“If you can’t measure it, you can’t improve it.” – Lord Kelvin
About me

• 23 Years in Manufacturing Software

• Founded SensrTrx 2015
Goals

- Process Improvement
- Lower costs
- Increase Capacity & Throughput
- On time delivery
- Improve Quality
- Competitive Advantage
“If you can’t measure it, you can’t improve it.”

– Lord Kelvin
Hard to Get

- Very Expensive
- Complicated
- Need specialized staff
- Months/Years to implement
- Systems from Rockwell/GE
Context is King
Heterogenous Equipment

- Different types
- Different ages
- May not have sensors
Most Popular Production Reporting Method?
Excel is a Problem

• Very error prone
• Subjective
• Manual Roll ups
• Locked up
• No real time visibility
Market changes

• Lower costs sensors
• Network connectivity
• Cloud
• Created the ability to do this easily and cheaply.
A 1,000 Mile Journey Begins with a Single Step
Examples

• Stamping
• Wire manufacturing
Controls & PLCs

Sensors

SensrTrx Gateway
Supports 100+ protocols

Manual Data Collection
• Augment
• Add Context

Algorithms
• Summarize
• Calculate
• Predict
• Real Time

System Architecture

Dashboards
• Role Based
• Operator to CEO
SensrTrx Cloud Details

Contextualize
- Facility
- Department
- Shift
- Machine

Algorithms
- OEE
- Bottlenecking
- Machine Learning
- Custom Algorithms

Visualization
- Trends & Analysis
- Aggregate Views
- Details

Integration
- Maintenance Management
- ERP
- MES

Manufacturing Insights
- Summary Dashboards
- Via Email
- Daily, Weekly, Monthly

Alerts
- Errors
- Warnings
Stamping Company

- 20 different machines
- Limited visibility into plant floor
- Manual reporting on excel and paper
Stamping Solution
<table>
<thead>
<tr>
<th>Cell</th>
<th>Status</th>
<th>Downtime</th>
<th>Quantity</th>
<th>Op Time</th>
<th>Up Time %</th>
<th>Cycle Time PPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injection Molding 01</td>
<td>up</td>
<td>112.86</td>
<td>1.00</td>
<td>460.00</td>
<td>75.47%</td>
<td>4.16</td>
</tr>
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<td>86.21</td>
<td>2.00</td>
<td>460.00</td>
<td>81.26%</td>
<td>5.09</td>
</tr>
<tr>
<td>Injection Molding 03</td>
<td>up</td>
<td>31.93</td>
<td>1.00</td>
<td>460.00</td>
<td>93.06%</td>
<td>4.35</td>
</tr>
<tr>
<td>Injection Molding 04</td>
<td>up</td>
<td>0.00</td>
<td>1.00</td>
<td>460.00</td>
<td>100.00%</td>
<td>4.47</td>
</tr>
<tr>
<td>Injection Molding 05</td>
<td>up</td>
<td>0.00</td>
<td>2.00</td>
<td>460.00</td>
<td>100.00%</td>
<td>4.41</td>
</tr>
<tr>
<td>Injection Molding 06</td>
<td>up</td>
<td>78.09</td>
<td>1.00</td>
<td>460.00</td>
<td>83.02%</td>
<td>4.91</td>
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<td>0.14%</td>
<td>0.00</td>
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<tr>
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<td>up</td>
<td>0.00</td>
<td>0.00</td>
<td>340.00</td>
<td>100.00%</td>
<td>0.00</td>
</tr>
<tr>
<td>Injection Molding 09</td>
<td>down</td>
<td>339.52</td>
<td>0.00</td>
<td>340.00</td>
<td>0.14%</td>
<td>0.00</td>
</tr>
<tr>
<td>Injection Molding 10</td>
<td>up</td>
<td>0.00</td>
<td>0.00</td>
<td>340.00</td>
<td>100.00%</td>
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</tbody>
</table>
## Daily Shift Update

### Machine Status

<table>
<thead>
<tr>
<th>Machine Name</th>
<th>Status of Machine</th>
<th>Downtime Duration</th>
<th>Quantity</th>
<th>Op Time</th>
<th>Up Time</th>
<th>Downtime</th>
<th>UP Time %</th>
<th>Avg PPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>P511</td>
<td>down</td>
<td>238.3</td>
<td>3</td>
<td>479</td>
<td>4</td>
<td>475</td>
<td>0.7%</td>
<td>0.8</td>
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<tr>
<td>P522</td>
<td>down</td>
<td>42.8</td>
<td>2,053</td>
<td>479</td>
<td>258</td>
<td>221</td>
<td>53.8%</td>
<td>8.0</td>
</tr>
<tr>
<td>P533</td>
<td>down</td>
<td>123.3</td>
<td>53</td>
<td>479</td>
<td>31</td>
<td>448</td>
<td>6.4%</td>
<td>1.7</td>
</tr>
<tr>
<td>P544</td>
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<td>3,995</td>
<td>479</td>
<td>458</td>
<td>21</td>
<td>95.6%</td>
<td>8.7</td>
</tr>
<tr>
<td>P555</td>
<td>down</td>
<td>4.0</td>
<td>350</td>
<td>479</td>
<td>96</td>
<td>383</td>
<td>20.1%</td>
<td>3.6</td>
</tr>
<tr>
<td>P566</td>
<td>down</td>
<td>3.0</td>
<td>861</td>
<td>479</td>
<td>142</td>
<td>337</td>
<td>29.7%</td>
<td>6.1</td>
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<tr>
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<td>0.0</td>
<td>1,293</td>
<td>479</td>
<td>294</td>
<td>185</td>
<td>61.4%</td>
<td>4.4</td>
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<tr>
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<td>106</td>
<td>479</td>
<td>37</td>
<td>442</td>
<td>7.6%</td>
<td>2.9</td>
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<tr>
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<td>215.5</td>
<td>1,054</td>
<td>479</td>
<td>181</td>
<td>298</td>
<td>37.8%</td>
<td>5.8</td>
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<tr>
<td>P600</td>
<td>up</td>
<td>0.0</td>
<td>2,942</td>
<td>479</td>
<td>473</td>
<td>6</td>
<td>98.6%</td>
<td>6.2</td>
</tr>
</tbody>
</table>

### Dashboard Filters

- **Start Date:** 03/01/2019
- **End Date:** 03/07/2019

Total:

- **Total Downtime:** 635.8
- **Total Up Time:** 12,710
- **Total PPM:** 4,790
- **Total Production:** 1,973
- **Total Output:** 2,817
- **Total Efficiency:** 412.0%
An alert was triggered:

- **Name:** P10
- **Description:** Press 10 Down > 5 mins
- **Alert Time:** 03/07/2019 6:48 CST

**Details**

- **Cell ID:** 1d36c7a0-a061-11e6-86c3-ef8c12a0d188
- **Type:** downtime

**Information**

- **Cell:** Ball Machine
- **Department:** Machining
- **Facility:** St Louis
- **Company:** SensrTrx

[View Production Log]
Wire Manufacturer

- 7 different lines
- Multiple machines per line
- Manual data collection
Wireless Solution
Stamping - What’s it cost?

$31,249
Wireless - What’s it cost?

$21,242