# Case Study 1 – Food Industry / Capacity Constraint

## $400,000 saved and 15% capacity gained by working through the question, why are we so far from where we should be?

### Introduction

This food company was at a the point where the company's capacity appeared to be maxed out and they were facing a hefty investment decision.

The process was simple:


Applied Performance consultant, Jim Beswick, was told they were looking at spending $400,000 to buy and install a new oven to add to the four ovens they already had in place. Jim's first step was to look at their theoretical capacity and compare it to what their actual production was. The theoretical capacity was simple to calculate:

1. The company's total work day was 15 hours (2 shifts of 8 hours less 1 hour for cleaning and hygiene).
2. The cooking time per batch was 30 minutes equalling 30 batches per day.
3. Each batch was 120 units.
4. The company's capacity was therefore equal to 30 batches per oven x 4 ovens x 120 units = 14,400 units per day.

The company's actual production was much lower, fluctuating between 12,000 and 13,000 units per day. ***Where was the 2,000 units in lost capacity?***

It had to be in the "3 Know Components": the Work Day, Cooking Time and Oven Capacity. This is where we began our analysis.

### Work day

Essentially we needed to know if the ovens were being used for the full 15 hours per day. To answer this, we systematically reviewed the entire work day for the ovens.

First, we looked at the start-up process: did operators have to wait for the ovens to warm up in the morning? Answer: no. The ovens were steam heated and ready to be used at the start of the day. What was noticeable at the start of the day was there was no product ready, so cooking didn't commence for another 15 to 20 minutes. Also, it was impossible to load all the ovens at the same time in the morning, meaning that ovens were unused while other ovens were being loaded.

Next we looked at what was happening at the end of the day. We found out that if a batch was not going to be finished before the scheduled cleaning time, it was not started. This meant at least one oven was empty 20 minutes before cleaning started and sometimes all four ovens were empty before the end of the day.

We then looked at what was happening during the day. We reviewed the break times and found that when breaks didn't align with the batch cooking times, then again oven time was being lost.

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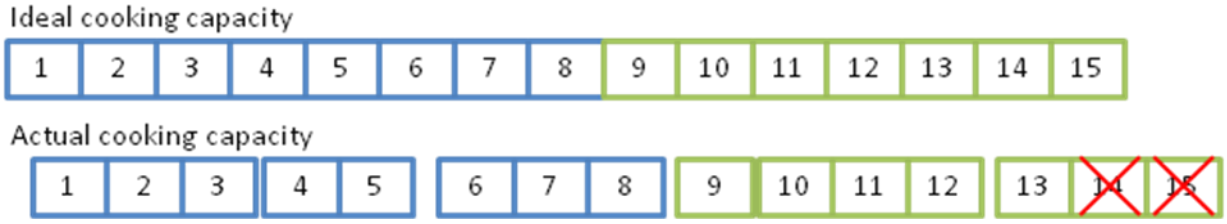
Schematically the work day often looked like this:




The solutions were simple:

1. **Could product be prepped the day before?**
   Yes, so cooking could start when the work day started.
2. **Could break times be staggered by 10 minutes so there was always someone available to load and unload batches?**
   Yes, now ovens weren't waiting for operators
3. **Could start times be staggered 10 minutes so that the loading of ovens could be staggered over 10 minutes at the day start?**
   Yes, now it wasn't all rush and wait.
4. **Could the ovens be cleaned at different times?**
   Yes they would now be cleaned separately so it was not necessary for them all to be stop by the last hour.

### Cooking Time

We then took a closer look at the cooking time to determine if every was batch being cooked for exactly 30 minutes or were there variations in the cooking time? Interestingly for this process, the product did not degrade if it was cooked for longer than the 30 minutes. To see how it was working in real life, we spoke with the operators. It was apparent that the 30 minute cook time was often being exceeded for 2 simple reasons.

The first reason was the signal to indicate if the 30 minutes was finished was only on the entry side of the ovens. So when the operator was on the exit side, he had no way of knowing it was time to unload and reload the oven.

The second reason was that there was bottleneck further along in the process. The ovens often had to wait for cooling capacity. So the ovens couldn't be unloaded and reloaded until the cooling area was ready.

Again, the solutions were simple:

1. A second signal was added to each oven on the exit side. In this case, a flashing light.
2. 8 fans were added to the cooling area, improving the cooling capacity so that it was greater than the ovens.
3. Also the staggering of the cooking start times helped to prevent the cooling area from being overloaded.

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## Capacity

It felt a little silly to go out and check the oven racks to see if they actually did carry 120 units (15 rows of 8). However, it turned out to be well worth it! We found that the number of rows on the racks ranged from 12 to 16. We also found that a rack with 16 rows was difficult to load and would cause product damage.

Once again, there was a simple the solution:

- Standardize all racks to have 15 rows.
- A contract welder was hired to convert all racks to 15 rows.

## Savings

The result was a savings of $400,000 for about a $12,000 expenditure, primarily on fans and welding. The biggest change for the company was finding that it had 15% additional capacity that it did not have to pay for. Therefore, for any additional work taken on, the overheads were already covered, the only cost being material, which increased the profit margin from 5% to nearly 25%!

## Lean Thinking

The Lean thinking used here was to look at the process **Overall Equipment Effectiveness** (OEE), which is a measure of how well a process is performing against its potential. OEE is calculated by multiplying, as percentages, the process speed x utilization x quality. In this particular situation, we looked primarily at the process speed (cook time) and utilization (number of batches per day and batch size) as these were the critical issues. Quality was being tackled as a separate project. The result of the changes was that the OEE improved from 75% to 90%.

This shows how small losses can quickly add up to a much bigger 15% of capacity. It also shows the reverse, how small gains can quickly add up.

Going forward the company introduced a simple set of measures to show when production was deviating from the new standard. Problems could then be quickly identified and resolved. The longer term aim was to continue to improve the OEE and, therefore the profitability of the company.