Pump manufacturing unit doubles output

Background

MMW, established in the year 1984 at Coimbatore, India manufactures various models of pumps both for aleading OEM as well as its own brand. A surge in demand caused MMW to look to increase the output within the existing facility. Kanzen Institute Asia-Pacific (KIAP) worked with MMW to implement lean concepts over a 12 month time frame. The lean journey commenced with a current state assessment to identify areas for improvement, followed by implementing a series of improvement projects in a step by step manner.

Current State Assessment:

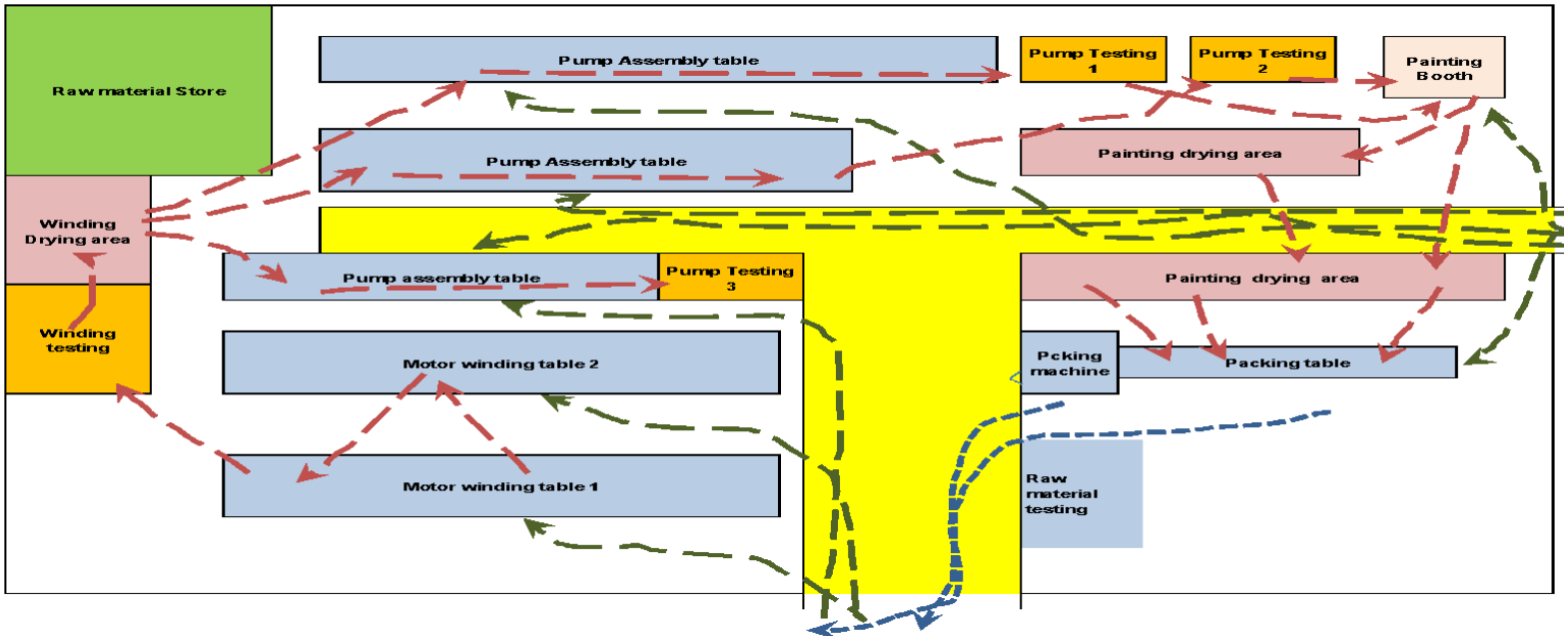
KIAP team had a detailed discussion with the unit owners followed by a diagnostic study to understand the processes, operations and the value stream of the pumps. The plant is an assembly line. The complete process flow through is shown below in exhibit 1.

Exhibit 1. Typical Process Flow

The *gemba* walk threw up the following observations:

- The shop floor was full of inventory with 20 days stock of RM/WIP which occupied most of the plant area.
- The stock of stampings on the production floor was approximately 3000 no's or 20 days stock
- Multiple handling of the pump was observed at every workstation - from working table to storage table and again to the workstation of next operation. In many workstations, semi-finished pumps were found under the work table.
- Motion of operators was significant and, in some cases, they were walking for more than 20 feet to get either material or tool.
- All the pumps were manually handled one by one from one workstation to another thereby increasing the strain on operators
- Motor winding section was located more than 60 feet away from the assembly line increasing the transport and motion between winding and assembly lines.
- Zig zag movement of pumps and their parts across the entire shop floor.

Observed material flow



- Defective pumps detected on the line were kept below the table. No defect recording or analysis could be observed.
- Many times, models which were planned had to be discontinued due to shortage of some raw material leaving semi-finished pumps on the table. These pumps were then kept under the table and the next plan taken up.
- Pumps which were painted were placed on tables for drying without any mention of the time of completion of painting. There was no control on duration of drying of the pumps.

The Goal

MMW needed to quickly ramp up output to meet the increasing demand and this had to be done within the existing facility and resources. The bottleneck cycle time for assembling a pump was 4 minutes which translates to 90 pumps per shift per line with 85% OEE. There were two fully operational lines, but actual output was in the range of only 70 pumps per day for both lines put together. **Hence, it was decided to streamline the flow so as to achieve the inherent capacity.**

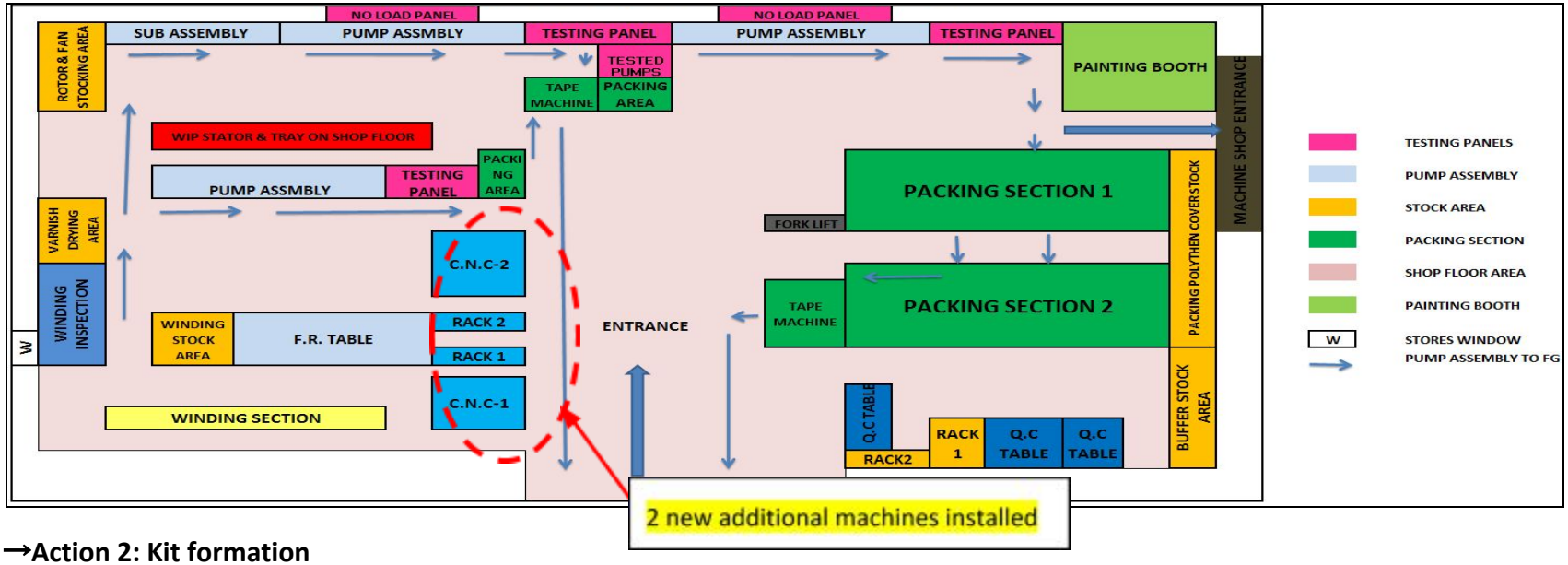
Improvement Projects Implemented

The improvements were carried out through a step by step approach as described here. The first step was to convert batch manufacturing process to the core lean concept of single piece flow.

→**Action 1:** Introduced **single piece flow process** from assembly to painting in one line. For this

- The layout was modified to ensure smooth unidirectional flow of the pump such that the next operator could directly pick up the pump placed by the previous operator.
- Line was re-designed and balanced with 7 work stations spread over 14 feet length.
- Rework area designated to keep defectives, record, analyze and take corrective action.

Modified layout post-lean workshops



→**Action 2: Kit formation**

All the parts needed as per the production plan are supplied in specifically designated trolleys to each workstation before the start of production. This has eliminated the need for operators to search or move around to fetch material. ***No kit, no cut*** policy was then implemented (i.e) production will start on the line only if all the required raw materials are available as per plan.

→ Action 3: Line balancing and point kaizen.

Testing was observed to be the bottleneck with a cycle time of 3-4 minutes depending on the pump variety. The line was balanced to ensure that one pump would be painted every 3 minutes by rearranging the activities to the workstations such that cycle time at each workstation was lower than the testing cycle time. Where needed, workstations were improved by arranging the tools for ease of pick up and put back thereby reducing non- value-adding time.Pumps were placed on trolleys with proper identification of sequence of painting and the trolleys were then moved to packing workstation thereby ensuring proper drying time for each pump as well as reduction in strain on operators

→**Action 4: Store room created** – the office was shifted to the first floor and a raw material store room was created in that space for keeping bought out components. The space thus freed in the shop floor was useful in re-organizing the entire layout.

Results

- The output from the lines increased from an average of **3000** numbers per month during its peak demand in 2016 to **4000** numbers per month in the same period in 2017.
- On time in full (OTIF) deliveries to the customer went up from 70% to 90% by the end of the implementation period.