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Audit & Recommendations for Planning and Scheduling in an Industrial Plant – Case Study

Doc Palmer PE(ret), MBA, CMRP
Author McGraw-Hill *Maintenance
Planning and Scheduling Handbook*



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First Visit in 2011 Second Visit in 2015

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First Visit in 2011

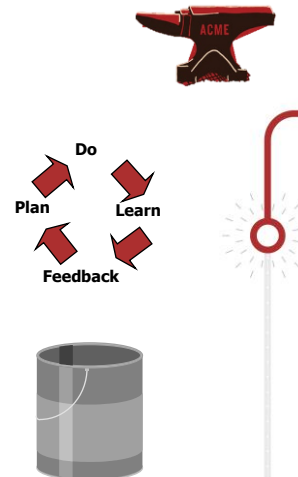
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Essence of Planning and Scheduling

- Planning supports improving individual jobs repeated over time: a Deming Cycle of improvement for each job (Learn Fast)
- Planning also supports scheduling by identifying craft skills and labor hours
- Scheduling sets goals by assigning enough work for a week (Sets a “Mission”)
- The goals increase maintenance productivity, but only when it is “OK” to break the schedule when appropriate
- P&S helps free up supervisors to have more time in the field



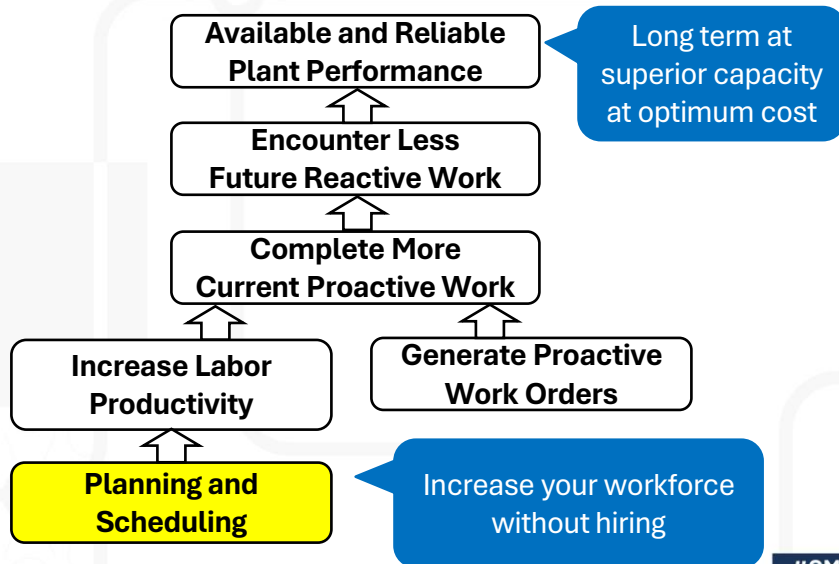
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“WIIFM” What’s In It For Me (ACME)?



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WIIFM What's In It For ACME?



- **Improve productivity to increase reliability and lower cost**
(Planning can increase productivity of maintenance force by 50%)
 - Help complete more proactive work including PMs to lessen future reactive work.
(Industry 1:10 rule: \$1 spent on proactive maint increases profits \$10.)
 - Help increase visibility of completions to encourage more proactive Work Requests
 - Help complete more projects internally to accelerate realization of benefits
(Industry 1:100 rule: \$1 spent to improve equipment increases profits \$100)
 - Help save some cost and reliance on external contractors
- **Improve quality of work to increase reliability and lower cost** Institutionalize knowledge to avoid past problems (Deming)
- **Improve safety**
 - Anticipate hazards & apply learned knowledge
 - More proactive work with known scopes & less rushing
 - Less reactive work which is inherently less safe

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ACME Current Best Practices



- Good management commitment
- Change agent in place (planning mgr.)
- Planners at good level in organization
- Sufficient amount of planners
- Good use of gatekeepers
- Good priority system – More than 3 levels
5-Emergency, 4-Urgent This Week, 3-Routine High Two Weeks, 2-Routine Normal This Month, 1-Routine Low, Projects
- Project in place to optimize PMs

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ACME Current Best Practices

- A scheduling mentality is in place
- Doing weekly scheduling and weekly meeting
- Planners create weekly schedule
- Creating schedule close to end of week ahead
- Using paper WOs in field to capture feedback
- Good CMMS (Avantis) for P&S
- Familiar with Standard Job portion of CMMS



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ACME Opportunities

- Need to measure schedule compliance based on the original schedule, not the schedule as amended during execution week
- Schedule 100% of available weekly hours instead of just 80% (MBO Management by Objective-Drucker). Okay to have Schedule compliance between 40% and 90%.
- Use Avantis Standard Jobs for nearly all plans. Planners can update the Standard Jobs with feedback to apply the learning to future jobs.
- Focus more on helpful feedback to improve plans than on perfection in plans (PDCA-Deming)



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ACME Opportunities

- Help crafts on feedback. Change from “Was plan accurate?” to “Could plan be improved?”
- Consider planner involvement in some Urgent Work Requests (Priority 4s) to avoid past job problems and provide supervisor assignment help with required craft skill and estimated hours
- Be careful that Work Request approval process does not become a bottleneck
- Be careful pushing “want a low backlog”
- Help manage behavior by analyzing success of weekly schedule. (“Red-Green Report”?)

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Red Green Report Example*

BLMCH Crew Weekly Schedule

MACH Craft, 109% Sched Success, 41% Sched Success, 75% Plan Coverage

Pin	Asset	Phase	Pri	Typ-Stat	Class	%Cmp	WO-Tsk	Desc	Est	Reg	OT
N	B-TD-CNV-FS	WSCHD	7	R-FINISHED	CM	1808323-01		Replace plows on TD to FSF conveyor c	8	4	
Y	B-DPS-SWP-1	WSCHD	7	P-FINISHED	PMT	1807555-01		VERTICAL TURBINE DRAINAGE PUM	2	2	
Y	B-DPS-SWP-2	WSCHD	7	P-FINISHED	PMT	1807556-01		VERTICAL TURBINE DRAINAGE PUM	2	2	
Y	B-DPS-SWP-3	WSCHD	7	P-FINISHED	PMT	1807557-01		VERTICAL TURBINE DRAINAGE PUM	2	2	
Y	B-DPS-SWP-4	WSCHD	7	P-FINISHED	PMT	1807558-01		VERTICAL TURBINE DRAINAGE PUM	2	2	
Y	B-TOOL-HGW	WSCHD	7	P-FINISHED	PMT	1807742-01		BLUE LAKE ANNUAL MECHANICAL P	1	1	
Y	B-TOOLS	WSCHD	7	P-FINISHED	PMT	1805414-01		Perform monthly inspection and adjustm	1	1	
Y	B-TOOLS	WSCHD	7	P-FINISHED	PMT	1808248-01		Quarterly Blue Lake PM Inspection of lift	1	1	
Y	B-TOOLS	WSCHD	7	P-FINISHED	PMT	1808250-01		Perform monthly inspection and adjustm	1	1	
N	B-TOOLS	WSCHD	7	R-ACTIVE	PMR	1802099-01		Please fix JABSCO oil pumps, need ne	8		
Y	B-DIG-CFD-P01	WSCHD	7	P-ACTIVE	PMT	1804445-01		DIGESTER PROGRESSIVE CAVITY P	8		
Y	B-DPS-SWP-3	WSCHD	7	P-ACTIVE	PMT	1807557-02		VERTICAL TURBINE DRAINAGE PUM	2		
Y	B-ERPST	WSCHD	7	P-ACTIVE	PMT	1720914-01		1) Ensure Lock Out has been completed	4		
Y	B-PWB-WPE-P06WSCHD	WSCHD	7	P-ACTIVE	PMT	1729485-01		SUBMERSIBLE SUMP PUMP INSPCT	10		
Y	B-PWB-WPE-ST	WSCHD	7	P-ACTIVE	PMT	1805663-01		AUTOMATIC STRAINER INSPECTION	2		
Y	B-TD-TS-P02	WSCHD	7	P-ACTIVE	PMT	1804443-01		DIGESTER PROGRESSIVE CAVITY P	8	6.5	
N	B-PSP-10	WSCHD	6	R-ACTIVE	CM	1625188-01		Remove pump and overhaul. **Multicra	16		
N	B-PSP-12	WSCHD	6	R-ACTIVE	CM	1621752-01		Remove pump and overhaul. **Multicra	16		
N	B-TOOL-GTOPE	WSCHD	6	R-ACTIVE	PMR	1804111-01		Clean Carb	4		
N	B-TOOL-GTOPE	WSCHD	5	R-ACTIVE	PMR	1804110-01		clean carb	4		
N	B-TOOL-GTOPE	WSCHD	5	R-ACTIVE	PMR	1804108-01		clean carb	4		
N	B-TOOLS	WSCHD	5	R-ACTIVE	PMR	1804107-01		Clean Carb on 3in trash pumpb	3		
									109	22.5	
Pin	Asset	Phase	Pri	Typ-Stat	Class	%Cmp	WO-Tsk	Desc	Est	Reg	OT
N	B-EFF-SAMPLE	WSCHD	7	R-ACTIVE	CM	1809585-01		EFF-SAMPLE P01 - pump is plugged. Plt	4		
N	B-PSP-9	WSCHD	6	R-ACTIVE	CM	1625190-01		Remove pump and overhaul. **Multicra	6		

* (courtesy to author for sharing by METC in Minneapolis St Paul)

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- Reprint Weekly Schedule after week is over.
- Highlight work completed **green** if it was on schedule and **red** if not.



Typical P&S KPI Reporting*

Is scheduling working?: (Generally per week) Helps productivity

- % **Schedule loading (Available labor hrs. scheduled) (~100%)**
- % Schedule compliance (NOT tied to pay)(40 - 90% "ok")
- # of *WO completed/month*
- Trend of # active WO's in backlog each month

Is planning working?: (Generally per month) Helps quality of work

- # of **new Avantis Standard Jobs created**
- **Minimal unplanned backlog of unplanned work orders**
- % *Planned coverage* for non-PM (est. Hrs.>0 & has SJ) >80%?
- Helpful feedback: # & % of WO's with feedback that improves plan
- # and % Jobs that had a parts problem, especially P4 & P3s

*(Push **bold** items to achieve *italic* results)

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From Good to Great

- Increase general plant awareness of P&S concepts
- Schedule weekly 100% crew labor hours as goal setting to increase productivity
- Plan and improve Avantis Standard Jobs with feedback as cycle of improvement
- Persistence required

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Second Visit in 2015

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Maintenance Planning and Scheduling Review



Richard Palmer & Associates
May 2015

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Doc Palmer Review

- McGraw-Hill *Maintenance Planning and Scheduling Handbook*
- Second set of eyes from outside
- Follow-up visit from 2011
- May 12-13 Best practices workshop
- May 14-15 Review planning practices, consider application to ACME



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Doc Palmer Review



ACME: “We have made great progress since 2011 by implementing 100% scheduling to increase craft productivity and using Avantis Standard Plans to allow continual improvement of job plans that support scheduling and improve work quality.”

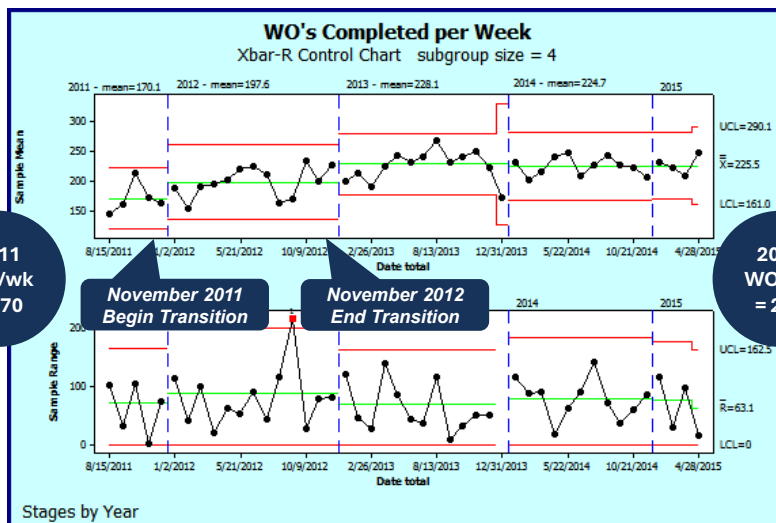
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32% Labor Productivity Improvement from Increasing Schedule Loading from 80% to 100%



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65 persons now doing the work of 86.

Equivalent to 21 extra persons to do proactive work.

Equivalent to 46% “Wrench Time”

ACME Current Best Practices



- Good management commitment
- Change agent in place (Planning & Otg Supt)
- Scheduling 100% of labor capacity weekly including giving shift workers work
- Publishing schedule compliance as “Schedule Success” and not mandating over 90%
- Supervisors handle daily scheduling
- Planners at good level in organization
- Sufficient amount of planners

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ACME Current Best Practices



- Good use of gatekeepers
- Using paper WOs in field to capture feedback and they come back to planners
- Good CMMS (Avantis) for P&S
- Using Avantis Standard Jobs for plans that planners can improve with feedback and invoke later for new jobs to promote improvement cycle of plans
- Good multi-craft union agreements
- Adequate priority system with more than 3 levels

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ACME Opportunities



- Use Avantis Standard Jobs for more jobs
- Add Standard Job # on WO printout
- Use planners to plan more of the P4 Urgent work
- Work Request approval process is cumbersome requiring multiple approvals for even routine, low-cost work
- Scaffolding process is cumbersome requiring individual purchase orders for each job.
- Inventory support might be requiring excessive planner time.
- Returning unused parts difficulty causes unmanaged parts storage around plant.

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ACME Opportunities



- Might have too many PMs. Consider revitalizing project to optimize PMs.
- Engineers should improve project turnovers as “maintenance ready” with entity data
- Help planners not become overwhelmed with managing on-site contractors, updating P&IDs, and attending project meetings
- Engrs, not planners, should be looking into design changes or modifications

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ACME Opportunities



- The current **Planning Accuracy** KPI may be inappropriate because it **inappropriately encourages planners to give excessively high estimates to get better scores.**
- Higher estimates overall reduce the amount of work that can be assigned which then reduces productivity.
 - Example: Actual 10 hours on a job planned for 5 hours: $5/10 = 50\%$, but actual 10 hours on a job planned for 10 hours: $10/10 = 100\%$ “accurate.”
- Also, using this KPI to gauge craftspersons **inappropriately encourages craftspersons to reduce quality to meet deadlines**
 - Example: If a craftsperson actually needs 10 hours on a job planned for 5 hours, the craft scores better by “cutting corners” to do the job in 5 hours.

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ACME Opportunities



- **Help everyone with feedback**
 - Supervisors support is critical
 - Planners participate in more crew meetings
 - Rotate craftspersons as observers with planners
 - Develop a feedback indicator
 - Highlight past plan improvements that print out with job plan
 - Work on improving feedback loop
 - Be cautious pushing for perfection or “doing it right the first time.” Instead, promote continual improvement for plans

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Typical P&S KPI Reporting*

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- # and % **Jobs that had a parts problem, especially P4 & P3s**

*(Push **bold** items to achieve *italic* results)

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Staying Great and Not Settling for Good

- **“Maintain”** general plant awareness of P&S concepts
- Schedule weekly 100% crew labor hours as goal setting to increase productivity
- Plan and improve Avantis Standard Jobs with feedback as cycle of improvement
- Persistence required

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iGracias!

Thank you for letting me part of your maintenance family today!

Doc Palmer

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