USING VALUE STREAMING TO IMPROVE PRODUCTIVITY AND REDUCE LEAD TIME IN JOBBING FOUNDRY

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Abstract:

Numerous South African foundries have very little or no exposure at all to the modern manufacturing principles of value streaming. The application of value streaming methods in the manufacturing environment is critical for the improvement of customer demands.

A value stream system includes all manufacturing steps and processes that occur to a given product from its inception through to its delivery to the customer. This paper focusses on the implementation of value streaming to reduce the delivery lead time in a local jobbing foundry. In this specific case study, seven deadly manufacturing waste were identified. A value stream mapping was implemented to improve productivity by reducing longer lead-time using value streaming approach. The current-state value stream mapping as-it is was drawn up to highlight the waste and eliminate them by implementation of a future-state value stream. The implementation of the future-state resulted in the evident improvement of the foundry melting process in terms of speed and reduced energy consumption. A proper production scheduling was also applied which reduced unnecessary work in progress inventory.

Keywords: Value streaming, jobbing foundry, lead time.

1. Introduction

Most South African foundries have little or no exposure to modern manufacturing principles in value streaming which is one of the key sources of competitive advantage. South Africa jobbing foundries are having challenges of delivering the products in the competitive short lead time due to wastes in the production system.

A Case study was carried out to (1) Identify waste which have tendency of increase cycle time (longer lead time) and (2) Reduce the identified wastes within the production system using value streaming mapping principles.

2. Literature Review

Value streaming is one of the effective ways to identify waste to create a value for the product. The purpose of the value stream is to find non-value-adding wastes, identify their root causes and prepare strategic plans for their elimination through planning and focusing on continuous improvement. Waste elimination is one of the most effective ways to increase the profitability of a company. The typical wastes found in manufacturing environments consist of: *Motion, Waiting, Transportation*, *and Correction/Rework*, *Over-processing*, *Inventory* and *Over-production [1]*. A value stream is all the actions (both value-added and non-value added) currently required to bring product through its essential main flows: (1) the production flow from raw material into the arms of the customer and (2) the design flow from concept to launch [2]. VSM includes creating a map of the flow material through production and flow of information from the customer back to each production process. A current-state map of in-plant value streams the serves as the basis for developing future-state maps that omit non value adding steps while pulling resources through the system and smoothing flow. The difference between the current – state and potential future states provides a road map to start the implementation of performance improvements [3]. V. R. Murugananthan et.al [4], applied 5s technique in a foundry and this resulted in effective organization of the workplace, improvement of work's environment, elimination of losses connected with failures and breaks, improvement of the quality and Safety of work.

From VSM to remove the non-Valued activities during manufacturing and also to reduce manufacturing lead time.

3. Experimental Work

The value streaming mapping was mapped through the use of Micro Visio by direct observation of the process with aim of collecting, people, material and information flow and detailed operation steps within the system. Method was designed and used to identify the types of wastes associated with each process see table 1. This information was then weighted using numbers 1-3, 1 being severe waste and 3 less critical wastes. When waste was present at a specific process a **Yes** was filled in the table and when no waste was identified **No** was filled. A value streaming tools were used to reduce or eliminate wastes and then map the future value stream mapping.

4. Result and Discussion

Figure 1 shows the flow of the product life cycle from customer order to product shipment. The VSM shows that the total value adding time for making the pedestal products is *6 hours and 47 minutes* the non-value adding time is *20 hours and 53 minutes.* This account to only 24 % of time in the product life cycle being value adding. This means 76 % of time is spent on non-value adding activities.

Table 1 shows waste classification in each prodcution process.

Processes	Identified Wastes in the process						
	Transportation	Waiting	Motion	Inventory	Over-Production	Over-processing	Rework/Defects
Pre-moulding	Yes[2]	Yes[1]	Yes[2]	Yes[3]	no	no	Yes[1]
Stripping	Yes[2]	Yes[1]	Yes[2]	no	no	no	Yes[1]
Core-Making	Yes[2]	Yes[1]	Yes[2]	Yes[3]	Yes[3]	Yes[3]	Yes[1]
Mould assembly	Yes[2]	Yes[1]	no	no	no	no	Yes[1]
Coating	Yes[2]	Yes[1]	no	no	no	Yes[3]	Yes[1]
Melting	Yes[2]	Yes[1]	no	no	no	Yes[3]	Yes[1]
Casting	Yes[2]	Yes[1]	no	no	no	no	Yes[1]
Knock-Out	Yes[2]	Yes[1]	Yes[2]	Yes[3]	no	no	Yes[1]
Fettling	no	Yes[1]	Yes[2]	Yes[3]	no	no	Yes[1]
Inspection	no	Yes[1]	Yes[2]	no	no	Yes[3]	Yes[1]

The results on table 1 show that waiting and rework/defects are the most critical/severe wastes because they occur in all processes, which is ranked 1. Figure 2 shows that by applying value streaming tools, such as *the single scheduling, pull system, line balancing* will promote first in first out (FIFO) and allow the upstream process to flow with less WIP (work in progress) inventory and reduce the lead time utilisation.

The figure 2 shows that by applying value streaming tool the process have potential of reducing the lead time.
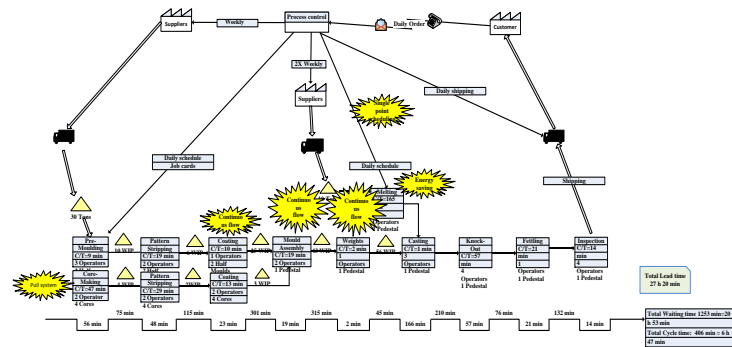

Fig 1: shows the current VSM and proposed changes of current stream map.
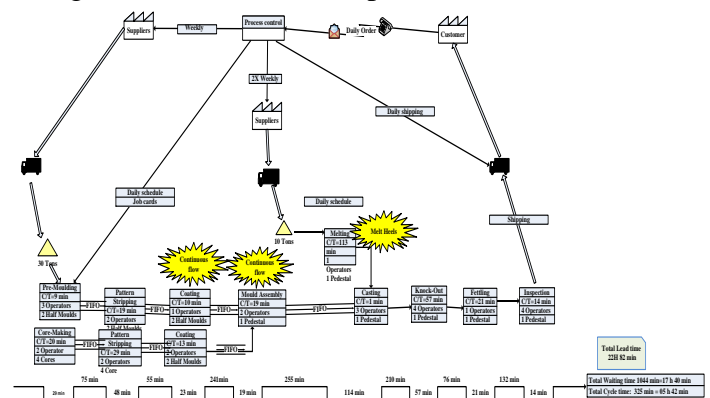

Figure: 2 shows the future value stream with reduce waste.

5. Conclusion and Recommendations

It can be concluded that the use of value streaming principle in the foundry has the capability to reduce lead time and allow local foundries to gain competitive advantage in the local markets. It can be recommended that South African foundries need to gain skills and competences in applying the value streaming principle in order to identify waste and eliminate within their processes.

6. References

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