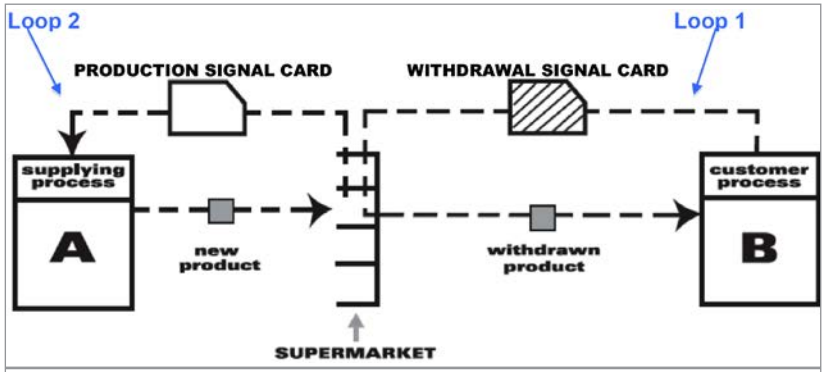


FIGURE 43: EXAMPLE OF A SUPERMARKET-BASED PULL SYSTEM

A supermarket-based pull system works in two loops:

Loop 1: The "customer process" (e.g. finished goods warehouse, or bottling) goes to the supermarket and withdraws what is needed based on the customer demand. It does this by supplying a 'withdrawal signal card', which provides information on what product (and how much) will be removed from the supermarket, who is making the withdrawal and to where the product will be moved.

Loop 2: As soon as a withdrawal signal card is provided to the supermarket, a production signal card is sent to the supplying process (e.g. bottling, or filtering) with instructions on what is required to replenish the supermarket inventory, and by when.

Done in this way, the downstream process' withdrawal out of a supermarket ultimately determines what the upstream process produces when and in which quantity. Wineries that have implemented Supermarket-based pull systems have typically placed them:

» Between Filtering and Bottling/packaging processes, and/or
» Between Bottling/packaging and Shipping processes.

On the shop-floor, supermarkets are located near the supplying process to help the process with keeping a visual indication of customer demand and requirements.

CONTROLLING THE 'PACEMAKER' PROCESS

By using Supermarket-based pull systems, there is really only one process in the value stream that needs to receive production scheduling (customer orders) – it is typically the process closest to the end of the value stream and it's called the 'pacemaker' process, because how the winery controls this process sets the production pace for processes upstream. Selecting and controlling the pacemaker process aides pull-based production flow, and reduces complexity associated with communications between the customer and wine production. In wineries, the pacemaker process is typically bottling, or filtering/clarification for those wineries that bottle off-site.

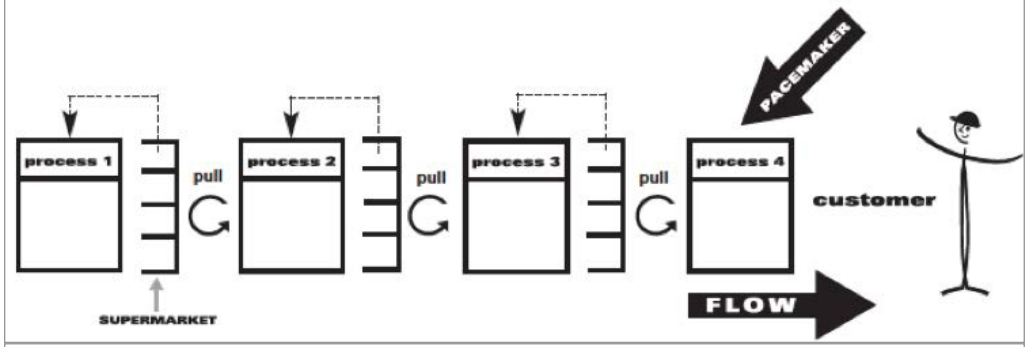


FIGURE 44: CONTROLLING THE PACEMAKER PROCESS DRIVES PULL UPSTREAM IN THE VALUE STREAM

LEVELING PRODUCTION MIX AND VOLUME

Most wineries traditionally schedule long runs of one product type and avoid changeovers, however this can create issues with flexibility in responding to changing customer demands. This ultimately creates the need for more finished-goods inventory, which as discussed in Step 1, can be a Waste of Inventory and thus costly the business.

There are two ways overcome this production scheduling issue:

1. Leveling the production mix
2. Leveling the production volume

LEVELING THE PRODUCTION MIX

The more leveled the production mix, the better the business can respond to changing customer requirements within a shorter lead-time.

In below example, the bottling line has a capacity of 500 cases per day. A customer places an order for 500 cases of Shiraz, 750 cases of Merlot and 1,250 cases of Cabernet Sauvignon per week. The production schedule outlined in Table 3 and represented graphically in Figure 45 may seem logical as it minimises changeover.

A better strategy could be to level out the peaks and troughs, implement quick changeovers and balance the schedule. The existence of inventory at any process stage causes waste. The idea is to produce products in a smooth repetitive mixed sequence that minimises inventory. A leveled production schedule has been outlined in Table 4 and represented graphically in Figure 46.

Leveling the product mix is economical only when changeover times are reduced. In part, this is the objective of a leveled production mix - to create a dynamic and flexible operation.

Product Mix	Monday	Tuesday	Wednesday	Thursday	Friday
Non-leveled	500 Shiraz	500 Merlot	250 Merlot 250 Cab Sav	500 Cab Sav	500 Cab Sav

TABLE 3 : NON LEVELED PRODUCTION SCHEDULEUPSTREAM IN THE VALUE STREAM

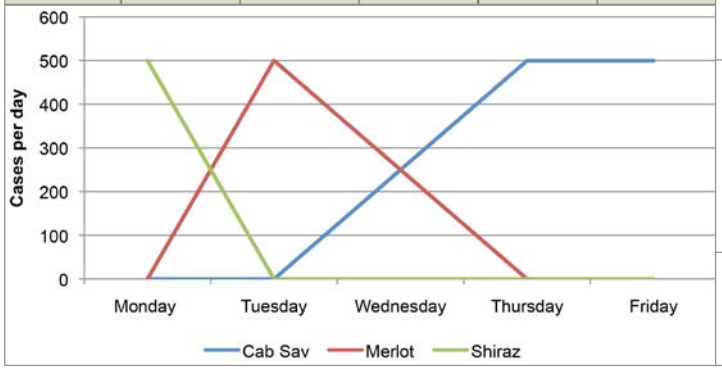


FIGURE 45: NON-LEVELED WEEKLY SCHEDULE

Product Mix	Monday	Tuesday	Wednesday	Thursday	Friday
Leveled	100 Shiraz 150 Merlot 300 Cab Sav	100 Shiraz 150 Merlot 300 Cab Sav	100 Shiraz 150 Merlot 300 Cab Sav	100 Shiraz 150 Merlot 300 Cab Sav	100 Shiraz 150 Merlot 300 Cab Sav

TABLE 4 : LEVELED PRODUCTION SCHEDULE

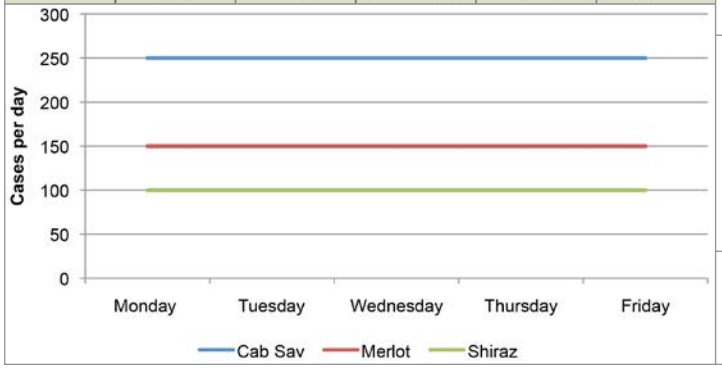


FIGURE 46 : LEVELED WEEKLY SCHEDULE

LEVELING THE PRODUCTION VOLUME

Leveling the production volume focuses on leveling variations in customer orders. Using the production mix example, assume that instead of a constant 2,500 cases of wine per week, the customer orders between 2,300 and 2,700 cases per week. It may make sense to produce the amount ordered. In reality, variation in the weekly required output creates waste. Extra capacity is 'forced' during high orders weeks (200 cases need to be manufactured per week) and the plant is under capacity during low order weeks (creating waste). The better approach is to produce volumes consistent with the long term average demand of the customer. In this case, the long term average would be 2,500 cases per week. A finished inventory of 200 cases is required for weekly variation. Normally carrying an inventory is a waste, however carrying a finished inventory allows smooth production, avoids process inventories, simplifies the operation and decreases costs. Production volume leveling creates more certainty around the volume of work needed and reduces the risk of 'peaking' or overloading certain processes or staff.

Businesses that have implemented changes in production to level the production mix and volume have made use of a 'load-leveling box' (Figure 47 below).

A load-leveling box has production signal card slots for each time interval (columns), and each product (row). Production signaling cards are placed into the load-leveling box based on customer demands and process capacity. Structured in this way, the load-leveling box can be used to easily level production loads. It also provides clear signals to indicate the type of product to be produced, the quantity to be produced, and the time it takes to produce that volume of product.

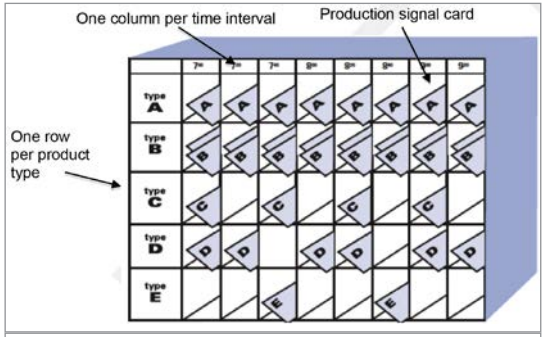


FIGURE 47: LOAD-LEVELING BOX

FUTURE-STATE VALUE STREAM MAPPING

Step 2 of the Lean Guide discussed the development of a current-state Value Stream Map to assist wineries with mapping the current state of production flow, and identifying opportunities to reduce waste, improve flow and better balance production across equipment and labour.

A **future-state Value Stream Map (VSM)** on the other hand provides a visual picture of what production might look like in future, if Lean Production techniques and practices were implemented. A future-state VSM provides the vision for an "ideal state" of production flow, resulting from practices that have eliminated waste, improved efficiency and shifting the production model from "push" to "pull" such that the winery gets as close as possible to producing wine only when demanded by the customer.

In order to create a future-state VSM, it helps address the following questions:

1. What is the takt time, based on the available working time of your downstream processes that are closest to the customer?
2. Will the winery create a finished-goods supermarket from which the customer pulls, or will you end directly to shipping?
3. Can the winery incorporate any continuous flow processing?
4. Where will you make use of supermarket-based pull systems to control production of upstream processes?
5. What process will you select as the "pacemaker process" to schedule production?
6. How might you level the production mix and volume at the pacemaker process?
7. What process improvements will be necessary for the value stream to flow as needed?

WHAT DOES A FUTURE-STATE VALUE STREAM MAP LOOK LIKE FOR A WINERY?

Figure 48 on the following page describes a future-state VSM, for the same example winery that was used to develop the current-state VSM in Part 2 (refer to Figure 19 in Step 2).

The future-state VSM in Figure 48 has incorporated the results of a variety of Lean Production techniques and practices, namely:

1. Implementation of supermarket-based pull system
2. Implementation of load-levelling
3. Streamlining of production scheduling information → fed directly to the pacemaker process (Bottling and packaging)
4. Implementation of 'fast changeover' improvements in Fermentation and Clarifying & Filtering process steps (reduced change over time from 240min to 120min)
5. Implementation of Total Productive Maintenance (TPM) practices to increase uptime of Tip & crush, Drain & press, and Bottling & packaging steps to 100%
6. Implementation of 5S across production to facilitate improved workplace productivity, eliminating the need for an operator at each of the Tip & crush, and Bottling & packaging processes
7. Through implementing the supermarket-based pull system and load-levelling, greater predictability of demand/supply was achieved and the winery was in a position to gradually reduce the number of days of inventory through amendments to contracts with grape suppliers.

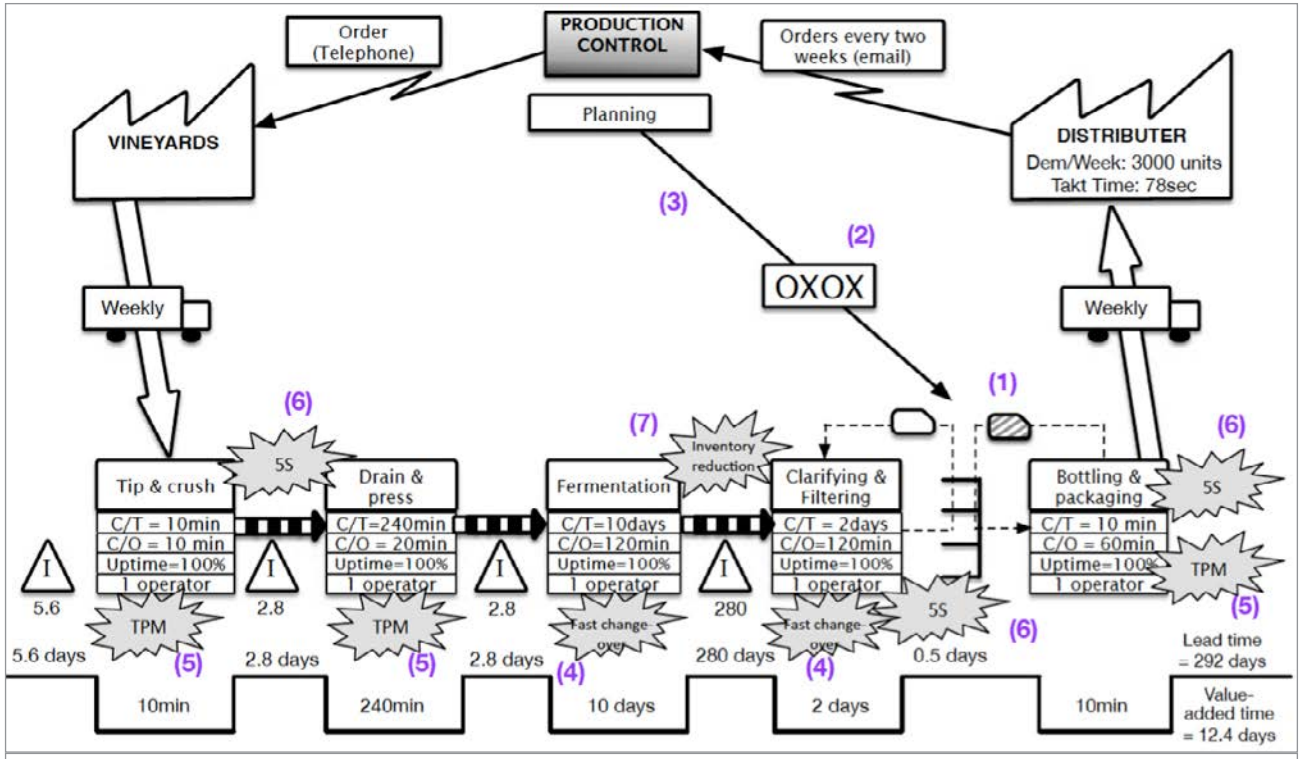


FIGURE 48: EXAMPLE OF A FUTURE-STATE VALUE STREAM MAP FOR A WINERY

KEEPING IT UP: CONTINUOUS IMPROVEMENT

Continuous improvement (CI) (or 'Kaizen', in Lean terminology) is an incremental way of improving processes and practices over time throughout the winery, and in particular making continued use of the Lean Production techniques and tools covered in Steps 1 – 4 so that improvements are made permanent to the business.

KEEPING IT UP: CONTINUOUS IMPROVEMENT

Continuous improvement (CI) (or 'Kaizen', in Lean terminology) is an incremental way of improving processes and practices over time throughout the winery, and in particular making continued use of the Lean Production techniques and tools covered in Steps 1 – 4 so that improvements are made permanent to the business. Hence CI is relevant to all Lean Production tools and techniques as an overlapping concept and set of guidelines for wineries to adopt in order to gain the maximum benefit from Lean.

STEPS FOR CONTINUOUS IMPROVEMENT

At the core of the continuous improvement process is the approach that lots of small improvements increases the overall efficiency of the business. There are three broad steps to this approach:

1. **Examine** the process
2. **Identify** improvement opportunities
3. **Implement** the changes.

Using these three broad steps, there are two main barriers and these include a) time needed to examine the process and b) time needed to implement the changes. How often do we hear someone say, "There must be a better way to do this." These people are correct – there is always a better way to do it, but staff need to feel both empowered and capable to a) identify the issues and b) implement the change.

In addition to the three broad steps, there are six additional mindsets that are needed for continuous improvement:

1. **Small changes**
2. **Ideas from workers**
3. **Spend small**
4. **Use your existing skill set**
5. **Self improvement**
6. **Ownership of work**

1. **Small Changes:** As mentioned previously, continuous improvement comes from many small changes rather than one large improvement. It is the sum of all these small steps that increases efficiency.
2. **Ideas from workers:** In any business, a well trained workforce is its greatest asset. A worker may have hundreds of ideas about how to make their particular process more efficient. These ideas may be far more effective than if an external consultant or manager told them the best way to undertake a task. The challenge is to encourage these ideas and ensure they are acted upon.
3. **Spend small:** Continuous improvement is not about buying one new piece of capital that will improve efficiency. Continuous improvements are likely going to cost nothing, or a small commitment to time and resources in printing a label or purchasing a new sign and some tape.
4. **Use your existing skill set:** As mentioned earlier, a well trained workforce is a business's greatest asset. Use their skills. People have lives outside of work and many of these skills can be applied to the workforce. Ask a Gen Y to undertake a 5S audit and their first step may be to find a 5S template from an itunes app! The organisation may find these apps are the new standard work tool!
5. **Self Improvement:** It is important to develop a culture where employees are continually seeking ways to improve their own performance. Tools to help improve performance may be visual tools, or standard work charts so they understand what is important, and how to produce work efficiently.
6. **Ownership of work:** This is potentially the greatest change to continuous improvement. Staff need to feel they have both ownership and responsibility for their work. A culture of 'not my problem' is detrimental to continuous improvement. Staff taking ownership and responsibility will lead to some of the greatest improvements.

CONTINUOUS IMPROVEMENT IMPLEMENTATION

As can be seen, there are no hard or fast rules for continuous improvement. Continuous improvement is as much about a mindset change as it is about putting in place formal processes. There are however some key techniques that wineries may wish to consider adopting, in order to implement CI practices into the business.

CONTINUOUS IMPROVEMENT BLITZ (KAIZEN BLITZ)

One technique to help kick start changes is a Continuous Improvement Blitz. This involves:

1. **Training**
2. **Examining**
3. **Analysing**
4. **Implementing**
5. **Checking and celebrating the change**

This technique can be spaced over several days (or weeks) for a few hours each day. Ideally, this process should initially be implemented full time over one week to get the team moving to this culture change. It would be beneficial is this was repeated every few months until the culture becomes ingrained. These steps are explained in further detail below.

Training

The first step is to train the workforce. It is best at this time to give a broad overview of both lean management and tools available. This training is also the time to encourage a culture of 'no blame' and empowerment. Teams need to feel empowered to make decisions and contribute to their environment. It can start right from the training step. It is important that leaders attend these training sessions. All members of an organisation need to contribute to continuous improvement and this needs to be demonstrated at the highest level – so training is the perfect opportunity.

For the wine industry, training should ideally cover aspects of 5S Production, Standard Work, TPM, Visual Management, quick changeover and production leveling in the initial steps.

Examining

In the first instance, examination of workstations should be undertaken individually by operators. This provides a sense of ownership needed for continuous improvement. In subsequent blitzes, this may be done in groups to maximise the information and observations gained from the examination step. Photos of the current situation can help by providing information, and as a training exercise for 'before' and 'after' case studies.

Analysing

Analyse the processes and look for efficiencies using lean tools and management. The opportunities may include things such as visual management implementation, 5S implementation, reducing movement, or reconfiguring workflows. It is important that this is discussed as a group activity. This allows brainstorming and provides new ideas. Remember, the key during this phase is encouraging everyone to participate, not just listening to the loudest talker. These people will be undertaking continuous improvement autonomously after the blitz.

Implementing

Implement the new practice making the process owner agrees with the changes. Hopefully the process owner has contributed to analysing and coming up with solutions to their own workspace as this provides additional ownership and commitment. The changes, however, can be implemented by anyone – the importance here is to get the job done.

Checking and celebrating

This step allows the team to understand if the change is working or not. This involves looking at the process or workstation and checking how it is functioning. Using tools such as standardised work instruction sheet allows the processes efficiencies to be easily measured. Now it's time to celebrate the success of the project. Share the learnings of the process with all staff. Use photos to show staff the situation before and after implementation. It is only through this acknowledgement that continuous improvement will become a cultural change for the better.

APPLICATION IN THE WINE INDUSTRY

All tasks in the wine industry could benefit from continuous improvement. The key is encouraging this mindset. They are a few ways to kick start this process. Get your team together and ask them what works well in their area. More importantly, ask them what doesn't work well. Their responses can be primary targets for implementing continuous improvement blitz projects.

Areas that deserve particular attention include receival to fermentation steps. In this case, it would involve getting a team together to observe the operation. During this observation, ask some of these questions:

- How long does it take to empty a bin into the destemming hopper?
- Where are grapes stored?
- How far do the grapes need to travel to reach the hopper?
- How many people are involved in the operation?
- How many times does the operation stop and then start?
- Is the hopper always full?
- What are the bottlenecks?

As can be seen in the above example, the situations and solutions are varied. All team members should have something to contribute to how processes can be run more efficiently.

Once a new work flow, or process improvement has been established, it important to ensure staff don't go 'back to the old way'. Most of the time, staff will see and like the improvements, and these will remain the norm. If there is still resistance, it may be a sign that a part of the process is not working quite properly.

Continuous Improvement has a great potential in reducing waste time, increasing staff morale, and increase staff ownership. Once the culture change has been implemented, it will reduce costs and benefit all members of the organisation.

TOOLBOX

This section of the Lean Guide provides a repository of useful tools and resources that wineries can use to assist with better understanding and implementing Lean Production practices.

The Toolbox will be continually updated as case studies, resources and materials are further developed for the Lean Wineries Guide, and will be added to document as well as made available via the AGWA website (www.agwa.net.au).

The Toolbox currently consists of the following resources:

1. Lean Glossary

2. References & Sources

3. Case Studies

LEAN GLOSSARY

5S Production – used to improve workplace practices including elements of visual management:

1. **Sort** and eliminate items that are not needed
2. **Straighten** and organise all items that remain
3. **Sweep** and ensure the workplace is organised
4. **Standardise** to ensure that waste and inefficiencies are easily and consistently recognised
5. **Sustain** the previous four steps and make 5S a way of life in the business.

Continuous Improvement – a business culture to continually enhance value adding activities and decrease waste

Error proofing - methods that help stop operators making mistakes. These may be physical barriers that are difficult to overcome accidentally.

Fast changeover - A process for changing production equipment for a different product as quickly as possible.

Lean Production - a system of tools and practices for improving production operations, suppliers, and customer relations such that the business requires:

Overall Equipment Effectiveness (OEE) – A measure of how effectively equipment is being used. This is calculated using 3 components:

6. Performance % (output)
7. Availability % (time to run the machine)
8. Quality % (product to specification)

These 3 elements combined result in the following formula:

OEE (%) = Performance% x Availability% x Quality%

Production leveling - Leveling the production mix to distribute the production of different wine more evenly over time

Process Capacity Table – A table designed to understand the true capacity of a piece of equipment

Pull systems – a mindset for pulling from the end of the production line to the beginning of the production line to increase efficiencies.

Quality – delivering products at an optimum cost effectiveness that customers will purchase.

Quality Control Tools – Visual indicators to reveal production information.

Seven Wastes – is a term used to identify and eliminate non-value adding activities (NVA). These NVA activities include:

1. **Overproduction:** Producing more than is needed by the next process or customer.
2. **Waiting:** Operator idle time while waiting for information, equipment, process, tools, parts, etc.
3. **Transportation:** Moving parts and products unnecessarily from one area to another.
4. **Over processing:** Performing excessive processing potentially due to poor equipment or practices (e.g. multiple filtration steps, refrigeration systems running too hard).
5. **Inventory:** Having excessive stock to prepare for customers requests
6. **Motion:** Unnecessary operator movement due to poorly designed workplaces or looking for parts, etc.
7. **Correction:** Rework such as re-labelling wine bottles, multiple cold stabilisation processes, scrap (discarded wine), inspections at the final step.

Standardised Work - Establishing a procedure for producing work at a certain standard. This includes three components:

1. Takt time, the rate at which products must be made to meet customer demand.
2. Work sequence a visual map to indicate which steps an operator must perform within the takt time.
3. Adequate resources the minimum inventory needed to keep the process operating smoothly without stoppages

Standardised work combination table – A standardised work combination table combines manual work time, walk time and machine processing time for one operator in a task.

Standard Work Chart - A standardised work chart shows operator movement and material location in relation to machinery and the process layout.

Standardised Work Instruction Sheet – a combination of a process capacity table, standardised work combination table and Standard Work Chart. Used a a visual tool for both operators and leaders.

Takt Time – a metric that indicates how often a winery should produce in order to meet a customer's needs.

Total Productive Maintenance (TPM) – A method of all staff taking ownership to eliminate equipment failure downtime.

Value-Stream Mapping (VSM) – Is a visual tool for identifying all process steps involved in producing wine. The VSM is subsequently used to identify wastes.

Visual management – a diverse tool that relies on staff following visual signals

REFERENCES AND SOURCES

SUGGESTED READING LIST

Interested in reading more on Lean Production? We suggest taking a look at the following resources:

1. Watch the following YouTube Clip on how Accolade Wines adopted Lean in their operations: http://www.youtube.com/watch?v=rLwc4NnNXHs
2. Visit the website: Lean Enterprise Institute http://www.lean.org/
3. Lean Global http://www.leanglobal.org/
4. Visit the US EPA's Lean, Energy and Climate resource: http://www.epa.gov/lean/
5. Read, Womack, J. and Jones, D. (1996) Lean Thinking. New York: Simon & Schuster.
6. Womack, J. and Jones, D. (2005). Lean Solutions. New York: Simon & Schuster.
7. Watch an interesting video by SAPartners on how 'Fast Changeovers' work in Formula One racing: https://www.youtube.com/watch?v=aHSUp7msCIE
8. Watch a useful video by the Gemba Academy on '5S': https://www.youtube.com/watch?v=SU01D-jTZcE&list=PLe3WfovsG6OzXCxBGeRyJJsJww30AKier

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Womack, J. and Jones, D. (2005). *Lean Solutions*. New York: Simon & Schuster.

Womack, J. et al. (1990) *The Machine That Changed the World*. New York: Rawson Associates.

FIGURE SOURCES

Figure 1: The Five Principles of Lean (Source: www.lean.org)

Figure 2: Overproduction leading to other wastes http://www.fob-architectsuk.com/wp-content/uploads/2011/08/FW-28.jpg

Figure 3: Six people waiting for a job to finish http://todayinheritagehistory.files.wordpress.com/2012/07/shove-lean-23.jpg

Figure 4: Forklift movement http://www.inboundlogistics.com/cms/userfiles/intermodal_wine_forklift_1012(1).jpg

Figure 5: Over processing uses more resources than required http://carhumor.net/wp-content/uploads/2012/04/car-humor-funny-joke-road-street-drive-driver-truck-trailer-Overkill.jpg

Figure 6: Inventory Waste https://leanhomebuilding.files.wordpress.com/2010/06/slide7.jpg?w=500&h=375

Figure 7: Unnecessary motion (2XE Pty Ltd)

Figure 8: Defective wine – resources wasted (iStock.com)

Figure 9: Before Sorting - Removing un-needed items http://leanmanufacturingtools.org/wp-content/uploads/2011/06/clutter-workbench1.gif

Figure10: After Sorting – Un-needed items removed http://leanmanufacturingtools.org/wp-content/uploads/2011/06/clean-workbench.gif

Figure 11: Example of a red tag http://www.northstarqualityconsulting.com/Red%20Tag.png

Figure 12: A well straightened workstation http://thewaiblog.files.wordpress.com/2011/06/img_2173.jpg

Figure 13: Before and after straightening http://totalqualitymanagement.files.wordpress.com/2010/03/figure12.gif

Figure 14: A manual forklift returned to its correct location http://www.cisco-eagle.com/blog/Images/5S-floor-Striping.jpg

Figure 15: A sweep reveals a tool is missing http://ep.yimg.com/ay/yhst-52155379439012/shadow-mark-tool-shadow-tape-1.gif

Figure 16: Standardised colour coded bins http://commons.wikimedia.org/wiki/File:NEA_recycling_bins,_Orchard_Road.JPG

Figure 17: Standardised shadow board for tools http://superfactory.typepad.com/photos/uncategorized/2008/10/16/shadowboard.jpg

Figure 18: Visual coded factory floor http://www.bbc.co.uk/wear/content/images/2008/09/05/289_470x353.jpg

Figure 19: Example of a current-state Value Stream Map for a winery (2XE Pty Ltd)

Figure 20: Relationship between Standard Tools (2XE Pty Ltd)

Figure 2: Time observation sheet (2XE Pty Ltd)

Figure 22: Example of an equipment process capacity table (2XE Pty Ltd)

Figure 23: Standardised work/walk combination table (2XE Pty Ltd)

Figure 24: Standard work map for boxing wine (2XE Pty Ltd)

Figure 25: Standard work instruction sheet (2XE Pty Ltd)

Figure 26: TPM Elements (2XE Pty Ltd)

Figure 27: You can't fit a square peg in a round hole http://bjegede.wikispaces.com/file/view/Peg1.png/472407654/428x389/Peg1.png

Figure 28: A very fast Formula 1 changeover http://commons.wikimedia.org/wiki/File:2012_Italian_GP_-_Ferrari_pit.jpg

Figure 29: Cockpit space shuttle Atlantis - Push the button. http://en.wikipedia.org/wiki/Space_Shuttle_orbiter#mediaviewer/File:STSCPanel.jpg

Figure 30: Information overload - I'll take the bus! http://www.marketingdonut.co.uk/sites/default/files/local-sign_249x371.png

Figure 31: Cluttered tool box http://pics.boredmder.com/garagejournal/DSC05529.png

Figure32: Clear signals http://www.industryweek.com/site-files/industryweek.com/files/imagecache/galleryformatter_slide_penton/gallery_images/shadow-boards.jpg

Figure 33: Visually managed clean workshop http://4.bp.blogspot.com/-wzl5e1Dy8AU/TcFGZGujUsI/AAAAAAAAAts/BqW9dCqJHUo/s1600/shelf-wide-overview.jpg

Figure 34: A mess http://fusionlimited.com/wp-content/uploads/2013/10/MessyFactory.jpg

Figure 35: Visual signal (and physical barrier) to notify people it's not safe to cross http://www.cisco-eagle.com/catalog/images/albums/AisleCop-Ped/aisle-cop-app2.jpg

Figure 36: Graph of wine stock on hand (2XE Pty Ltd)

Figure 37: Forklift pre-use checklist http://www.jjkeller.com/wcsstore/CVCatalogAssetStore/images/catalog/full/028B_full.jpg

Figure 38: Fishbone diagram http://upload.wikimedia.org/wikipedia/commons/5/52/Ishikawa_Fishbone_Diagram.svg

CASE STUDIES

CASELLA
FAMILY BRANDS

CASELLA FAMILY BRANDS – LEAN IMPLEMENTATION – BENEFITS AND OUTCOMES

BACKGROUND

Casella Family Brands (formerly Casella Wines) is a family-owned company based in New South Wales. Its [yellow tail] label is the most successful Australian wine brand in the history of the Australian wine industry. From its launch in 2001, when 1 million cases were shipped to the US, global sales today exceed 12 million cases every year. In 2000, approximately 15,000 tonnes of grapes were crushed using 45 staff members. In 2014, almost 180,000 tonnes of grapes were crushed and staff numbers are closer to 500.

DECISION FOR LEAN

In 2008, Casella Family Brands had a smaller product range. It manufactured two sizes of wine bottles and six types of wine were exported direct to the United States. This required a bottling line changeover once per week. The bottling line infrastructure and bottling line changeover processes were adequate for the work being undertaken at the time, and the efficiencies of this system were adequate for the business' needs.

Over the next 5 years, as demand for [yellow tail] wine grew the packaging line products and the cellar functions increased in variation and complexity. This complexity decreased the efficiency of the existing bottling line. A greater product variation resulted in frequent bottling line changeovers. This compounded inefficiencies that at the time were considered acceptable. In addition to the bottling line, this product complexity compounded cellar inefficiencies. As a result, a considerable labour force was required and overtime costs escalated. The equipment had the capacity to process the high variation in products, however the changeover labour, cellar labour and equipment downtime were high. This contributed to high operating costs.

Once the bottling line and cellar inefficiencies had been identified, Casella Family Brands made the decision to implement lean manufacturing practices throughout the facility. The objectives were to increase efficiency and decrease operating costs.

JOURNEY TO LEAN

Casella Family Brands undertook multiple lean manufacturing steps to improve its system. In the beginning, these changes included:

- Site wide overview on lean manufacturing
- High level lean training for lean leaders

Once this training had been undertaken, it became important for a cultural change and for staff to take ownership of the lean system. This was done in a number of ways:

- Creating a shared purpose to empower, involve and align staff
- Selling the benefits of lean and explaining why it is important (i.e. making it easier to undertake work)
- Changing the culture to focus on continuous improvement
- Making sure it required less effort and the consequences were more favourable for staff to do the right thing than the wrong thing

In creating ownership and making it easier for staff to undertake their jobs, Casella Family Brands implemented lean tools including:

» Creating visual management tools to make the operator's jobs easier
» Using 5S methodology to make jobs easier to undertake
» Regular auditing by both operators and leaders to help create and maintain a standard

This resulted in the appropriate culture shift towards lean, continuous improvement and the new way of doing business.

Lean systems were implemented across site and used to improve the bottling line and cellar performance. The tools that were used in these areas included:

» Continuous improvement (identifying and overcoming constraints)
» 5S implementation
» Fast changeovers
» Visual management

The bottling line and cellar benefitted from 5S, continuous improvement and fast changeovers. The objective for fast changeovers involved reducing the amount of time that equipment was idle. To accomplish this, several steps were undertaken including:

» Preparing
» Having all tools ready
» Having all parts ready
» Ensuring staff availability
» Continuous improvement
» Constraints analysis.
» Undertaking changeovers with no downtime (if safe)

Continuous improvement using constraint analysis involved looking at the changeover system and identifying the constraints that prevented this changeover from being undertaken quickly.

Once these constraints had been identified, innovation was undertaken to overcome these constraints and improve the changeover.

5S was implemented throughout the system and this helped further improve the changeover speed by ensuring all tools were where they were needed and able to be used for changeover.

Lean also provided the culture change, continuous improvement and auditing structure to improve:

» Safety (through auditing, risk elimination and risk management)
» Quality (through clear signalling)
» Training (through visual management and simplification through standard work)

LEAN OUTCOMES

Casella Family Brands recognises that lean is not a one off event but a sustained new way of undertaking business. This has resulted in many improvements for the business including:

» Reductions in cellar operations costs
» Reduction in bottling line costs
» 85% reduction in lost time injuries over the last 4 years
» Reduced training time by 80%
» Increase in quality
» Faster changeovers in bottling lines
» A more flexible bottling line operation
» Reduced lead time
» Inventory reduction
» Reduced lost time in cellar operations
» Increase in labour efficiency
» Ability to use existing workforce with a more complex work profile.

LABOUR SAVINGS OF ~$2 MILLION PER ANNUM

Overall, lean manufacturing has resulted in a more flexible facility with reduced waste and decreased operating costs. If Casella Family Brands had continued with its pre-lean processes, the facility may have coped with the diversity of product; however the operation costs would have been excessive. Since implementing lean, Casella family Brands has estimated savings close to $2 million dollars per annum in real terms in labour costs alone. Streamlining this process has meant the company can manufacture more complex products and greater volumes with the same workforce. Through implementing lean management, Casella Family Brands has achieved the objective of increasing efficiencies and decreasing operating costs.

CASE STUDIES

Pernod Ricard Winemakers
Leading Wine Innovation

PERNOD RICARD WINEMAKERS – LEAN IMPLEMENTATION – BENEFITS AND OUTCOMES

BACKGROUND

Pernod Ricard Winemakers is the premium division of Pernod Ricard – the world's co-leader in wine and spirits. Founded in 2010, Pernod Ricard Winemakers boasts one of the world's most diverse portfolios of premium wines – featuring brands such as Jacob's Creek in Australia, Brancott Estate and Stoneleigh from New Zealand, Campo Viejo from Spain and Graffigna from Argentina. The business also owns and administers several other wine brands worldwide, including Kenwood Vineyards and Dead Bolt in the United States and Helan Mountain in China.

With over 2000 employees based across five continents, Pernod Ricard Winemakers is dedicated to producing high-quality, premium wines and setting the benchmark for innovation in the winemaking world – launching 14 new products in the last year alone. In 2013, the business changed its name globally from Premium Wine Brands to Pernod Ricard Winemakers.

Pernod Ricard Winemakers highlighted the need to undertake lean manufacturing practices at their Rowland Flat and Richmond Grove Wineries to improve areas of their production system. To ensure the processes became common practice, two waves of lean manufacturing implementation were conducted at the winery.

FIRST IMPLEMENTATION

Originally lean implementation was undertaken focusing initially on 5S, which involved:

- Sort - Sorting work areas and removing un-needed equipment
- Shine - Straightening and organising all remaining items
- Set - Sweeping to keep the work areas tidy
- Standardise - Standardising to ensure equipment is consistently recognised
- Sustain -Sustaining the previous four steps and ensure 5S is maintained as the business normal

5S Implementation involved:

- Removing un-needed items
- Standardising tank farm tools
- Implementing visual management
- Using tools such as shadow boards
- Identifying where equipment was needed
- Regular auditing and monitoring
- Keeping areas clean and tidy

This execution of 5S across the winery was originally successful and efficiencies were gained for a time. The problem was that this was not sustained and after the initial implementation, the site returned to its previous state.

This was an excellent lesson and provided new insights to implement and maintain lean systems during a second wave of lean execution. Lean is a new way of business and not a once off module. Lean requires ongoing stewardship and accountability by all employees. More importantly, lean needs a 'buy in' by all staff and ownership. Learning these lessons provided a new and sustainable implementation model for the second lean wave.

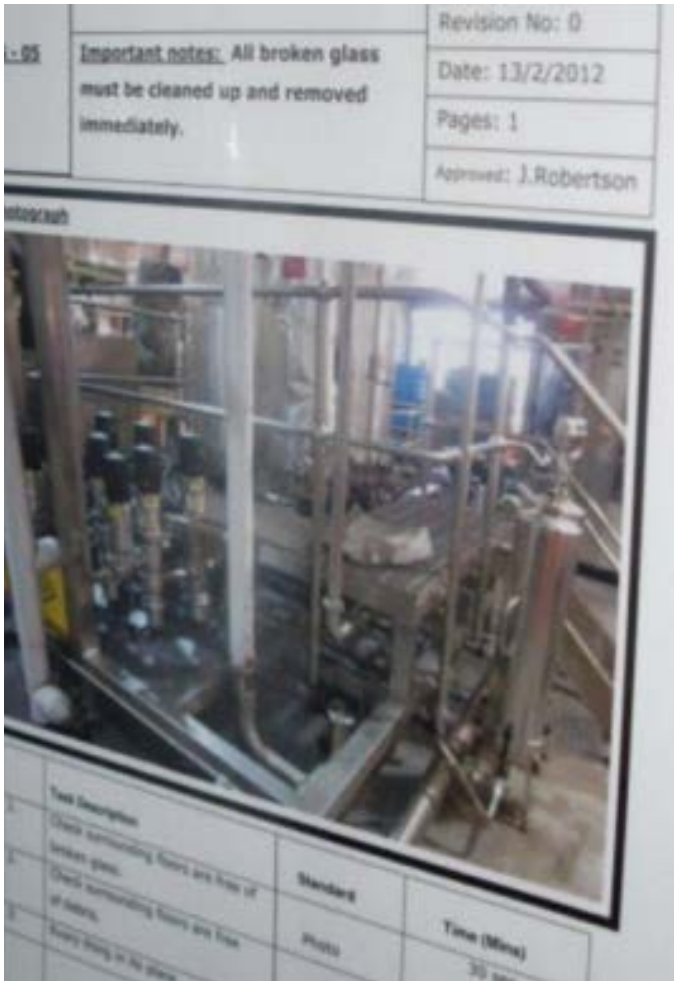

FIGURE 1: 5S VISUAL MANAGEMENT BOARD

SECOND IMPLEMENTATION

This second implementation focussed on the 'people' side of the operation including:

- Developing a business training plan for all staff
- Ensuring everyone was involved and contributing to lean
- 'Selling' the benefits of lean to the workforce
- Providing ownership of lean processes
- Making staff accountable for lean implementation
- Regular auditing

Ownership for lean was instilled in both operators and leaders. Each leader was accountable for a particular area, and each operator was accountable for their workspace. This meant everyone shared a common goal. To help sustain this, regular auditing was undertaken by operators and any 'fails' of audits were identified and highlighted for improvement using visual management boards. These boards required signoff by both leaders and operators in a timely fashion.

This resonated with staff further when operators could see the benefits of the lean manufacturing system. Previously, looking for a hose coupling would take between 15-30minutes. After lean implementation, this time was reduced to less than 5 minutes. The implementation goals for lean manufacturing and 5S included:

- Making systems safe and simple enough so anyone could use them effectively
- Making it easier for operators to undertake their work and eliminate waste
- Demonstrating the benefits of improving the workplace through 5S and continuous improvement projects

Because of this, it was in the best interest for staff to maintain the lean systems. This helped the system to become sustainable.

Once lean was implemented and sustainable, production systems focused around lean manufacturing practices and tracking these systems. This meant if manufacturing processes fell outside of specification (time to undertake a task, failed audits, etc.), these problems were investigated. The objective was to understand how the situation occurred, how to stop it happening again, and how to further improve the system. This resulted in increased the accountability and sustainability of the continuous improvement system.

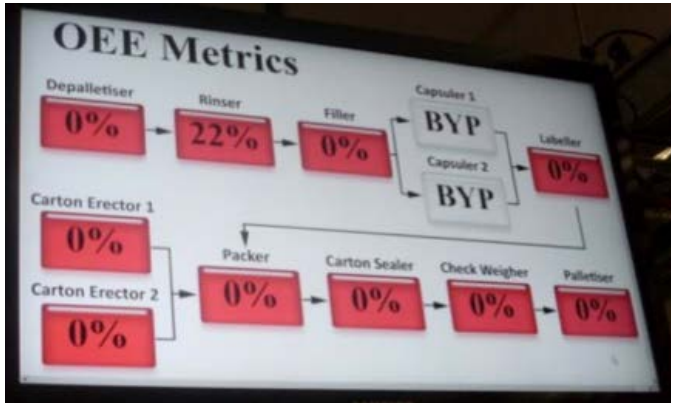

FIGURE 2: LEAN MANUFACTURING TRACKING BOARD

BENEFITS FROM SUSTAINABLE LEAN IMPLEMENTATION

There have been many improvements in the winery due to lean implementation. The most significant have included:

- Reduction in time waste
- Reduction in task complexity
- Increased productivity
- Decreased operating costs

Craig Curnow the Barossa Cellar Operations Manager for Pernod Richard Winemakers has stated that since implementing lean, the decrease in waste and simplification of processes has meant staff are available for other projects. "It's like having an extra person on staff every day". This is a significant benefit for a busy winery.

In addition to these benefits, lean implementation resulted in:

- Increased safety
- Increased quality
- Maintenance improvements
- Reduction in non-value adding activity
- Easier problem identification
- Easier root cause analysis
- A more efficient workplace

The streamlining of work systems meant that more work was undertaken in a safer and effective manner with less effort. This allowed staff to be available for other projects. Pernod Ricard Winemakers found that after implementing lean, a significant improvement in value adding activity was noted. For labour constrained businesses, this is a significant benefit. Overall the implementation of lean made a considerable difference to the overall productivity and safety.

"IT'S LIKE HAVING AN EXTRA PERSON ON STAFF EVERY DAY"

CASE STUDIES

TREASURY WINE ESTATES

TREASURY WINE ESTATES (ROSEMOUNT WINERY) – LEAN IMPLEMENTATION – BENEFITS AND OUTCOMES

BACKGROUND

Treasury Wine Estates (TWE) is an Australian based global wine company with a leading portfolio of international wines.

TWE produces over 80 brands, including: Annie's Lane, Castello di Gabbiano, Chateau St. Jean, Coldstream Hills, Devil's Lair, Etude Wines, Greg Norman Estates, Heemskerk, Matua, Pepperjack, Rosemont Estate, Seppelt Wines, Stags' Leap Winery, Wynns Coonawarra Estate and Yellowglen.

TWE has over 11,000 hectares of vineyards, sales of 32 million cases of wine annually, and revenues of about AU$1.7 billion. TWE employs more than 3,500 winemakers, viticulturists, sales, distribution and support staff across 16 countries.

CASE STUDY: ROSEMOUNT ESTATE WINERY

Rosemount Estate Winery, located at McLaren Flat, South Australia is 100% owned by TWE. The Winery has a long and proud history and was established in 1888.

Rosemount Estate began its Continuous Improvement (Lean) journey in late 2009. It recognised, like many wineries, it was not immune to pressures facing businesses across Australia, namely:

- Environmental & safety requirements – new regulations, tighter controls
- Productivity – specifically labour productivity and the need do more without increasing input costs
- Quality focus – a drive towards 'premium' wine production
- Heightened interest from Customers – both internally and externally
- Competition – from both local and national premium wine producers
- Cost – cost containment and reduction
- Suppliers – a better working relationship to contribute to quality and cost outputs.

As a medium sized winery, Rosemount recognised it couldn't absorb these pressures for long and recognised the need for change.

DECISION FOR LEAN AND CONTINUOUS IMPROVEMENT

The biggest hurdle to change is altering mindsets and behaviours. Rosemount faced the same issues:

"If it isn't broken, why fix it?"
We don't need to change!"
We've always done it this way!"

To the credit of the operators and Winery leaders, they found they could rise above the status quo and challenge themselves.

THE APPROACH

The approach targeted the following key areas:

(a) Engage the people
(b) Structure & leadership
(c) Strategy
(d) Knowing the Business
(e) Knowing the Customers

ENGAGING THE PEOPLE

The first step towards lean (continuous improvement) was to engage the people. Without engagement the shift towards a lean organisation would be unsuccessful. This was done by providing staff input into relevant day to day operating decisions including visibility of metrics that controlled the performance of the winery. This effectively put the operators in the 'big picture'.

STRUCTURE & LEADERSHIP

A continuous improvement structure included the following elements:

- Putting 'people leaders' in positions critical to winery operations
- Encouraging input from operators (e.g. thoughts and ideas on what's not working and what needs improving)
- Creating an environment to support improvement

STRATEGY

Disseminating a clear and concise lean business vision was critical. 'Motherhood statements' often lose translation and purpose as they cascade through an organisation. Rosemount Winery ensured it clearly articulated the company wide strategy through all levels of the winery and ensured the strategy was relevant to operations.

KNOW YOUR BUSINESS – METRICS THAT DRIVE PERFORMANCE

Rosemont Winery understood its basic business metrics including:

- Operating Budgets
- Labour & overtime spend
- Maintenance spend
- Work Order schedule
- Maintenance costs
- Injury rates

These metrics were a starting point but specific performance metrics were required to enable effective benchmarking. This benchmarking was measured against their own winery and against peer wineries in the TWE network. A sample of these metrics include:

- Cost per litre of wine produced
- Total Labour Capacity vs. Planned work
- Maintenance work (planned vs. unplanned)
- Planned conformance (i.e. Planned work orders vs. completed work orders)

Initially these metrics were not apparent and were developed over a period of time. The team at Rosemount is still 'continually improving' and reviewing what drives performance. While some of these metrics can be discussed and actioned daily, others are better suited to weekly measurements and strategic responses.

TOOLS & TECHNIQUES FOR CONTINUOUS IMPROVEMENT

Tools for implementing lean and continuous improvement were setup throughout the facility. These tools included:

- Visual management – throughout the winery and specifically in the continuous improvement corridor (refer to Figure 1)
- Standard work – creating repeatability, standardisation and clear instructions for operators
- 5S – creating and maintaining an organised and safe workplace
- Daily performance meetings (stand up meetings) – to communicate performance and actions
- Problem and resolution boards – to enable an avenue for operators to raise and resolve problems

FIGURE 1: THE CONTINUOUS IMPROVEMENT CORRIDOR

RESULTS OF CONTINUOUS IMPROVEMENT

The adoption of continuous improvement created a safe, performance driven work place. Some of the key results of improved performance are as follows for the years 2011 – 2013:

In addition to these performance metrics, lean implementation has provided many other benefits including greater ownership and accountability, engaged and valued staff and a real passion for making great wine in an entrepreneurial spirit.

TONNES CRUSHED – UP 20%

REPAIRS AND MAINTENANCE ACTIVITY – UP 4%

COST PER TONNE – DOWN 10%

SAFETY INCIDENTS – DOWN 30%

Australian Government

Australian Grape and
Wine Authority

THE LEAN GUIDE IS AN INITIATIVE OF THE AUSTRALIAN GRAPE AND WINE AUTHORITY.