Productivity Improvement in High Pressure Die Casting

Presentation By:
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What is Productivity?

Productivity is the measure of how specified resources are managed to accomplish timely objectives as stated in terms of quantity and quality.

Productivity isn't everything, but in the long run it is almost everything

Productivity is usually expressed in one of three forms:

- Partial Factor Productivity,
- Multifactor Productivity,
- Total Factor Productivity.
Partial Factor Productivity,

The standard definition of productivity is actually what is known as a partial factor measure of productivity, in the sense that it only considers a single input in the ratio.

The formula then for partial-factor productivity would be the ratio of total output to a single input.

Multifactor Productivity,

A multifactor productivity measure utilizes more than a single factor, for example, both labour and capital. Hence, multifactor productivity is the ratio of total output to a subset of inputs.

A subset of inputs might consist of only labour and materials or it could include capital.

And Total Productivity.

A broader gauge of productivity, total factor productivity is measured by combining the effects of all the resources used in the production of goods and services (labor, capital, raw material, energy, etc.) and dividing it into the output.
Facts:

One of the major causes of company's decline is low productivity.

Failure to meet targeted productivity can result to high costs per unit, hence higher prices, making your good, services, or commodities not competitive enough on the market.

Many businesses try very hard to remain competitive in the market. Therefore, it is important for businesses to implement strategies to make improvements in productivity levels.

Businesses can make productivity improvement by asking themselves questions

Productivity Improvement can also be achieved by implementing several latest technologies and smaller supporting equipments.
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Example:
Productivity Devices, Goods and its Benefits

Selection of Die Casting Machine

Parting Injection U series

U2W / U2PLUS/ U20 / U30

Courtesy: Hishinuma Machinery Co. Ltd
### U20 & CX25F2

<table>
<thead>
<tr>
<th></th>
<th>U20</th>
<th>CX25</th>
<th>% Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cycle time</strong></td>
<td>5 sec</td>
<td>13 sec</td>
<td>38%</td>
</tr>
<tr>
<td><strong>Production</strong></td>
<td>720 shot / hour</td>
<td>276 shot / hour</td>
<td>260%</td>
</tr>
<tr>
<td><strong>Cavity weight</strong></td>
<td>24.263 g</td>
<td>24.202 g</td>
<td>100.25%</td>
</tr>
<tr>
<td><strong>Shot weight</strong></td>
<td>45.06 g</td>
<td>93.87 g</td>
<td>48%</td>
</tr>
<tr>
<td><strong>Scrap weight</strong></td>
<td>20.8 g</td>
<td>60.87 g</td>
<td>34%</td>
</tr>
</tbody>
</table>

**Courtesy:** Hishinuma Machinery Co. Ltd
Gravity Casting Tilt Pour Machines

Multiple Castings in One Cycle Time

Rotary Table / Carousel

Courtesy: CMH Manufacturing, USA
Regular Maintenance Of Die Casting Machine Tie Bars

Strain Measurement Devices
Regular Maintenance Of Die Casting Machine Injection System

Courtesy: OTI, UK
Process Monitoring System

Complete Process Technologies
For Improving Die Casting Quality
and Profits, Worldwide!

Innovatively Designed,
Rugged and Reliable

Process Monitoring

1. Quality castings, understand variation causes.
2. Reduce scrap & set-up time while avoiding downtime.
3. Document machine capability to minimize surprises.
4. Diagnose machine problems quickly and with confidence.
6. Flexible & Cost Effective systems options - see diagrams below.
Visi-Trak – Shot Monitoring System
Capability to track each and every casting part with its complete shot profile and its history from manufacturing stage to end of product delivery.
Die Temperature Controller

Benefits

1. Save cost on die preheat.
2. Improved die life.
3. Less maintenance work.
4. Avoid casting defects.
5. No heat check marks on casting and die.
7. Optimized die temperature.
Quick Die Change System

Manual Die change time is 30mins to 75mins.
With Quick Die Change System in less than 15mins.
### Plunger Tip

<table>
<thead>
<tr>
<th></th>
<th>CAST IRON</th>
<th>BERYLLIUM COPPER</th>
</tr>
</thead>
<tbody>
<tr>
<td>COST OF EACH TIP FOR 60 DIA</td>
<td>400</td>
<td>5500</td>
</tr>
<tr>
<td>SHOTS</td>
<td>1000</td>
<td>40,000</td>
</tr>
<tr>
<td>Plunger tip change over time after</td>
<td>500 min (8 ½ hrs.)</td>
<td>20,000 min (333½ hrs.)=19 days</td>
</tr>
<tr>
<td>CYCLE TIME (Approx.)</td>
<td>30 sec</td>
<td>30 sec</td>
</tr>
<tr>
<td>Approx. Cost of Component</td>
<td>Rs. 10</td>
<td>Rs. 10</td>
</tr>
<tr>
<td>If company works 18 hrs. per day</td>
<td>2 tips/day</td>
<td>1 tip/19 days</td>
</tr>
<tr>
<td>For 19 days</td>
<td>38 tips</td>
<td>1 tip</td>
</tr>
<tr>
<td>For changing of each tip to load and unload and heating of dies it takes up to 30 min</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production loss due to change of 38 tips = 2280 Components (Shots)</td>
<td>2280 * Rs. 10 = Rs. 22800</td>
<td>-</td>
</tr>
<tr>
<td>For die heating (Rs.100/change of tip)</td>
<td>Rs. 3800</td>
<td>-</td>
</tr>
<tr>
<td>Manpower (4000/month) Rs. 10 for 30 min</td>
<td>Rs. 380</td>
<td></td>
</tr>
<tr>
<td>Cost for 38 tips</td>
<td>Rs. 15200</td>
<td>One Tip Rs. 5500</td>
</tr>
<tr>
<td>TOTAL</td>
<td>Rs. 42180</td>
<td>-5500</td>
</tr>
<tr>
<td>Savings</td>
<td>Rs. 36680</td>
<td></td>
</tr>
</tbody>
</table>

Courtesy: Hildreth Manufacturing LLC, USA
Casting Simulation Software

Low Pressure Die Casting

Shot Sleeve

Die Temperature

Complete Process Simulation & Validate

Courtesy: FLOW-3D
### Casting Simulation Software

<table>
<thead>
<tr>
<th></th>
<th>Projected Area in Cm²</th>
<th>Shot Weight (Grams)</th>
<th>HPDC Machine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing Design</td>
<td>240</td>
<td>767</td>
<td>250 Ton</td>
</tr>
<tr>
<td>Modified Design</td>
<td>130</td>
<td>570</td>
<td>150 Ton</td>
</tr>
<tr>
<td><strong>Percentage Improvement</strong></td>
<td><strong>-46 %</strong></td>
<td><strong>-26 %</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Courtesy:** CRP India (P) Ltd., Chennai
Water-Free Electrostatic Spray Technology
for High Pressure Die Casting
Water Based & WFR Effect

With Water Base

With WFR
Water Based & WFR Effect

With WFR on Toshiba 350 Ton M/c
Quick Economics

<table>
<thead>
<tr>
<th></th>
<th>Water Treatment</th>
<th>Waste Water Disposal</th>
<th>Cost per die</th>
<th>Approx. 70,00,000</th>
<th>Min 3 time More</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Die Life</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Compressed Air</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Reduce Metal Temperature</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>A. Avoid turbulence</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>B. Control Porosity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>C. Energy Saving in Metal melting</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>No Fumes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Maitain Clean Environment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>No Human Health or Environment Hazardous</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>With Electrostatic ensure complete die area is with die coat</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

800 Ton m/c

<table>
<thead>
<tr>
<th></th>
<th>15 Kg * Rs. 3000</th>
<th>Rs.45000</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2ml / shot 15 kg = 15000ml</td>
<td>7500 sprays</td>
</tr>
</tbody>
</table>
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Questions?
Thank You

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Questions about the Business itself:

• *Research and Analysis* – Has the business done any research on the targeted markets and analyze the result on the approaches best fit?

• *Smart Investment* – Has the business calculated the amount of financial resources available to allocate to research and analysis, production cost, *labour cost*, and marketing?

• *Productive Risks* – Are there any risks that the company should know of during production?

• *Innovation and Originality* - Is your product something original and in a new market?