Kanban Number Calculation – An Advanced Calculation

A mugs company has a family product made of 4 different sizes: Small, Medium, Large and Extra Large Mugs. The weekly request is: 204 Small Mugs, 176 Medium Mugs, 120 Large Mugs and 140 Extra Large Mugs.

The Company works on 17 shifts every week of 450 minutes (8 hours – 30 min lunch break).

The process is simple and reported above:

**Picking from Warehouse --> Labelling --> Polishing --> Cooking in the Oven**

Picking from Warehouse, Labelling and Polishing are 1 piece flow. The Oven is batch.

Picking from Warehouse takes 72 hours once the signal is given because of the queue.

Labelling, Polishing and Cooking are very close and do not need kanban.

The Cycle Time are: Labelling = 2 min. / Polishing = 7 min / Cooking is 1080 minute every batch.

The Batch Size are: Small Mugs = 120 pcs / Batch, Medium Mugs = 176 pcs / Batch, Large Mugs = 88 pcs / Batch, Extra Large = 80 pcs / Batch.

**Calculate:**

Takt Time, Yamazumi, Number of Kanban from Cooking to Warehouse.
**Exercise Solution**

The Time Available is 17 shift * 450 min. = 7650 min.

The Customer request of the products of family is = 640 pcs.

The **Takt Time** is = 7650 / 640 = **11.95 minutes**.

Labeling and Polishing are with a Cycle Time < Takt Time. This means that there is no machine limit to satisfy customer request.

For the oven the **C/T** for every kind of mug is:

- **Small** = 1080 min / 120 pcs = **9 min**
- **Medium** = 1080 min / 176 pcs = **6.14 min**
- **Large** = 1080 min / 88 pcs = **12.27 min**
- **Extra Large** = 1080 min / 80 pcs = **13.5 min**

There are some cycle time higher than Takt and some lower. It is necessary to evaluate oven capacity.

**Time Request** = 204 * 9 + 176 * 6.14 + 120 * 12.27 + 140 * 13.5 = **6278 minutes**

**Time Available** = **7650 minutes**

This means that the Oven has the capacity to satisfy the customer request.

**So with the equipment there is no constraint to satisfy customer request.**

Now, let us imagine a production plan.

To satisfy customer request you need to perform:

- **2 Small Mug Batch** = 240 pcs / 204 requested
- **1 Medium Mug Batch** = 176 pcs / 176 requested
- **2 Large Mug Batch** = 166 pcs / 120 requested
- **2 Extra Large Mug Batch** = 160 pcs / 140 requested

This means 7 loads, almost 1 a day.

To calculate the right number of kanban let us imagine the oven has a point of use (POU) that need one box of mug every 1080 minutes regardless the size.

The general formula to calculate the right number of kanban is:

\[
\text{[ Daily Demand } \times \text{ Lead Time (in days)} \times (1 + \% \text{ Safety Stock}) ] \div \text{ [ Quantity in a Container ]}
\]
Looking into details:

Daily Demand = 1 Batch (Regardless the kind of mug)

Lead Time = 3 days Warehouse + 1 day Labeling and Polishing (i.e. 176 pcs * 9 min) = 4 Days

1 + % Safety = 1,2 (it is considered 20% of safety from the company)

Quantity in a container = 1 Batch (Regardless the kind of mug)

N° Kanban = 1 Batch * 4 * 1,2 / 1 Batch = 4,8 ==> 5 Kanban

What does it means?

This means that with 5 Kanban you should have the right amount of WIP to allow production flow. In this case (different kind of mugs) the kanban has to be only a signal to move mugs from warehouse. The kind of mugs should be managed by "Heijunka Box" or "Every Part Every Week".

See the simulation on Slide Share:

Download the Kanban Calculator software on www.leanlab.name

Exescise Code: KB-004