

7 Steps to Make Your Planning and Scheduling More Effective

By Ricky Smith CMRP, CMRT



WORLD
CLASS
MAINTENANCE Inc.



Checkout our website for Maintenance/Reliability Best Practices information which may meet your needs,
with no email addresses required at: www.worldclassmaintenance.org

Follow us on Facebook at <https://www.facebook.com/worldclassmaintenance.org>

Follow us on LinkedIn at: <https://www.linkedin.com/company/world-class-maintenance>

Definitions

Maintenance

To Maintain – Keep, Preserve, Protect from Degradation

Maintenance Planned Work

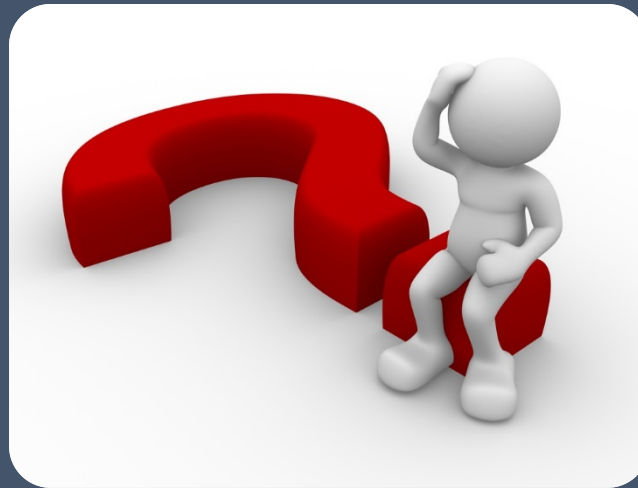
Work that has gone through a formal planning process to identify labor, materials, tools, and safety requirements. This information is assembled into a job plan package and communicated to craft workers prior to the start of the work.

Maintenance Scheduling

Maintenance scheduling refers to the timing of planned work, when the work should be done and who should perform it. It offers details of "when" and "who." Scheduling is meant to: Schedule the maximum amount of work with the available resources. Schedule according to the highest priority work orders.

Expectations of Maintenance Planning and Scheduling

1. Unsure?
2. Decrease in Failures
3. Effective Utilization of Maintenance Labor, Material, and Parts
4. Reduction in Cost
5. Less stress
6. ???



Objective of Maintenance Planning and Scheduling

1. To Optimize Maintenance resources: labor, material, and parts
2. To Optimize Asset Reliability through minimized unscheduled and scheduled downtime
3. To Optimize Cost

TABLE 7.2. Maintenance Costs in Typical and World-Class Companies

Metric	Typical	World Class
Maintenance cost/replacement asset value Maintenance cost must include labor (including overtime), materials, contract maintenance, and capital replacements, and maintenance (replacing worn-out assets because they were never properly maintained)	3.5–9%	2.0–3.0%
Maintenance materials cost/replacement asset value Maintenance materials cost must include material in storeroom stock plus material in other locations (maintenance shop, plant floor, etc.)	1.0–3.5%	0.25–0.75%

Best Practices Benchmarks

- **Schedule Compliance 80-90%**
- **Breaks to the Schedule (minimal)**
- **% of Planned Work 90%**
- **PM Execution – 15%**
- **Results from PM Execution – 15%**
- **PdM Execution – 15%**
- **Results from PdM – 35%**
- **Wrench Time typical company – 18-30%**
- **World Class Company – 55% +**
- **Maintenance Cost (Reactive) 3.5 – 9.0% / RAV**
- **Maintenance Cost (World Class) 2.0 – 3.0% / RAV**

**Data Source;
Alcoa's World Class
Maintenance Global
Initiative**

Root Causes of Equipment Failure

A Few Causes of Equipment Failures:

1. Lack of repeatable PM and Corrective procedures
2. Lack of discipline in Maintenance Work Execution
3. Lack of discipline in Production Operating Equipment to Specifications
4. Lack of effective Maintenance Leading and Lagging KPIs
5. No formal process for Maintenance Planning and Scheduling
6. No formal training in Maintenance and Reliability Best Practices for all critical players

"IF YOU CANNOT REPEAT IT, YOU CANNOT IMPROVE IT"

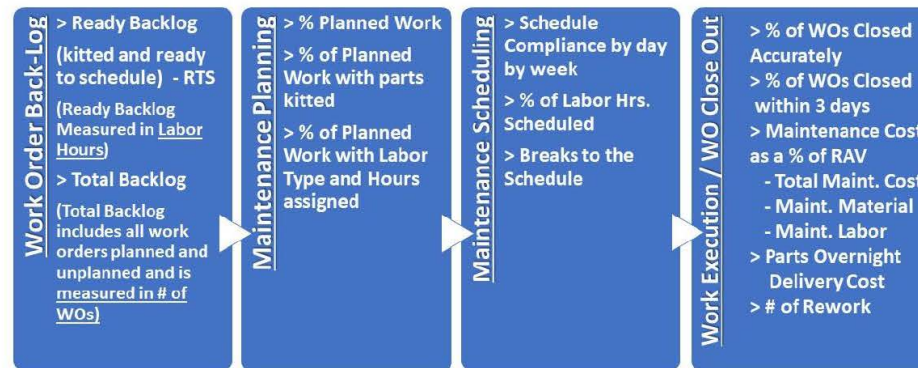
MAINTENANCE VISION

The Maintenance Vision for the XYZ Plant is to always provide an efficient continuous operating facility through...

- minimizing unscheduled / scheduled downtime
- ...and by approaching maintenance as an investment
- with a goal of minimizing the cost over the long run.

Proactive Maintenance Planning and Scheduling Guiding Principles

- Maintenance Planners focus on Future Work only, today's issues are handled by Maintenance Supervisor or Lead Person
- All work "Scheduled" which require parts / material are kitted in a secure area
- All Planned and Scheduled work is tracked through status codes, see "Status Codes" below:
 - RTS – Ready to Schedule (parts kitted and staged/secure)
 - AP – Awaiting Parts
 - AWP – Awaiting Production
- All Work Scheduled one week in advance, typically scheduling meeting is held on Thursday for the following week with Production, Maintenance, and others as required (ie. Contractors, Safety)
- Leading and Lagging KPIs are used to manage the Planning, Scheduling, and Work Execution Process.



Work Order Requirements

“Not an Option for Proactive Maintenance Planning and Scheduling”

A Work Order is critical to ensure:

- A Planned/Scheduled Work Order is Repeatable
- What work is to be done
- What work was done
- Step by Step Instructions
- Actions required of the work
- Maintenance KPIs are accurate
- The % of Maintenance Work assigned to;
 - Reactive Work
 - Proactive Work
 - Project Work

PM Line 3

Equipment Block ID: _____
 Chart 102 - Line 3
 Equipment Hierarchy: E540000
 Project Description: Preventive Maintenance - Inspect Line 3 Shear Pins
 Job Description: PM Line 3
 Frequency: Monthly
 Estimated Craft Hours: 1 x 1.0 Estimated Elapsed Time: 1.0
 Estimated Production Downtime: _____
 Originator: Dave Smith Origination Date: 01/12/2020
 Owner: Maintenance Dept Version #: 1
 Previous Version(s) Modification(s): _____
 Approval: DS Version #: 1.0
 Warnings: Failure to follow PM requirements can result in equipment failure
 Cautions: _____
 Personal Protective Equipment Required: Gloves, face shield, hearing protection
 Part # (Stores ID) Part Description Quantity Unit Quantity Description
 ES - 31256 1/2" x 2" Gr. 5 socket & head bolts 6 each
 Consumables Needed: Degreaser, paper towels
 Special Tools Required: 2" pry bar, 1/2" torque wrench
 Mobile/Special Equipment: _____

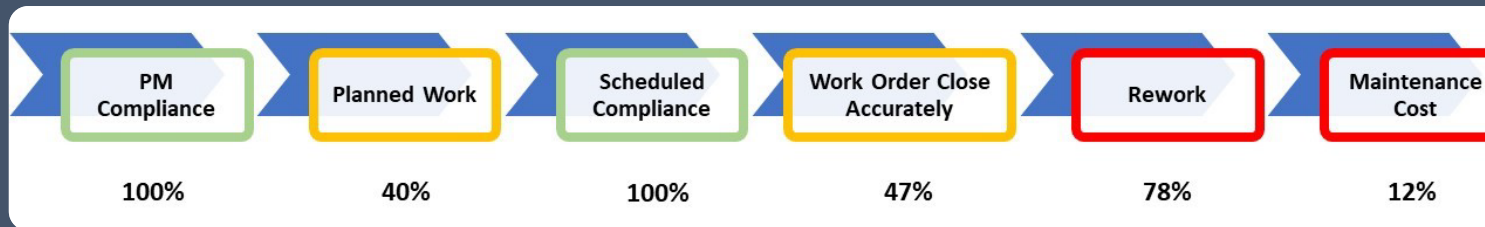
PM Line 3

Required Departmental Coordination: _____
 Production shutdown / position / blow off equipment: _____
 Other Procedures Referenced: None

ID	Description	Craft	# of Crafts	Clock Hours	Craft Hours
1	Clean area to be inspected using compressed air or degreaser as required Warning: use face shield when blowing with compressed air Warning: Ensure hydro-pulse pump drive motor is locked out. Tag test before proceeding.	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 Are any cracks evident? Yes No				
2-2	Insert 2" pry bar between plates to check for movement. Is any movement present? Yes No				
3	Inspect sprocket	Mech	1	0.3	0.3
3-1	Visually inspect for: Cracks Yes No Broken Teeth Yes No Visible Signs of Wear? Yes No If indicated, repair findings below and to immediate supervisor for appropriate actions				
4	Inspect retainer cap	Mech	1	0.2	0.2
4-1	Visually inspect for broken bolts Are there any broken bolts? Yes No				
4-2	If broken bolts are found, replace as required Replace bolts to 85 ft. lb.				

PM Line 3

Condition (As Found): _____
 Condition (As Left): _____
 Comments: _____
 Craft's Feedback on Procedures: _____
 Craft's Signature(s): _____
 Date: _____



Maintenance Issues

Most maintenance staff work 2-4 hours a day

- Effective Direct work is low
- Caused by Lack of effective Planning
- Caused by Lack of effective Scheduling

70-80 % of equipment failures are Human-INDUCED

- Not using a Torque Wrench
- Not knowing specifications
- Not having the right part at the right time
- Improperly handling and installing bearings (parts)
- No Repeatable, Effective PM, Corrective, Lube Procedures

Maintenance Planning and Scheduling Impacts “Wrench-Time” (or utilization time)

Wrench Time is “The time a Maintenance Person actually has their hand on a tool”

Typical Wrench-Time 15-35%

World Class 55-65%

- 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.

Wrench-Time Example Calculation

How a typical maintenance day is spent ... (%)

Direct Maintenance Labor Hours available: 10 techs x 40hrs = 400hrs

In-Direct Time

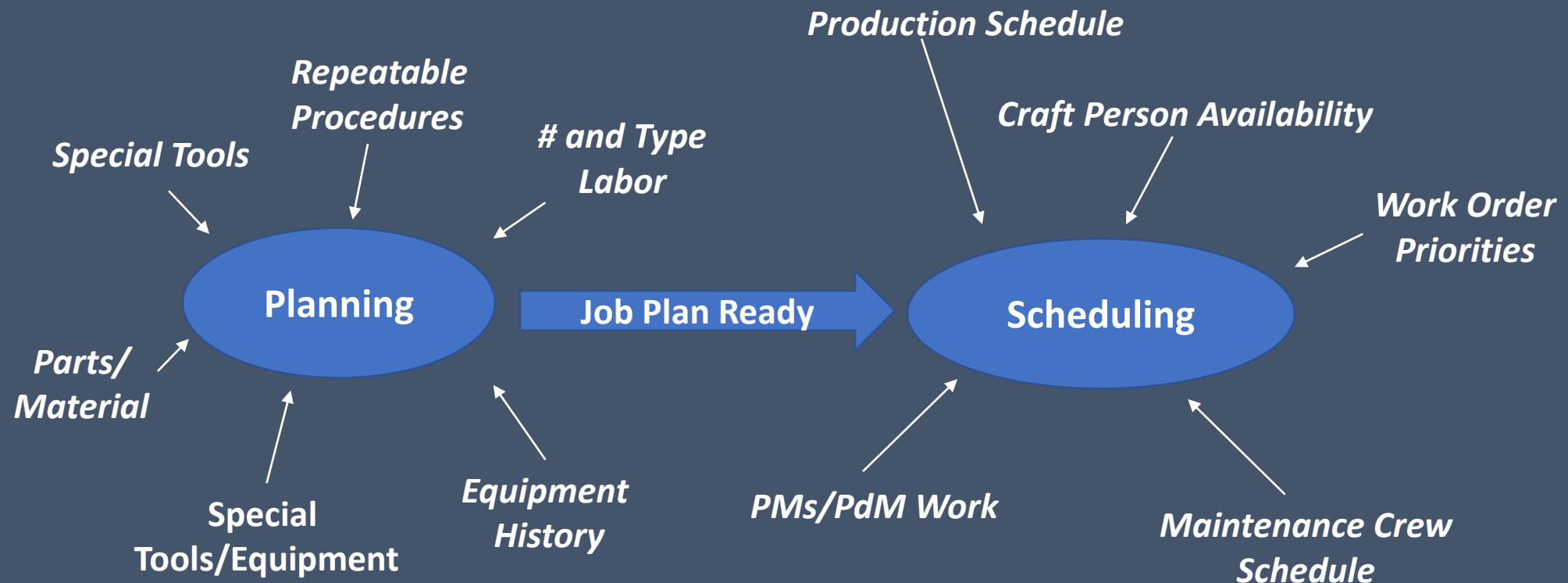
1. Traveling from point "A" to point "B"	67
2. Looking or Waiting for Parts	32
3. Looking for Tools	28
4. Looking for Information	24
5. Waiting on Production	79
6. Looking for Maintenance Leadership	22
7. Travel to and from job site	67
<u>TOTAL In-Direct Labor Hours</u>	<u>319</u>

Direct Labor Hours = 400 (Available) – 319 (Indirect) = 81

Wrench-Time = Direct Labor Hours 81 / Total Labor Hours 400 = 20%

World Class Wrench-Time = 55-65%

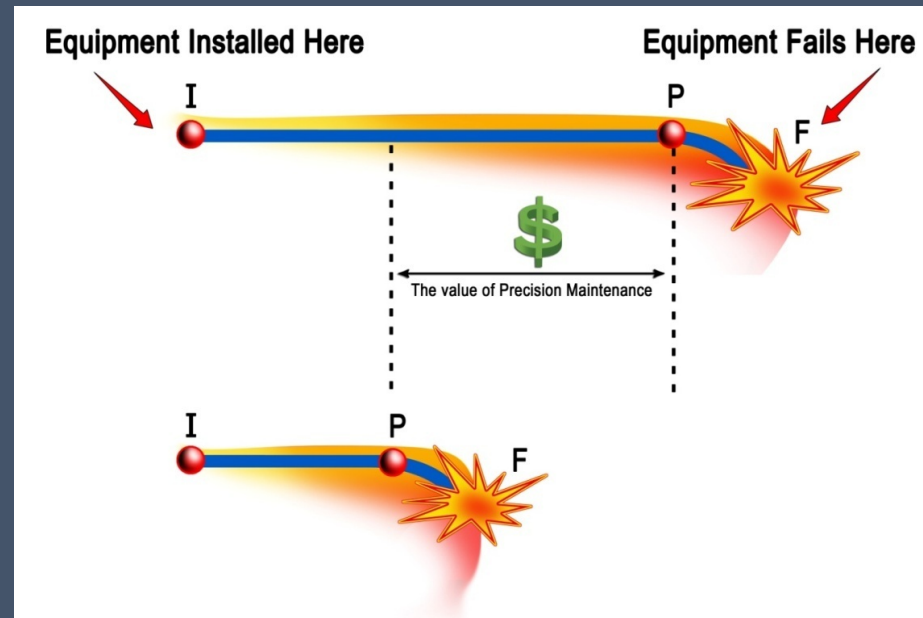
Maintenance Planning “Enables” Maintenance Scheduling



Maintenance “Planned Work”:

Work that has gone through a formal planning process to identify labor, materials, tools, and safety requirements. This information is assembled into a job plan package and communicated to craft workers prior to the start of the work.

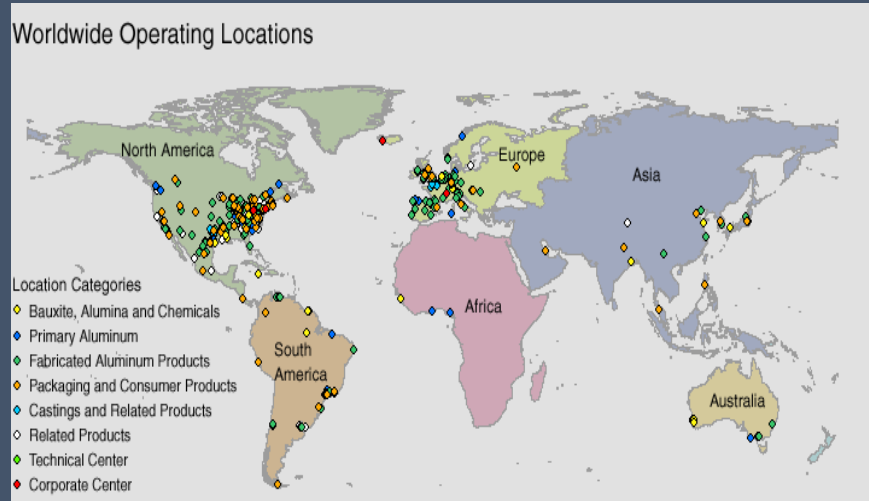
Source: SMRP Best Practices



“Planning is Critical to the success of Precision Maintenance”

Source of Planning and Scheduling Best Practices

1. Alumax Mt Holly – bought by Alcoa in 1990s
2. Alcoa Mt Holly – expanded to all Alcoa Plants Worldwide
3. Recognized as having a “World Class Maintenance” organization by HSBRT, Maintenance Technology Magazine, Reliable Plant Magazine, and many others
4. Created to effectively manage maintenance, labor, material, time and to minimize interruption to production



THE MAINTENANCE STRATEGY

John Day, Alcoa Mt Holly
World Class Maintenance Model

The Maintenance Vision will be achieved through a....
Total Proactive approach to maintenance based on...
CENTRALIZED, PROACTIVE MAINTENANCE PLANNING
and DECENTRALIZED EXECUTION of the work.



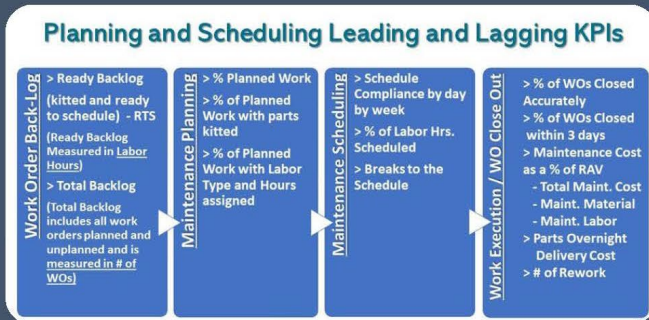
7 Steps to Make Planning and Scheduling more Effective

1. **Gain knowledge of Known Best Maintenance Planning and Scheduling Practices through formal training**
2. **Maintenance Planners and Maintenance Supervisors should be trained in a formal Planning and Scheduling**
3. **Assess the Maintenance Planning and Scheduling Process**
4. **Perform a Wrench-time Study**
5. **Create Proactive Maintenance Process Maps**
6. **Define Roles and Responsibilities in Maintenance Planning and Scheduling**
7. **Create Maintenance KPI Dashboard**

Maintenance Scheduling

Maintenance Scheduling is the “when” and involves assigning all required resources to perform the work at the optimum time to facilitate the most efficient execution of the work.

Source: SMRP Best Practices



Task Position	Ops Mgr.	Maint Mgr.	Maint Foreman	Maint Head Foreman	Stores FM	Trailer person	Maint Super	MRC Planner	Maint Planner	Asset Wks Support
Repeatable Procedure	I	A	R	R	I	R	R	C	R	R
Scope of Work	C	A	R	R			C	R	R	R
Parts Availability	I	A	C	R/C	R/C		R/C	I	R	C
Asset Availability	A	I	C	R/C			R	R	R	
Work Request	R	A	R	R			C	R	R	I
PM / PdM		A	R	R	C	R	R	C	R	R
Work Order Close Out		A	R	R			C	I	I	R
Scheduling	A	I	I	C/I	I	I	R/C	R/C	R	I
Verification of Work	I	I	R	C			C	A	I	I
Failure Reporting	C/I	A	R	C			I	C	I	C
Work Execution	I	A	C	C			R/C	C	I	I
Special Tools/Equipment Availability	I	C	R/C	R/C	C	C	A	V/C		
Craft Availability	I	A	R	R			R	C	I	



Steps to Optimize Maintenance Planning and Scheduling

“If a step in a process is skipped or performed at a substandard level it creates defects known of failures”

**Ron Thomas
Engineering/Maintenance Manager
Dofasco Steel - 2004**

Step 1: Gain knowledge of Maintenance Planning and Scheduling through formal training

Sources of Best Maintenance Planning and Scheduling Practices Training

1. Live / Virtual Training (Preferred)
2. Webinars
3. Tool-Box Talk

Join me Friday, May 21st at 4pmET is for

"7 Ways to Make Your Maintenance Planning and Scheduling More Effective"

Registration link: <https://app.livestorm.co/upkeep/7-ways-to-make-your-planning-and-scheduling-more-effective>.

If you cannot attend register anyway and a recording of this presentation will be sent to you after this session is over.



Single Point Lesson

Steps to Optimize Maintenance Planning and Scheduling in any Organization

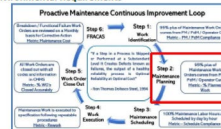
By Ricky Smith CMRP

Maintenance Planning and Scheduling is critical to success of any Maintenance Organization resulting in a significant increase in Wrench time (Hands on Tool Time). Planning and Scheduling are two distinct functions which are dependent on each other.

Wrench-time is a measure of maintenance personnel's time accomplishing proactive work on time, on schedule, and on budget.

Wrench-time does not include time obtaining parts, tools or instructions, and work associated with those tasks, traveling to or from job sites, or time spent obtaining work assignments. It is about only focused on "hands on tool" time.

- Maintenance Planning is a highly skilled function that requires a basic knowledge of the maintenance work processes, operations expectations, project management, computerized maintenance management system (CMMS) and related systems, as well as a practical understanding of the work to be performed.
- Planning is the "what's required" and "how to" part of any maintenance job.
- Planning typically includes the following:
 - Parts/Materials
 - Specifications
 - Instructions (Repeatable)
 - Coordination requirements
 - Estimated time
 - Repeatable procedure
 - Safety/Environmental Requirements



Maintenance Planning and Scheduling Best Practices Workshop

October 19-21

By Ricky Smith CMRP

For information send your inquiry to: rsmith@worldclassmaintenance.org

Step 2: Maintenance Planners and Maintenance Supervisors should be trained in Maintenance Planning and Scheduling

Maintenance Planners and Maintenance Supervisors make the most impact on increasing wrench-time and thus need the same knowledge in Planning and Scheduling (One Team)

EXAMPLE OBJECTIVES:

The objectives of a Planning / Scheduling workshop

- Define how “Known Best Maintenance and Reliability Practices” impacts the Planning and Scheduling processes
- Define the Proactive Maintenance Process
- Obtain the ability to Execute Proactive Maintenance Planning and Scheduling
- Describe the objective, mission and attributes of Proactive Planning and Scheduling
- Plan and Schedule through numerous “hands on” exercises
- Learn how to Measure an organization’s current Wrench-time
- Define Methods to Optimize Maintenance Wrench-Time
- Create a Proactive Maintenance Planning and Scheduling Workflow Model which impacts Maintenance Wrench-time
- Create Leading and Lagging Planning and Scheduling Metrics
- Define how to transition from current state to a more Proactive Planning and Scheduling Process
- Define how to measure and manage Maintenance Backlog
- Learn to implement and manage a Proactive Kitting Process
- Gain first steps in how to Manage Change
- Create a Master Plan, with timeline for Proactive Maintenance Planning and Scheduling Implementation / Optimization

Step 3: Assess your Maintenance Planning and Scheduling Process

Maintenance Planning/Scheduling Assessment (answers are either YES or NO)

1. Does most of the maintenance work scheduled have pre-planned job packages developed for them? (all specifications, procedures, parts, labor, etc. identified)
2. Does the planner use the maintenance staff to assist in the development of pre-planned job packages?
3. When is a planner/scheduler (or just a planner) performing their day-to-day job they are never called upon to rush parts in for a breakdown?
4. Does your planner identify backlog based on categories? (i.e.. Ready to schedule, waiting on parts, waiting on engineering, waiting to be planned, etc) and measured by labor hours, weeks of backlog?
5. Does the planner validate whether a work request is valid or not?
6. Does the planner provide feedback to the requester when a work request or notification has been entered into the CMMS/EAM System?
7. Does the planner visit the job sites of work to be planned on at least 30% of jobs?
8. Can the planner check status of planned work parts on the CMMS/EAM within 5 minutes or less of any job?
9. Does the planner validate work request in 3 days or less?
10. Do you have at least one planner or planner/scheduler for every 7 to 25 maintenance personnel?
11. Can the planner check status of planned work parts on the CMMS/EAM within 5 minutes or less of any job?
12. Does the planner validate work request in 3 days or less?
13. Do you have at least one planner or planner/scheduler for every 7 to 25 maintenance personnel?

Step 4: Perform a Wrench-time Study

Wrench time (sometimes also referred to as “hands on tool time”) is a metric that shows how much time maintenance techs spend with a tool in their hand, performing actual maintenance work.

Option 1: Hire a Maintenance/Reliability Consulting Company to conduct a wrench-time study

Option 2 (preferred method): Train 4 people - Maintenance Tech, Maintenance Supervisor, Maintenance Planner --- Each person randomly walks the floor and objectively identify what they see.

- a. **Traveling to and from the workplace looking for parts, material, supervisor, etc.**
- b. **Training: technical, safety, etc.**
- c. **Meetings: training, safety, etc.**
- d. **Work Execution: waiting on parts, waiting on someone, etc.**
- e. **Breaks: lunch, heat breaks, etc.**
- f. **Waiting: waiting on supervisor, another maintenance person, production, etc.**
- g. **Administrative: Union issues; personnel issues; discussion with supervisor about vacation, work orders, etc.**
- h. **Any activity that a Maintenance techs has a tool in their hand performing proactive work**

WRENCH TIME OBSERVATION DATA SHEET									
STUDY _____									PAGE ___ OF ___
PLANT _____									
(Cmptr Entry)	Unit Events	Observing Date	Day of Week	Person's Number	Person's Supr Number	Work Cat #	Time Period	OT?	Any Observation Comments (such as purpose of travel)
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2,000 – 3000 observations
Sorry; if it were easy, everyone would be
conducting one

Step 5 - Create Proactive Maintenance Process Maps

Tool Box Talk – World Class Maintenance

"The Journey"

Attributes of a World Class Maintenance Operation

World Class Maintenance Operations require all maintenance and reliability processes to be optimized, repeatable, and effective.

- PM/PdM program is effective.
 - PM/PdM is where the Proactive Maintenance Process begins; without it you cannot plan or schedule proactively.
 - PM/PdM is focused on identification or prevention of specific "Failure Modes" or regulatory compliance
 - PM/PdM effectiveness measured using Mean Time Between Failure (MTBF) by:
 - Site
 - Area
 - Asset
 - Equipment/Component



- Planning Process is effective.
 - Measure by:
 - 15% Work is PM
 - 15% Work from PM results
 - 15% Work is PdM
 - 35% Work from PdM Results
 - 90% Planned Work

- Definition: Percent of Planned Work; at the minimum, the following is required for a job to be defined as "Planned".
- Repeatable procedure with specifications and standards
 - Estimated labor hours by craft
 - Estimated time for work order execution
 - Parts Required
 - Potential parts identified and reserved
 - Parts kitted/staged (Planner is watching parts)

- Emergency/Urgent Labor Hours account for 2% of total labor hours
- Maintenance Scheduling is effective
 - Maintenance Scheduling requires maintenance, operations, engineers, etc. to agree on the Maintenance Schedule, by work order, at least one week
 - Scheduling Compliance at least 85%, measured by labor hours
 - Scheduled Compliance is given to work completed on the day scheduled if it has been scheduled at least one week out

- Work Execution is effective
 - Measured by percent of Rework

This process requires the following:

- Job to be planned and scheduled
- Repeatable procedures
- Parts kitted/staged
- Wrench time above 55%
- Time estimated +/- 10%

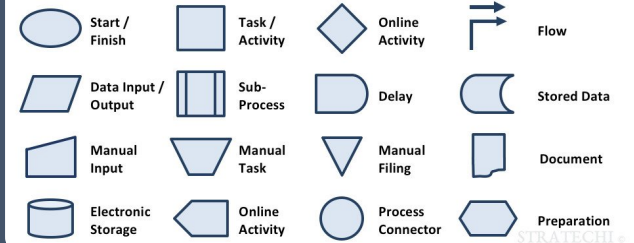
- Work Order Close Out is effective
 - Over 100% of work orders are closed out to 100% of standard
 - Standard: Required Data Fields identified by Reliability Engineering and Maintenance Management
 - Data fields are identified based on Metrics, Key Performance Indicators (KPI), and failure reporting required to manage a World Class Operation

If you have Maintenance Process Maps. "Great Job"

- Step 1: Assemble Cross-functional Team
- Step 2: Educate Stakeholders in Proactive Maintenance
- Step 3: ID basic flowchart symbols
- Step 4: ID and sequence Process Steps
- Step 5: ID Roles and Responsibilities



Process Mapping Symbols



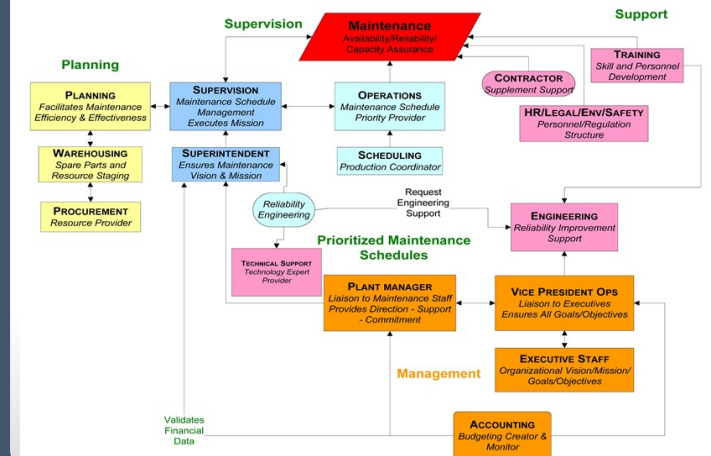
Proactive Maintenance "Roles and Responsibilities"

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 "the Dog" (could be more than one)
 Accountable "the Back stays here" (One person only)
 Consulted "two-way communication" (in the Loop)
 Informed "one-way communication" (kept in the picture)

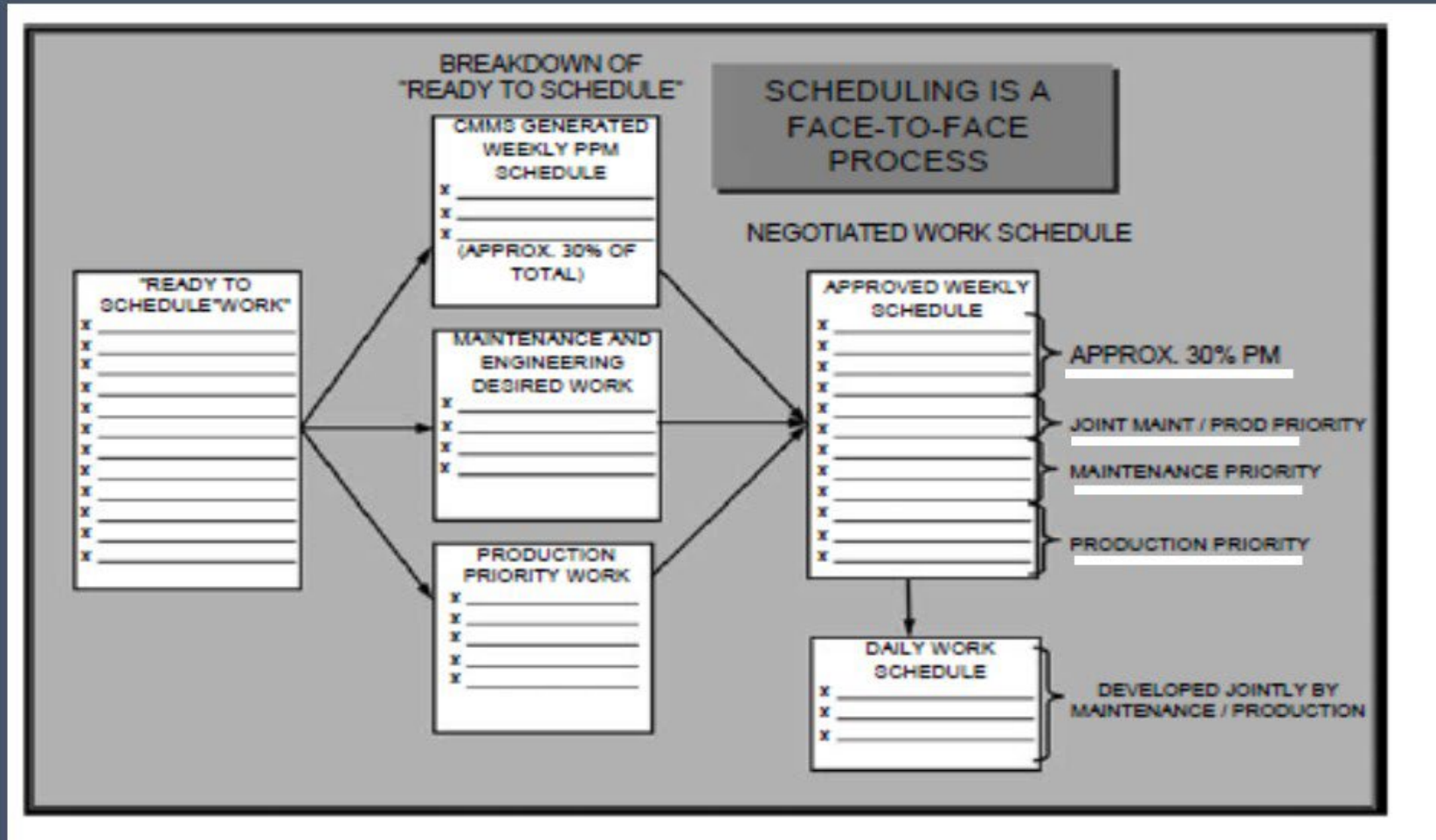
World Class Maintenance

"World Class Production thru World Class Maintenance"

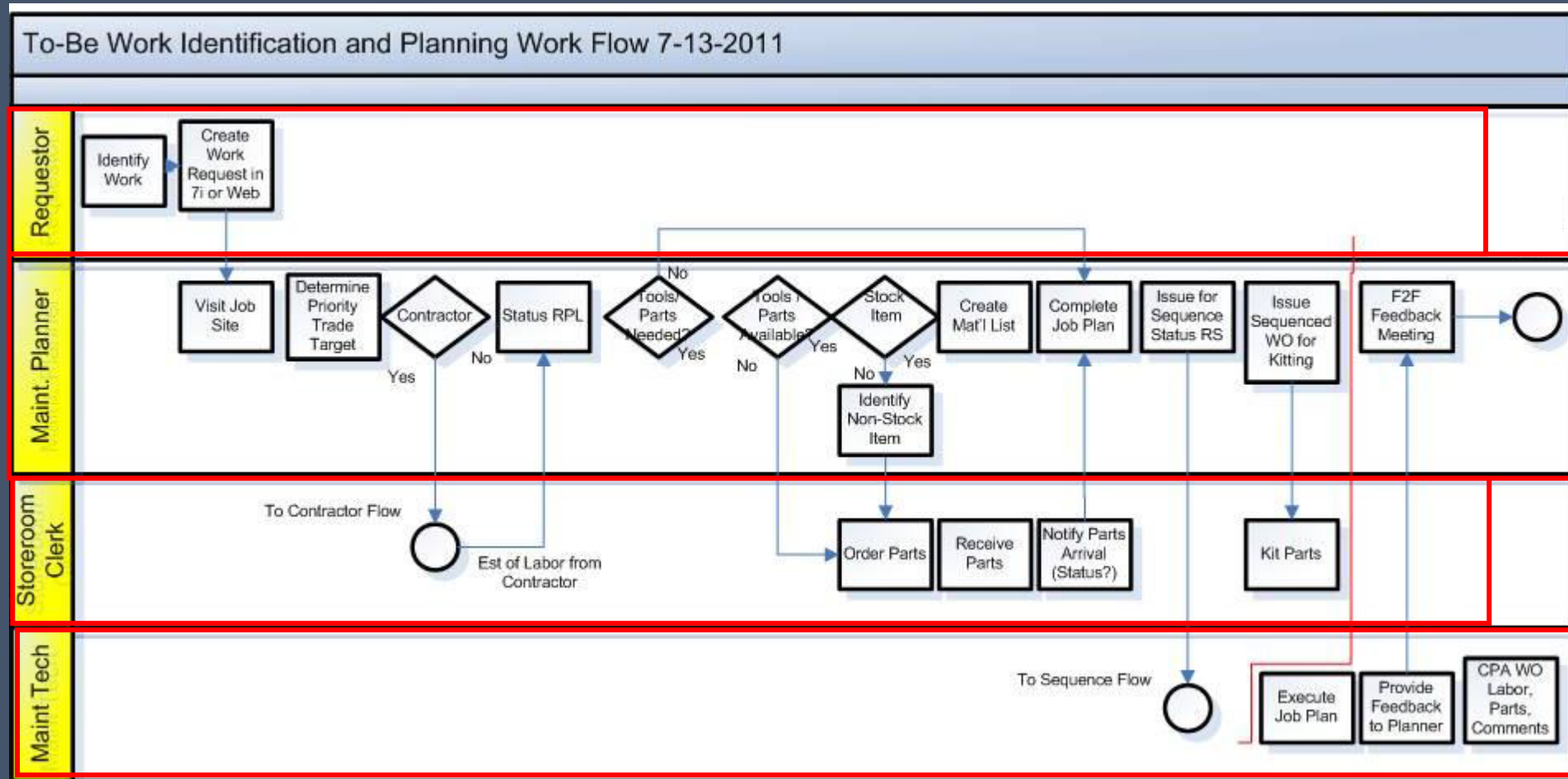


Excerpt from Rules of Thumb for Maintenance and Reliability Engineers

Example: Maintenance Scheduling Process Map



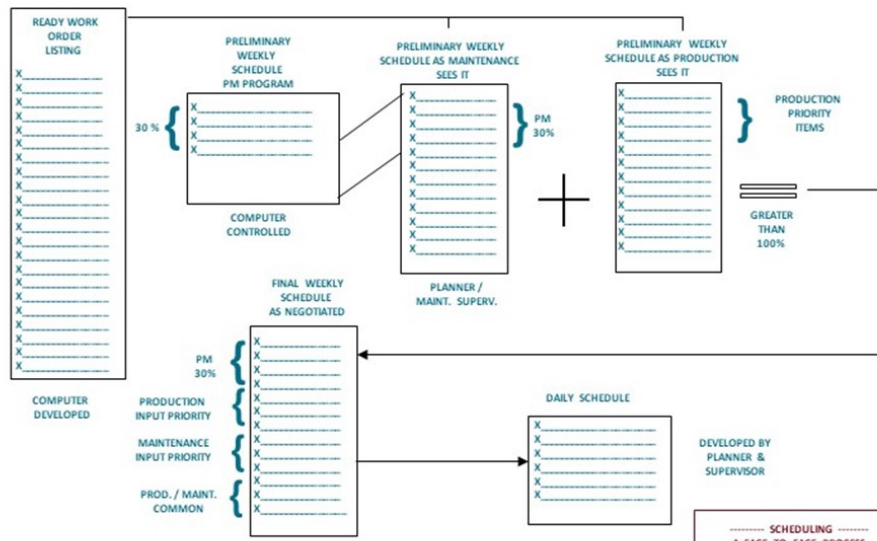
Maintenance Planning Workflow Process Map



Step 6 - Define Roles and Responsibilities in Maintenance Planning / Scheduling

1. ID Stakeholders/Positions
2. Review Scheduling Workflow
3. ID Task for Maintenance Scheduling
4. ID who is "R" – Responsible, "A" = Accountable, "C" = Consulted, "I" = Informed

Maintenance Scheduling Workflow



Examples

Maintenance Scheduling RACI "Roles and Responsibilities"

Task	Stores Mgr.	Maint Mgr.	Maint Sup.	Maint Techs	Maint Planner	Prod Mgr.	Plant Mgr.
Manage Asset Criticality	I	R	I	I	R	C	A
Identify Ready to Schedule Work Orders (RTS)		A	C		R	R	I
ID Parts Availability for Scheduled Work Orders	R	A			C	I	
Create a Preliminary Schedule		A	I	I			
ID Skill Requirements and Availability		A	C	C	I	C	
Review Preliminary Schedule with Production	C	C	C		R	R	C
Manage Scheduling Meeting		A	I		R	C	
Publish the Schedule	I	A	I	I	R	I	I
Adjust Schedule Daily as Needed		A	R	I		C	I
Manage Maintenance Dashboard (Leading / Lagging KPIs)	I	A	I	I	R	I	I

Responsibility	"the Doer"	(could be more than one)
Accountable	"the Buck stops here"	(One person only)
Consulted	"two-way communication"	(Kept in the Loop)
Informed	"one-way communication"	(kept in the picture)

Step 7 - Create Maintenance KPI Dashboard

1. ID the Steps in the Maintenance Process
2. ID a Metric/KPI for Each Step
3. Educate everyone how each metrics is critical to success of Planning and Scheduling
4. Post the Dashboard where everyone can see “THE SCORE”

“Warning: KPI Data comes from work order close out data, the data must be accurate and updated”



