Getting the Most out of an Operator Asset Care Program
OPERATOR DRIVEN RELIABILITY (ODR) TRAINING PROGRAM
Tracey Meeks
AGENDA

1. ODR Vision and Mission
2. Current Program
3. Brief History
4. What have we Learned
5. The Future of ODR
6. What ODR have given us
ODR Vision and Mission Statements

Our Vision
To produce the highest level of Asset Operator Care in the Industry

Our Mission
We will provide a superior training platform of educational value by teaching strong technical skills in reliability maintenance and predictive technology.
Trainer and Creator

Tracey Meeks

- Nissan ODR Creator/Trainer/Supervisor
- GMR Master Trainer
- 9 yrs Maint. Experience
- 26 Years in the Automotive Industry
- UE Ultrasonic Level 1 &2 Certified
- 20 year of Service
- Maintenance and Reliability Management diploma- Marshall Institute NCSU
- RMC 2022 Boot Camp Completion
Goal Of The ODR Program

- **Enablement** – Provide training in the form of computer-based learning, in conjunction with a hands-on approach, enhancing the skills levels of our employees, empowering them to perform their daily duties at a higher level.

- **Engagement** – Operators performing preventive maintenance tasks on their equipment to include inspection, troubleshooting, and making simple repairs to problems that are identified.
Break Down By Levels

**ODR Level 1 (2 weeks)**
Curriculum:
- Basic Hand Tools
- Portable Power Tools
- Making Measurement
- Lubricants and Lubrication
- Autonomous Maintenance Step Activity
- ABCD Tool Safety Training and Certification

**ODR Level 2 (2 weeks)**
Curriculum:
- Troubleshooting Skills
- Basic Mechanics
- Power Transmission Equipment
- Bearings
- PDM / Predictive Maintenance Technologies

**ODR Level 3 (3 weeks)**
Curriculum:
- Pneumatics
- Hydraulics
- Pumps
- Mathematics

**ODR Level 4 (4 weeks)**
Curriculum:
- Basic Electricity and Electronics
- Electrical Measuring Equipment
- AC / DC Equipment and Controls
- Transformers
Lubrication and Autonomous Inspection

Level 1 includes the basic elements needed to lubricate and inspect the machinery on a regular basis. This gives the operator a better sense of ownership for his/her piece of equipment. Autonomous Maintenance is introduced on the shop floor in the form of a group step activity.

ODR Level 1 Includes the following Curriculum:

- **Basic Hand Tools**
  - Course is designed to cover most hands tool and the proper safety guidelines for using them

- **Portable Power Tools**
  - Highlights the proper use and maintenance for using power tools

- **ABCD Tool Safety training and Certification**

- **Making Measurements**
  - Teaches the student the different aspects of measuring devices, proper use and conversions associated with measuring different things

- **Lubricants and Lubrication**
  - Teaches the different types of oils and grease while highlighting their application and properties how to be used in different environments
Safety Training in the ODR Program

• TOOL CERTIFICATION WILL EDUCATE EACH INDIVIDUAL ON THE SAFETY ASPECT OF ALL LEVELS A-D
• NOTE: YOU WILL NOT BE AN OPERATOR OF THE EQUIPMENT UNTIL YOU HAVE BEEN PROPERLY TRAINED ON A MACHINE
• IT TAKES TIME TO DEVELOP SKILLS TO OPERATE SOME MACHINERY
• YOU WILL BE TESTED AFTER EACH LEVEL
• PASSING SCORE IS 80% AND ABOVE
• WE WILL THEN TAKE THAT KNOWLEDGE TO THE MACHINE SHOP AND SEE FIRST HAND THE OPERATION OF DIFFERENT EQUIPMENT AND THEIR COMPONENTS

Level D
- Hammer Drill
- Air Chisel
- Disc Sander
- Electric Drill
- Hand Operated Grinder
- Bench/Pedestal Grinder
- Pedestal Belt Sander
- Ladder

Level C
- Circular Saw
- Router
- Magnetic Drill
- Jigsaw
- Pipe Bender (conduit)
- Table Saw
- Miter / Radial Arm Saw
- Panel Saw
- Sawzall
- Porta Band Saw
- Pipe Threader

Level B
- Metal Worker (hole Punch)
- Shearer
- Joiner
- Planer
- Metal Brake
- Drill Press
- Hydraulic Press
- Arbor Press
- Vertical Band Saw
- Metal Chop Saw (hand held)
- Horizontal Band Saw
- Cut off Wheel

Level A
- Stick Welder
- MIG Welder
- TIG Welder
- Mill
- Lathe
- Oxy-Acetylene Torch
- Compressed Gas Cylinders
- Plasma Cutter
Autonomous Maintenance Step Activities

1. Initial cleaning & Inspection
2. Eliminate source of problem
3. Establish check & lubrication standards
4. Improve the skills for simple repairs
5. Autonomous Maintenance
Step Activities

What is a Step Activity?

Answer:

A step activity is a restoration activity on one or more pieces of equipment that allows the operators to restore the asset to optimal running condition using skills learned in the ODR levels. Operators learn to clean and repair damaged or neglected equipment.
Step Activities

Why is it done?

Answer:

A well executed step activity works well for both production and maintenance. Problems can be easily identified and repaired in an asset that is in good working order. Also, a well-maintained piece of equipment will have fewer instances of downtime and be more efficient.
It not just what you see!

You must utilize your senses when it comes to a proper inspection. Look, Listen and Feel.
What are we going to look for?

Loose sensors – limit switches, proximity sensors, photoelectric switches
Loose or damaged wiring
Worn, loose, and damaged fasteners
Swarf and oil contamination
Loose belts and drive chains
Air and fluid leaks, damaged hoses
Worn and damaged machine components
Before and After
Before and After
ODR Foundations are Strong

8 Pillars of Activity

1. Autonomous Maintenance
   - Operators monitor the condition of their own equipment and work areas.

2. Process & Machine Improvement
   - Focus on improving equipment and work areas through autonomous maintenance.

3. Preventative Maintenance
   - Preventive maintenance tasks and schedules are shared by operators and team leaders.

4. Early Management of New Equipment
   - Early management of new equipment ensures smooth transition.

5. Process Quality Management
   - Improves quality and efficiency through continuous improvements.

6. Administrative Work
   - Administrative roles support and facilitate TPM activities.

7. Education & Training
   - Education and training improve skills and efficiency.

8. Safety & Sustained Success
   - Safety is prioritized to sustain the success of the TPM program.

The Three Goals of TPM:
1. Zero unplanned failures
2. Zero product defects
3. Zero accidents
Step 4: Improve Skills & Make Simple Repairs

- Replaced Gauge
- Clean Air Filters
- Fixed loose bolts & matched marked
- Identified exposed wire
- Repaired Prox Sensor Cable
- Repaired nicks on gripper
- Before
- After
ODR Level 2

Mechanical and Troubleshooting skills
Level 2 goes into further depth by teaching about the basics of mechanics, power transmission equipment, and bearings terminology. Students also learn to develop skills in basic troubleshooting

ODR Level 2 Includes the following Curriculum:

• Troubleshooting skills
  • Course is designed to cover tools and the proper procedures used when troubleshooting equipment on the shop floor

• Basic Mechanics
  • The mechanical elements that make up a machine. Course also highlights mechanical drawing

• Power Transmission Equipment
  • Items covered include belt drives, chain drives, pulleys couplings, clutches and brakes. Students will also learn hands-on spindle alignment application and criticality

• Bearings
  • Teaches the different types of bearings and their lubrication and care while highlighting installation procedure and causes for failure

• Predictive Maintenance technology.
  • Ultrasound – Detection of electrical phenomenon, air and/or gas leaks, bearing failure.
  • Thermography – Early bearing failure and motor failure.
  • Pyrometer- PDM Tracking for motors
  • Stroboscope- non-invasive inspection
What can a Level 2 ODR Technician do for You?

Basic mechanics and Troubleshooting skills

Level 2 technicians have been trained in mechanical operation and troubleshooting skills, they have had hands on training in the following:

- UE systems ultrasound using the UE 3000
- Leak detection using the Fluke 900 series leak detector
- Bearing care and lubrication
- Spindle and motor alignment, using a dial indicator (measurement with tolerances within 50 microns at 360 degrees)
- Mechanical and parts drawings for recreation of critical parts
ODR Level 3

Hydraulic, Pneumatics, and Mathematics
Level 3 teaches the basics of hydraulic and pneumatics. Students will learn symbols and schematics. They will learn the basics pumps and Mathematics

ODR Level 3 Includes the following Curriculum:

• Pneumatics
  • Course will the explain theory and function of pneumatic components. It will include symbols, diagrams and creation of simple pneumatic circuits

• Hydraulics
  • Course will the explain theory and function of hydraulic components. It will include symbols, diagrams and creation of simple hydraulic circuits

• Pumps
  • Teaches the student the different components that are associated with pumps. They will learn the operation and different types used. Students will have then dis-assemble and reassemble each type and explain their function

• Applied Mathematics in the Plant
  • Teaches foundational mathematics skills ranging from base numbering systems to trigonometric functions
What can A Level 3 ODR Technician do for You?

Basic Hydraulic and Pneumatic skills

Level 3 technicians have been trained in the principles of both hydraulic and pneumatic circuits. They will also possess the skills needed to perform basic inspections and simple repairs on these systems.

- Temperature readings on electric motors and pumps
- Filter change outs “Hydraulic & Pneumatic”
- Directional valve replacement or rebuild
- Hydraulic pump seal replacements
- Hose assembly and installation
- Various other dynamic PM task currently being performed by maintenance techs.
- Replacement of Directional Control Valves
ODR Level 4

Basic Electricity and Electronics
Level 4 teaches the basics of Electricity and electronics by teaching theory and hands on application. Students will learn how to read wiring symbols and schematics.

ODR Level 4 Includes the following Curriculum:

• Basic Electricity and Electronics
  • Covers the laws and principles of electricity with ohms laws and Kirchoff’s Law. Teaches the principles of voltage, current and resistance

• Electrical Measuring Equipment
  • An overview of electrical measuring devices and how they work and safety associated with

• AC / DC equipment and Controls
  • Teaches the student the differences in Alternating Current and Direct Current and the differences in the equipment they use

• Transformers
  • Teaches Electrical math and reinforces AC circuit terminology, explains turns ratios in Transformers and 3- phase power
  • Students will be expected to wire and label circuits in both AC and DC settings
3. ODR Program

Progression Ladder

ODR Level 1 - Lubrication and Autonomous Inspection

ODR Level 2 - Mechanical and Troubleshooting skills

ODR Level 3 - Hydraulics, Pneumatics, and Introduction to Mathematics

ODR Level 4 - Basic Electricity, Electrical Theory and Application

ODR Level 5 - Introduction to PLC’s and basic programming

ODR Level 6 - Introduction to Robotics, Basic Robot programs

ODR Level 7/GMR - Global Maintenance Reinforcement

Future

Current
The Fifth Rung: ODR Level 5

PLC basics and Programming
Level 5 teaches the basics PLC’s by starting with the basic minimum. Student will learn basic commands and language to program basic logic.

ODR Level 4 Includes the following Curriculum:

• Learning the PLC
  • Students will learn to identify the parts of a PLC and how each component works. They will assemble and wire a PLC system

• Numbering Systems
  • An overview of numbering systems. For example: Binary, Hexadecimal, Octal, and Binary coded decimal

• Basic Programming
  • Teaches the student the basics of ladder logic programming and the different elements used in logic programming

• Introduction to HMI Screens
  • Students will develop basic screens that can be used in conjunction with their PLC programs
The Sixth Rung: ODR Level 6

Robotics for Beginners
Level 6 teaches the basics of Robotics by using hands on application with classroom reinforcement. Students will learn how to interact with Robots and program safely

ODR Level 6 Includes the following Curriculum:

• Basic Robot Controllers
  • Covers the safety aspects and the electrical side of the controller cabinet and it functions

• Learning the Teach Pendant
  • An overview of how to use the teach pendant for robotics programming and function

• Tool handling and Macros
  • Teaches the student how to set a tool center point and user frames for different fixtures

• Basic Programming
  • Allows the student to create and develop his/her own program and teaches them how to edit points and positions
Global Maintenance Reinforcement

Level 7 is a comprehensive class designed to reinforce levels 1 through 6 and to further enhance skills that have been previously learned in the lower levels of ODR.

**ODR Level 7 Includes the following Curriculum:**

- **Mechanical Elements**
  - The how and why things function the way they do and their uses apply to maintenance troubleshooting

- **Troubleshooting Electrical, hydraulic and pneumatic circuits**
  - A reinforcement of electrical measuring devices, fluid power and how to correct problems associated with each

- **Mechanical Drawing**
  - Teaches the student the importance of drawing and recreating a parts with structure and detail.

- **Maintenance management**
  - Teaches student the importance of machine and breakdown prioritization, and how to measure the aspects of downtime utilization
Examples of: PM5 (Maint.) FOLLOW-UP WORK ORDERS IDENTIFIED

PM5 WORK ORDERS SUBMITTED

<table>
<thead>
<tr>
<th>Work Order #</th>
<th>Shop ID</th>
<th>Shift ID</th>
<th>Asset Name</th>
<th>Asset ID</th>
<th>Failure?</th>
<th>Comments</th>
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<tbody>
<tr>
<td>ZH – ZONE 2</td>
<td>CRANK PULLY SECURE – DE26NR001</td>
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<td>1) REPLACE 2 DAMAGED PROX SENSORS ON FLYWHEEL SIDE – CASEY</td>
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<td>2) LOOSE STABILIZER BOLTS ON MACHINE FEET – CASEY</td>
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<td>3) CABLES IN WIRE MESH CONNECTED TO MOVING SLIDE PLATE – CASEY</td>
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<td>4) CABLES LAYING IN FLOOR – CASEY / JESSICA</td>
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<td>5) LOOSE OUTLET COVER – MARKED YELLOW - NOVELLA B.</td>
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<td>6) PLC PORT COVER BROKEN ON MAIN PANEL</td>
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<tr>
<td>ZH – ZONE 2</td>
<td>VALVE COVER/INTAKE SECURE – DE25NR002</td>
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<td>7) COVER NEEDED FOR ELECTRICAL OUTLET ON SIDE OF HMI CONTROL PANEL</td>
</tr>
</tbody>
</table>

PM5 WORK ORDERS NEEDED (NO MFG PM’s FOR THESE ASSETS)
ODR Road Map

**Launch of each level based on these milestones:**
- Pool 200 level one to launch level 2. Currently 85% pass rate for level 1.
- Pool 100 level two to launch level 3. Assumed pass rate of 85% for level 2.
- Pool 60 level 3 to launch level 4. Assuming pass rate of 75% for level 3.

2018
- ODR Launched
- First Class - 4 supervisors, 12 week Course
- 40 personnel Trained through all 4 Levels
- Second ODR Trainer added Johnny Smith plant 2 Training lab established

2019
- ODR broken down into 4 individual levels
- Implementation of step activity into Level 1
- Sept. ‘19 Launched Level 2 ODR in RTC
- Third ODR Trainer added - Richard Cashion
- Launched Level 3 ODR Oct. ‘20 Fluid Power, pumps and Applied Math
  - Covid-19 Shutdown April -June

2020
- February - 50% of Decherd Campus completed ODR Level 1, 15% have completed Level 2
- Applied Mathematics for Electricity added to Level 3
- Began ODR Supervisor Training in Sept. 2021

2021
- October - Level 4- Foundations of Electricity Launched
## ODR Milestones:

### ODR Participation As Of June 1, 2022

<table>
<thead>
<tr>
<th>ODR Participation by Level</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
<th>Totals</th>
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<tbody>
<tr>
<td>Students Attended</td>
<td>677</td>
<td>268</td>
<td>55</td>
<td>19</td>
<td>1019</td>
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<tr>
<td>1st Time Pass Rate</td>
<td>94%</td>
<td>99%</td>
<td>91%</td>
<td>74%</td>
<td>89%</td>
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<tr>
<td>Total hours Trained by Level</td>
<td>54160</td>
<td>21440</td>
<td>6600</td>
<td>3040</td>
<td>85240</td>
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<tr>
<td>% of Campus Trained per Level</td>
<td>61%</td>
<td>24%</td>
<td>5%</td>
<td>2%</td>
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</tbody>
</table>

2019 ODR Level 2 First Class in the New RTC
What have we learned

<table>
<thead>
<tr>
<th>Continuous Training</th>
<th>ODR Supervisor / Manager Training Sept. ‘21</th>
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</thead>
<tbody>
<tr>
<td>Supervisors</td>
<td>34 Supervisors trained on how to use their ODR operators</td>
</tr>
<tr>
<td>Managers</td>
<td>2 Managers Trained, 1 of which was from the Maintenance Department</td>
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</tbody>
</table>
The CMMS system is not just a valuable tool for Maintenance.
Each student trained on opening & closing PM Work Orders in Maintenance Connection.

Failure

Repairs

Maintenance Connection provides Web-Based Maintenance

<table>
<thead>
<tr>
<th>Task</th>
<th>Est. Time</th>
<th>Actual Time</th>
<th>Condition Rating</th>
<th>Reading (Initial)</th>
<th>Reading (Final)</th>
<th>Reading (Tool Used)</th>
<th>Initials</th>
<th>Failure?</th>
<th>Eng Review?</th>
<th>Complete?</th>
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<td>EMSZ1</td>
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<td>Pressure gauge missing frame cover. (WED Maint Tech) had to order frame cover. Tresa Loudemilk &amp; Shawn Roberts found during ODR step activity</td>
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<td>Wires showing on sensor PRGS X1120 - installed new prox switch. Tresa Loudemilk &amp; Shawn Roberts done during ODR step activity</td>
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<td>Prox sensor X1134A &amp; cables were loose per inspection fixed by Tresa &amp; Gabor during ODR step activity</td>
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<tr>
<td>Loose Cat Track cover - fixed by Tresa &amp; Shawn during STEP Activity</td>
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<tr>
<td>1. Fiber optic sensor cable was cut into per inspection. Cable no longer in use. ODR instructor removed 2 on robot 2 gantry wire track. Wires rubbing against metal, wires broken &amp; wire connectors were separated. Tresa &amp; Gabor placed tubing over 3 purple wires to eliminate rubbing, reconnected wires that were not connected &amp; placed Velcro around wires where wire ties were cut</td>
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</tbody>
</table>
What have we learned

Scheduling Training for Individuals

### Current class enrollment process

#### Desired class enrollment process

| ODR Level 1 | VSP/Retired | Hopkins, Gary (Retired) | ODR Level 2 | Failed Level | Pobanz, Paul | ODR Level 3 | Plant 2 | Payton, Tom | ODR Level 4 | Apprentice | McDaniel, Richard | ODR Level 5 | Incomplete | Steele, Jerry | ODR Level 6 | Promotion/Transfer | Powers, Jeremy | Curtis, Lauren | Davis, Carolyn | ODR Level 1 | Block Line | Payton | Hankins | ODR Level 2 | Block Line | Payton |
|-------------|-------------|-------------------------|-------------|-------------|-------------|-------------|----------|------------|-------------|------------|----------------|-------------|------------|-------------|-------------|----------------|----------------|------------|-------------|-------------|------------|-----------|----------|--------|-------------|------------|--------|
| 17-Jun      | Absent     | Girls                   | 11-Jul      | Absent     | Boys        | 3-Sep       | Absent   | Boys       | 4-Sep       | Absent     | Girls         | 6-Sep       | Absent    | Boys        | 8-Sep       | Absent     | Girls       | 9-Sep       | Absent     | Boys       | 10-Sep     | Absent   | Girls     | 11-Sep     | Absent   | Boys         | 12-Sep     | Absent   |

Supervisors enroll their workers through a shared file on common drive
- Absenteeism and attrition create training gaps and low class volume

ODR Trainers evaluate areas and assess and schedule training based on data
- Training plan is scheduled 3 months in advance for planning purposes and would eliminate training gaps
Use what we’ve learned to drive future activities/projects

Potential abnormalities

Effect of autonomous maintenance and a robust Operator care Program where Maintenance can execute predictive technology

Effect of planned maintenance (preventive maintenance)

Effect of continuous improvement (Kaizen)

Occurrence of abnormalities

Embedding into the next equipment specification

Time

Effect of those activities on New Work

Time

Occurrence of abnormalities

Graph relating Overall Equipment Efficiency to Decherd activities

ODR and Autonomous Maintenance - Effect of activities
Currently there are 362 identified PM tasks assigned to assembly equipment that Maintenance has responsibility for completing.

ODR technicians can alleviate 69% of these tasks. *We are currently working with Maintenance and Manufacturing to add these to the Manufacturing PM’s and assign to technicians by level of ODR training completed.*

For Example:
- **ODR Level 1 Technicians:** can replace coolant filters on Coolant Supply
- **ODR Level 2 Technicians:** can grease needle bearings inside spindle housing on Nut-runner Station
- **ODR Level 3 Technicians:** can inspect/clean/replace seals on Actuator Guided Cylinder

Maintenance technicians can concentrate more on Condition Based Monitoring evaluations, as well as, Root Cause Analysis investigations on short stop / downtime creating issues.

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<table>
<thead>
<tr>
<th>ODR Level 1</th>
<th>ODR Level 2</th>
<th>ODR Level 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>56 Technicians</td>
<td>35 Technicians</td>
<td>16 Technicians</td>
</tr>
</tbody>
</table>

12 of these are trainers
What Has ODR Given Us

- Operators are taking **Ownership** of their equipment.
- Becoming responsible for day-to-day maintenance to preserve basic condition.
- Restoring deteriorated parts found during overall inspection.
- Optimizing PM’s
- Increasing MTBF and reducing MTTR thus effecting overall BDR.

**Lower Cost Repairs**

PR Valve Install Head Clamp
Cylinder Leaking –
- Even under shutdown conditions, the cylinder took 4 hours to replace
- Identified and repaired
- Resulted in a cost avoidance of $8,490.

Repair damaged I/O cables & proximity sensors
- average downtime 15 mins. Each.
- Potential cost avoidance of $900 / occurrence
ODR by the Numbers

- STEP Activities Completed: 37
- Items identified & repaired during STEP activities: 603
- 222 pieces of equipment inspected and serviced
Example
Operator improvement from our machining department resulting in a ROI of $40,272.00/Yr. Internally and a cost avoidance of $297,000.00

• This machining work group has completed ODR levels 1, 2, and 3.
• Including the one above, this group has completed 14 Kaizen’s on their line since finishing Level 3
• Their collective 14 Kaizens add up to a total Return on Investment of $133,342.58
Forging Case Study

ODR generates Efficiency

<table>
<thead>
<tr>
<th>Shift</th>
<th>Runtime</th>
<th>Cntrl Stop</th>
<th>TPW/FM</th>
<th>Act Prod</th>
<th>Sch Prod</th>
<th>Variance</th>
<th>Actual OEE</th>
<th>Planned OEE</th>
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</thead>
<tbody>
<tr>
<td>DS</td>
<td>6919</td>
<td>30</td>
<td>671</td>
<td>28019</td>
<td>30028</td>
<td>-2009</td>
<td>64.1%</td>
<td>84.2%</td>
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<tr>
<td>NS</td>
<td>6972</td>
<td>60</td>
<td>90</td>
<td>34656</td>
<td>32195</td>
<td>2461</td>
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<td>94.9%</td>
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<td>0</td>
<td>1402</td>
<td>23888</td>
<td>26212</td>
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<td>62.6%</td>
<td>79.6%</td>
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<tr>
<td>WN</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Calculated in Minutes:

With the Run Times almost equal. The real difference, Ultimately was spending less time (90 minutes) doing the right tasks with the right people, as opposed to spending more time (671 minutes) doing the wrong tasks. ALSO, THERE WAS A PARTS COUNT DIFFERENCE OF 4,470 PARTS PRODUCED.

7x more time spent
There was a 106.85 minute reduction in short stop downtime after a Step activity was performed in our E-motor area. A 25% decrease in downtime from month to month, a total cost savings of $96,165.00
QUESTIONS?