

Examining the Manufacturing Process & Measuring Productivity

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Example: Plastic Film Extrusion Operation

- A daily machine output sheet was generated by the plant engineer
 - Two 4.5 in. (11.5 cm) polyethylene mono-film extruders were generating outputs of 450 (204 kg) and 550 pounds (249 kg) per hour of film, depending on the thickness.
- The resin supplier's sales representative stated a new 4.5 in. (11.5 cm) polyethylene mono-film extruders should generate at an output of 1200 pounds (543.6 kg) per hour at the same thickness.
- Barrel and screw were wore down, resulting in a decrease in efficiency.
 - Could be maintained to original condition.

Thing to Keep in Mind

- Productivity is usually never measured or when it is the information is not used properly.
 - The plant engineer was collecting the information but was not using it.
- Periodic investments in maintenance can improve productivity.
 - Machines were operating at 40% of its capability.
 - Machinery operating higher than 92% of its rated capacity is considered excellent.

Maintenance

- Mechanical or electrical breakdowns are inevitable and unpredictable
 - Drop efficiency below the optimum level
- Reasons for breakdowns:
 - Stress
 - Cracking
 - Wear
 - Poor choice of lubricants
 - Hostile ambient conditions
 - Operator error
 - Sabotage

Preventive Maintenance (P/M) Programs

- Reduces maintenance down-time, but requires detailed paperwork and clerical input
- A simple first step may be regularly oiling and greasing with proper lubricants
- Detailed historical analysis of breakdowns
 - Helps identify which parts may fail and the estimated time to failure
 - Hopefully before the useful life ends key parts will be replaced
- Keep parts that are difficult to obtain or have long order times in inventory.

Objective of P/M Programs

- Reduce breakdown maintenance down-time with increased planned maintenance down-time.
- Balance the high costs of a maintenance P/M program
- What is an acceptable down-time?
 - Each industry is different, so there is no absolute answer.
 - Reasonable estimate for heavy machinery is maintenance cost, such as parts and labor, should be 5% of the replacement cost.

Efficiency Calculation

- Industry figures may not be available for comparison
- Know the company's current efficiency and compare to previous time periods.
- Create a simple method for determining efficiency output.
 - This is not easy because efficiency is measured as output over input, and output and input can be expressed in many ways. For example, units of time, weight, dollars, and so on.
 - Find the most reasonable measurement possible to compare to previous years

Video: Measures of Productivity

Measurement of Inefficiency

- Measuring raw materials that have been purchased and processed, but never sold.
- The three categories for raw materials are:
 - Scrap
 - Waste
 - Rework

Scrap

- Result of production error
- Poor or insufficient supervision, inadequate training, or lack of instruction result in errors.
- Scrap should be addressed because it is expensive
- To estimate scrap compare standards usage to actual usage

Waste

- The normal amount of material left over from the production
- Unavoidable leftovers may be disposed, re-processed, or reused
- If waste material has a market value the disposal may be lucrative
- Toxic or undesirable waste should be disposed of properly
- Waste should be calculated and compared to a standard

Rework

- Materials from an unusable end-product may be down-graded and re-used as raw materials
- Re-grounding materials is expensive because labor and overhead is being paid for a second time and reworked products may have reduced sales value due to the reduction of the end products quality.

Insidious Time Losses

- Efficiency may be lost through lost time or ineffective use of time of the employee.
- Most common factors:
 - Absenteeism
 - Grievances
 - Overtime

Absenteeism

- Turnarounds tend to include poor work habits and attitudes
- Examples of some obvious signs:
 - Increase in Friday and Monday absenteeism
 - Rash calling in sick
 - Mysterious back aches
- “Friendly” doctors that prescribe long periods of rest time

Absenteeism

- Steps that may be taken by the turnaround person:
 - Organize myriad meetings with small groups of workers
 - Explain the turnaround expert's role
 - Describe where the turnaround person thinks the company is heading
 - Elicit the feelings of employees (Ex. Pet peeves, personal ambitions, the future of the company, and their place and role within the company)

Absenteeism

- The goal of the turnaround person is:
 - Instill positive feelings
 - Gain the worker's confidence
 - Get workers to believe in the company and its future

Grievances

- Counting active grievances helps determine the health of the union and management relationship.
- Displeasure and frustration grievances tends to increase when financial fortunes are failing.
- The healing process may only begin when the turnaround person explains his purpose and gains the confidence of union leadership.
 - The turnaround person must make the first move and set the climate.

Overtime

- Shift workers tend to work less overtime
- Small amounts of overtime is healthy
 - Overtime must be fairly distributed amongst all workers
- The optimum amount of overtime can be calculated
 - Weigh the cost of overtime against the cost of hiring a worker for full shifts at straight time
- Overtime tends to be 3% to 5% of labor cost, 8% or higher should serve as a warning.

Worker Efficiency

- There are weakness to the human side of productivity For example:
 - Stopping for breaks
 - Stopping to speak with others
 - Stopping early for lunch
- Total machine efficiency above 87% is considered above average
 - Total machine efficiency is machine up-hours divided by total available hours.

Labor Cost

- May be one of the reasons for the company's financial difficulty
- Negotiated labor agreements may increase the worker's pay with no relationship to real living costs or without considering the increase of competitive companies
 - Results in the workforce getting paid in excess of what would be considered reasonable.
- The likelihood of reducing workers' pay is small
 - May think financial troubles are a hoax

Video: Improve Operator Efficiency

Thank You!