

# Equipment Set Up Situation

- When purchasing a new piece of equipment for manufacturing, it is important to learn how it works before moving it to the production floor.
- Often, this process is one of a) trying out a few parts b) questioning why it does what it does c) being forced to move the machine to production because they “just have to have it.” d) suffering the consequences
- These transitions are painful before and after the equipment moves.

# Equipment Set Up with DOE

- We have found it helpful to apply DOE to accelerate learning and provide more equipment knowledge.
- This Case Study summary provides a look at a range of applications which are common industrial applications.

# Three Equipment Set Up DOE Case Studies

- A drilling process was able to find an operating window that increased throughput by 4x, without increasing scrap or broken bits
- A new packaging machine was ordered to seal product for sterilization. A bug was found in the software during the demonstration period – forcing it to be fixed at no cost by the vendor.
- New technology was being investigated for volume processing of product. A process window was not possible, meaning that tooling and fundamental changes to the equipment would be needed to achieve process capability.

# 1) Drilling Equipment

- Goal: Expand operating window for drilling operation, if possible.
- Responses: Improve throughput time, but consider quality of product and expenses such as broken drill bits.
- Approach: Consider key variables such as feed rate and drill speed, plus the range of product produced, in a DOE set up.
- Result: A process was found that increased through put by 4x, without increasing scrap or broken bits
  - This clearly avoided the need to purchase duplicate equipment for a longer period of time than originally expected.

## 2) Packaging Equipment

- **Goal:** A new packaging machine was ordered to seal product for sterilization. Prior to acceptance, the company wanted to confirm it would work as promised.
- **Response:** Peel strength, cost and variability
- **Approach:** Evaluate the standard time, temperature and pressure variables within the recommended ranges in a DOE framework.
- **Result:** A bug was found in the software during the demonstration period – forcing it to be fixed at no cost by the vendor.
  - This was also done in a timely manner, since the vendor would not get paid until it was resolved.
  - Production did not need to scream for the equipment! It was ready, and working properly, in plenty of time for the capacity increase and floor layout changes.

## 3) New Process Technology

- **Goal:** New technology was being investigated for volume processing of product. Raw material was provided by customer.
- **Responses:** Specific operational capabilities, specified by the customer.
- **Approach:** Investigate the recommended (and not recommended) ranges for processing parameters. Determine if a sweet spot for the process exists.
- **Result:** A process window was not possible, meaning that tooling and fundamental changes to the equipment would be needed to achieve process capability.
  - It was also possible that the customer supplied raw material would need to be changed.

## Overall DOE Set Up Results

- In each case, either an opportunity or an issue was uncovered.
- The ability to show the results with a high level of confidence accelerated customer or vendor communications.
- Decisions could be made quickly.
- In the first two cases, the resolutions were identified and satisfied customer needs.
- In the last case, the situation was considerably more complex. Decisions could be made early: do we pursue this complex assignment and if so, at what price.

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