

# “Human Error in Maintenance is High because of Lack of Effective Maintenance Planning and Scheduling”

By John Day PE  
Former Engineering/Maintenance Manager  
at Alcoa Mt Holly (World Class Maintenance)

My interview with John Day on December 22, 2021

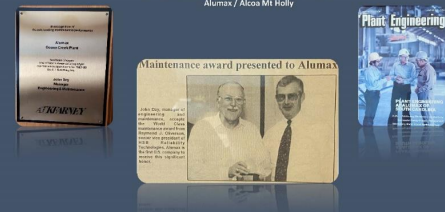
John Day and I have been good friends for over 35 years and Alumax / Alcoa Mt Holly is where I learned what “World Class Maintenance” looks like and if applied correctly reaps tremendous benefits. My years in Maintenance at Alumax / Alcoa Mt Holly set the foundation for who I am today. I spent time with John this week to wish him Merry Christmas and to listen to his words of wisdom. (I visit with John once or twice a year to hear his words of wisdom, this year’s visit made me aware of Human Error being caused by ineffective Planning/Scheduling). Never thought about this issue so I had to think about his statement before I wrote this article.

*“There are many definitions of human error, though they all have a common feature. Human error is a label given to an action that has negative consequences or fails to achieve the desired outcome.”*

*“by Barbara G. Kanki, ... Cynthia Null, in Space Safety and Human Performance, 2018”*



The Roots of World Class Maintenance  
John Day, PE – Engineering/Maintenance Manager  
Alumax / Alcoa Mt Holly

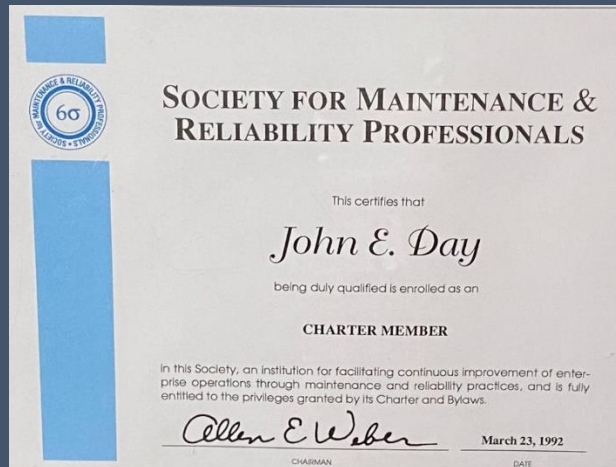


Alcoa-Mt. Holly (formerly Alumax of South Carolina) has been recognized as a proactive maintenance benchmark for over 18 years. Organizations designating Alcoa’s Mt. Holly operation as among the best in maintenance execution include PLANT ENGINEERING Magazine, A.T. Kearney, Inc., Hartford Steam Boiler Reliabilities Technology Division, and Life Cycle Engineering.

## World Class Maintenance vs Typical Attributes

| Category                       | Typical Maintenance                         | World Class Maintenance |
|--------------------------------|---|-------------------------|
| Maintenance Cost as a % RAV    | 5.6 – 11%                                   | 2.0-2.5%                |
| Budget Compliance              | Less than 60%                               | 100%                    |
| Planners per Craftsperson      | No Planner or No Proactive Planning Process | 1 - 20                  |
| Absenteeism                    | 10% plus                                    | +/- 5.0 %               |
| Ready Backlog in Weeks         | Unknown                                     | 2-4 weeks               |
| % Planned Work                 | 15% or less                                 | 90%                     |
| Schedule Compliance            | 50%   | 90-100%                 |
| PM Compliance                  | 60%   | 95-100%                 |
| Inventory Accuracy             | Unknown                                     | 95% plus                |
| Maintenance Training Cost      | No Budget                                   | 6% of Budget            |
| Maintenance Rework             | High  | Low                     |
| Accurate Maintenance Dashboard | Not Available                               | 100%                    |

In March 1992 John Day became a “Charter Member of SMRP (Society for Maintenance and Reliability Professionals).



John was truly a pioneer in “What is World Class Maintenance and proved through dedication and discipline that the rewards as a result of this process are many”.

Based on John’s philosophy from a basic point of view there are only two maintenance approaches. One approach is reactive, and the other is proactive. In practice there are many combinations of the basic approaches.

The reactive approach responds to a work request or identified need, usually production identified, and depends on rapid response measures if effective. The goals of this approach are to reduce response time to a minimum (the computer helps) and to reduce equipment down time to an acceptable level. This is the approach used by most operations today.

The proactive approach responds primarily to equipment assessment (preventive maintenance/predictive maintenance). The overwhelming majority of corrective, preventative, and modification work is generated internally in the maintenance function as a result of inspections and predictive procedures.

The goals of this method are continuous equipment performance to established specifications, maintenance which ensures capacity, and continuous improvement. Alumax of SC (Alcoa Mt Holly) practiced the proactive method. The comments which follow are based upon the experience and results of pursuing this vision of maintenance.

## MAINTENANCE MANAGEMENT PHILOSOPHY

Alumax/Alcoa Mt Holly of SC began development of the maintenance management concept with the idea that maintenance work would be planned / scheduled and managed in a way that always provides an efficient continuous operating facility.

Add to this that maintenance would also be treated as an investment rather than a cost, and you have the comprehensive philosophy on which the maintenance management system was built.

An investment is expected to show a positive return, and so should maintenance be expected to improve the profitability of an operation. The management philosophy for

maintenance is just as important as the philosophy established for any business operation. For most industry, maintenance is a supervised function at best, with little real cost control. But it must be a managed function employing the best methods and systems available to produce profitable results that have a positive effect on profitability.

The development of a philosophy to support the concept of proactive planned and scheduled maintenance is important. It is believed that many maintenance management deficiencies or failures have resulted from having poorly constructed philosophies or the reliance upon procedures, systems, or popular programs that have no real philosophical basis.

Based on the statement concerning Planning and Scheduling John stated to me that The #1 Reason why companies do not meet their expectations is because of “Human Error” which is caused by a LACK OF EFFECTIVE MAINTENANCE PLANNING AND SCHEDULING.

Effective Maintenance Planning and Scheduling is a process which results in:

1. Higher Wrench-Time

**Top 5 Reasons Why Maintenance Planning does not increase Wrench-Time?**

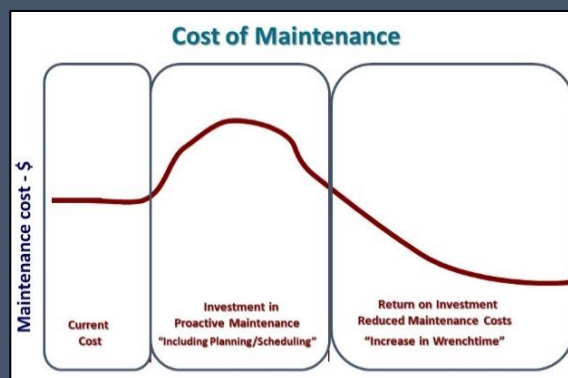


1. No one at the Plant / Organization has ever seen Proactive Planning and Scheduling
2. Maintenance Planning and Scheduling Function is not measured with Leading and Lagging KPIs (no scoreboard/dashboard)
3. No time to plan and schedule because we have too many equipment problems and failures
4. Maintenance Planner is pulled into today's reactivity
5. Maintenance Planner has never been formally trained in Planner and Scheduling

- World Class Wrench-Time = 55-65%
- Typical Wrench-Time = 15-25%
- Worst in Class Wrench-Time = 5-10%

- **Wrench-Time** is a measure of crafts personnel at work, using tools, in front of jobs.
- **Wrench-Time** does not include obtaining parts, tools or instructions, or the travel associated with those tasks.
- **It does not include** traveling to or from jobs.
- **It does not include** time spent obtaining work assignments.

2. Proactive Planning and Scheduling reduces cost however it requires an investment in training and coaching of all stakeholders.



3. Reduces “Human Induces Failures” (Human Error) however it requires discipline in Maintenance Execution of Proactive Work through use of well defined “Roles and Responsibilities” which aligns everyone towards a common goal.

| Proactive Maintenance<br>"Roles and Responsibilities" |          |           |            |             |        |            |               |       |
|---|----------|-----------|------------|-------------|--------|------------|---------------|-------|
| Task  | Position | Prod Mgt. | Maint Mgr. | Maint Super | Stores | Maint Tech | Maint Planner | Oper. |
| Write a Work Request                                  |          | I         | A          | R           |        | R          | R             | R     |
| Convert to Work Order                                 |          | I         | A          | R           | C      | I          | R             | I     |
| WO Charged to an Asset                                |          |           | A          | R           |        | C          | R             | C     |
| Maintenance Planning                                  |          | C         | A          | C           |        | C          | R             |       |
| Maintenance Scheduling                                |          | C         | A          | C           | C      |            | R             |       |
| Work Execution  |          | I         | A          | R           |        | R          |               |       |
| Work Order Data Input                                 |          |           | A          | C           |        | R          | R             |       |
| Work Order Close Out                                  |          | C         | A          | C           | I      | C          | R             | I     |
| Maintenance KPIs                                      |          | I         | A          | C           |        |            | R             |       |

Responsibility  
accountable  
consulted  
informed

"the Doer" (could be more than one)  
"the Boss" (One person only)  
"two-way communication" (in the loop)  
"one-way communication" (kept in the picture)

4. Requires Repeatable Procedures to ensure everyone is performing the work the same way every time to specifications thus reducing human-induced equipment failures and it was not an option at Alcoa Mt Holly.

| <b>Equipment Block ID:</b><br>SeeRock, Min. 2-ROTOR MARJETTA MINERS<br><b>Equipment Hierarchy:</b><br>664000 Miner<br><b>Project Description:</b><br>2-Rotor Miner Front End Inspection<br><b>Job Description:</b><br>Inspect shear pin plates<br><b>Frequency:</b> Monthly<br><b>Estimated Craft Hours:</b> 1 x 1.0<br><b>Estimated Production Downtime:</b> 1<br><b>Originator:</b> Dave Stone<br><b>Date:</b> Mine Maintenance<br><b>Version:</b> 1<br><b>Origination Date:</b> 09/11/2012<br><b>Previous Version(s) Modification:</b><br><b>Approved:</b> DS<br><b>Version #: 1.0</b><br><b>Warnings:</b> Always use face shield over safety glasses when blowing off equipment. Lockout procedure must be followed.<br><b>Caution:</b> Failure to follow torque specs can result in equipment failure.<br><b>Personal Protective Equipment Required:</b> gloves, face shield, hearing protection<br><table border="1"> <thead> <tr> <th>Part # / Store #</th> <th>Part Description</th> <th>Quantity</th> <th>Quantity Description</th> </tr> </thead> <tbody> <tr> <td>Part #</td> <td>1/2" x 2" Dr. B washer</td> <td>6</td> <td>each</td> </tr> <tr> <td>Part #</td> <td>head bolts</td> <td></td> <td></td> </tr> </tbody> </table> <b>Consumables Needed:</b><br>Degreaser, paper towels<br><b>Special Tools Required:</b><br>2 pry bar<br>1 torque wrench<br><b>Mobile/Special Equipment:</b> | Part # / Store #  | Part Description | Quantity             | Quantity Description | Part #      | 1/2" x 2" Dr. B washer | 6 | each | Part # | head bolts |  |  | <b>Required Departmental Coordination:</b><br>Production shutdown / position / blow off equipment<br><b>Other Procedures Referenced:</b><br>Job Preparation / Lockout Procedure #000<br><table border="1"> <thead> <tr> <th>ID</th> <th>Description</th> <th>Craft</th> <th># of Crafts</th> <th>Clock Hours</th> <th>Craft Hours</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Clean area to be inspected using compressed air or degreaser as required.<br/><b>Warning: Use face shield when blowing with compressed air. Warning: Ensure hydraulic pump drive motor is rotated and fan guard before operation.</b></td> <td>Mech</td> <td>1</td> <td>0.2</td> <td>0.2</td> </tr> <tr> <td>2</td> <td>Inspect shear pin plates</td> <td>Mech</td> <td>1</td> <td>0.3</td> <td>0.3</td> </tr> <tr> <td>2-1</td> <td>Visually check for cracks on shear pin plates<br/>Are any cracks evident? Yes <input type="checkbox"/> No <input type="checkbox"/></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>2-2</td> <td>Insert 2" pry bar between plates to check for movement. Is any movement present? Yes <input type="checkbox"/> No <input type="checkbox"/></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>3</td> <td>Inspect spacer<br/>Visually inspect for:<br/>Cracks Yes <input type="checkbox"/> No <input type="checkbox"/><br/>Broken Teeth Yes <input type="checkbox"/> No <input type="checkbox"/><br/>Visible Signs of Wear? If indicated, report findings below and to immediate supervisor for appropriate actions</td> <td>Mech</td> <td>1</td> <td>0.3</td> <td>0.3</td> </tr> <tr> <td>4</td> <td>Inspect retainer cap</td> <td>Mech</td> <td>1</td> <td>0.2</td> <td>0.2</td> </tr> <tr> <td>4-1</td> <td>Visually inspect for broken bolts<br/>Are there any broken bolts? Yes <input type="checkbox"/> No <input type="checkbox"/></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>4-2</td> <td>If broken bolts are found, replace as required<br/><b>Replace bolts to 80 ft. lb.</b></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> | ID | Description | Craft | # of Crafts | Clock Hours | Craft Hours | 1 | Clean area to be inspected using compressed air or degreaser as required.<br><b>Warning: Use face shield when blowing with compressed air. Warning: Ensure hydraulic pump drive motor is rotated and fan guard before operation.</b> | Mech | 1 | 0.2 | 0.2 | 2 | Inspect shear pin plates | Mech | 1 | 0.3 | 0.3 | 2-1 | Visually check for cracks on shear pin plates<br>Are any cracks evident? Yes <input type="checkbox"/> No <input type="checkbox"/> |  |  |  |  | 2-2 | Insert 2" pry bar between plates to check for movement. Is any movement present? Yes <input type="checkbox"/> No <input type="checkbox"/> |  |  |  |  | 3 | Inspect spacer<br>Visually inspect for:<br>Cracks Yes <input type="checkbox"/> No <input type="checkbox"/><br>Broken Teeth Yes <input type="checkbox"/> No <input type="checkbox"/><br>Visible Signs of Wear? If indicated, report findings below and to immediate supervisor for appropriate actions | Mech | 1 | 0.3 | 0.3 | 4 | Inspect retainer cap | Mech | 1 | 0.2 | 0.2 | 4-1 | Visually inspect for broken bolts<br>Are there any broken bolts? Yes <input type="checkbox"/> No <input type="checkbox"/> |  |  |  |  | 4-2 | If broken bolts are found, replace as required<br><b>Replace bolts to 80 ft. lb.</b> |  |  |  |  |
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| Part # / Store #   | Part Description  | Quantity         | Quantity Description |                      |             |                        |   |      |        |            |  |  |   |    |             |       |             |             |             |   |  |      |   |     |     |   |                          |      |   |     |     |     |   |  |  |  |  |     |   |  |  |  |  |   |   |      |   |     |     |   |                      |      |   |     |     |     |   |  |  |  |  |     |  |  |  |  |  |
| Part #   | 1/2" x 2" Dr. B washer  | 6                | each                 |                      |             |                        |   |      |        |            |  |  |   |    |             |       |             |             |             |   |  |      |   |     |     |   |                          |      |   |     |     |     |   |  |  |  |  |     |   |  |  |  |  |   |   |      |   |     |     |   |                      |      |   |     |     |     |   |  |  |  |  |     |  |  |  |  |  |
| Part #   | head bolts  |                  |                      |                      |             |                        |   |      |        |            |  |  |   |    |             |       |             |             |             |   |  |      |   |     |     |   |                          |      |   |     |     |     |   |  |  |  |  |     |   |  |  |  |  |   |   |      |   |     |     |   |                      |      |   |     |     |     |   |  |  |  |  |     |  |  |  |  |  |
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| 2  | Inspect shear pin plates  | Mech             | 1                    | 0.3                  | 0.3         |                        |   |      |        |            |  |  |   |    |             |       |             |             |             |   |  |      |   |     |     |   |                          |      |   |     |     |     |   |  |  |  |  |     |   |  |  |  |  |   |   |      |   |     |     |   |                      |      |   |     |     |     |   |  |  |  |  |     |  |  |  |  |  |
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| 4  | Inspect retainer cap  | Mech             | 1                    | 0.2                  | 0.2         |                        |   |      |        |            |  |  |   |    |             |       |             |             |             |   |  |      |   |     |     |   |                          |      |   |     |     |     |   |  |  |  |  |     |   |  |  |  |  |   |   |      |   |     |     |   |                      |      |   |     |     |     |   |  |  |  |  |     |  |  |  |  |  |
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John Day's comments concerning the "correlation between Maintenance Planning and Scheduling and Human Induced Failures" is critical to success of companies who are struggling with optimal asset reliability at optimal cost.

## Maintenance Planning and Scheduling Workshop "Live" and "Virtual" at Southern Wesleyan University's Bryant Lodge

February 8-10, 2022

At a Great training location on a small lake and quiet -- 4 miles from Clemson, SC --- 30 minutes from GSP Airport (Greenville-Spartanburg Airport)

Information? [rsmith@worldclassmaintenance.org](mailto:rsmith@worldclassmaintenance.org)



Bryant Lodge



Questions/Comments? Email me at [rsmith@worldclassmaintenance.org](mailto:rsmith@worldclassmaintenance.org)