



MAINTENANCE 4.0
Implementing an efficient Multi-week Scheduling process with Visual Planner Digital Platform



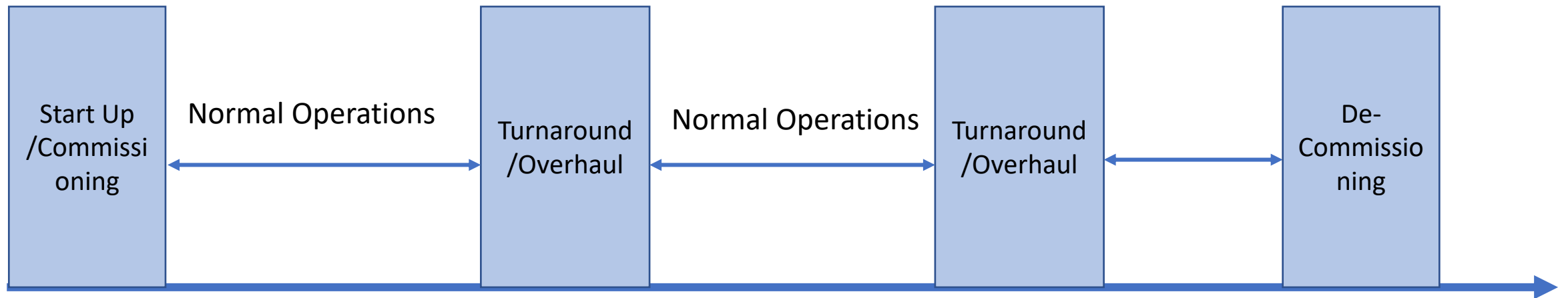
DISCLAIMER

This document is not to be released to any third party without the prior consent of the Maintenance Excellence Group inc. It contains confidential information and trade secrets, the disclosure of which would likely cause material financial harm to the Maintenance Excellence Group inc. and its affiliates, prejudice its competitive position and interfere with its ongoing or future contractual or other negotiations.

The document also contains personal information as defined in the *Privacy Act* .

© 2003-2022 Maintenance Excellence Group inc.

TYPICAL ASSET LIFECYCLE



- 🔥 Most of the asset life is spent in normal operations
- 🔥 Yet, everyone focuses on the Turnaround/Overhaul Process
- 🔥 Routine maintenance processes are often neglected or are sub-optimal

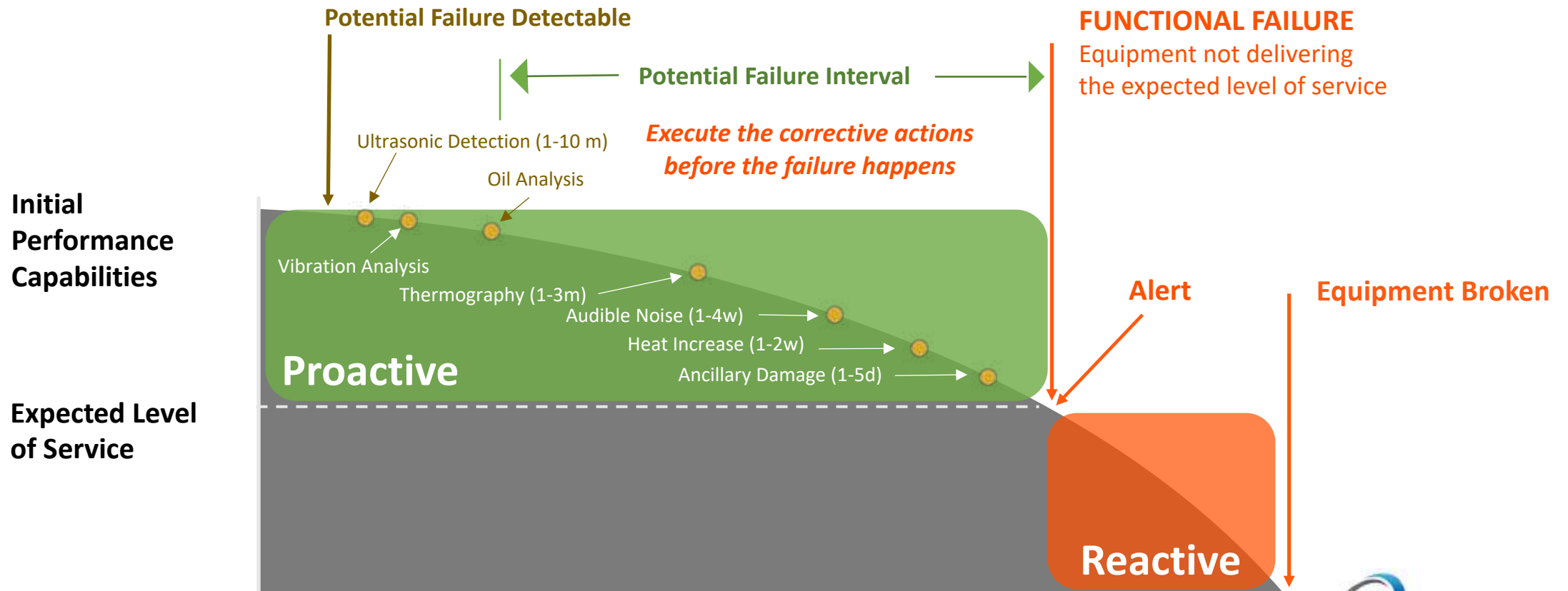
RED FLAGS

- 🔥 Too many unscheduled breakdowns
- 🔥 Preventive Maintenance activities are often pushed back or simply missed
- 🔥 Reactive VS Proactive
- 🔥 Backlog is out of control
- 🔥 Difficulty assigning their crafts people to jobs
- 🔥 Overtime costs too high
- 🔥 Looking for ways to lower maintenance costs

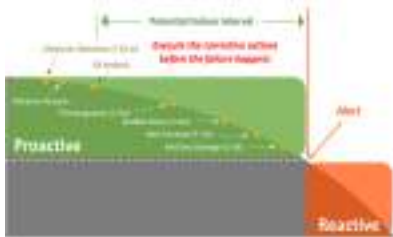
ASSET RELIABILITY 4.0



Put in place maintenance tactics based on asset criticality, to detect potential failures: CBM, RCM, IOT with analytics, TB, RT, etc.



ASSET PERFORMANCE 4.0



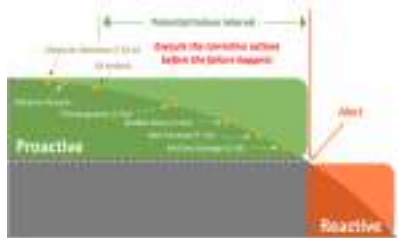
**PREDICTIVE
MAINTENANCE
4.0**

**CBM, IOT with
Analytics**



ASSET PERFORMANCE 4.0

ASSET PERFORMANCE 4.0



**PREDICTIVE
MAINTENANCE
4.0**

**CBM, IOT with
Analytics**



**PLANNED
MAINTENANCE
4.0**

IPSPEC

= ASSET PERFORMANCE 4.0

ASSET RELIABILITY FUNDAMENTAL ELEMENTS

Asset Data

- Complete mission critical assets inventory with BOM
- Perform risk assessment and define asset criticality

Develop the Maintenance Tactics Required to Prevent Failures

- CBM, TBPM, RTPM, RCM, RCFA, TPM, IOT with AI analytics.

Ensure On Time Execution of the Maintenance Tactics

- Project scheduling for overhaul performed during turnarounds
- Work Week Management process for routine maintenance

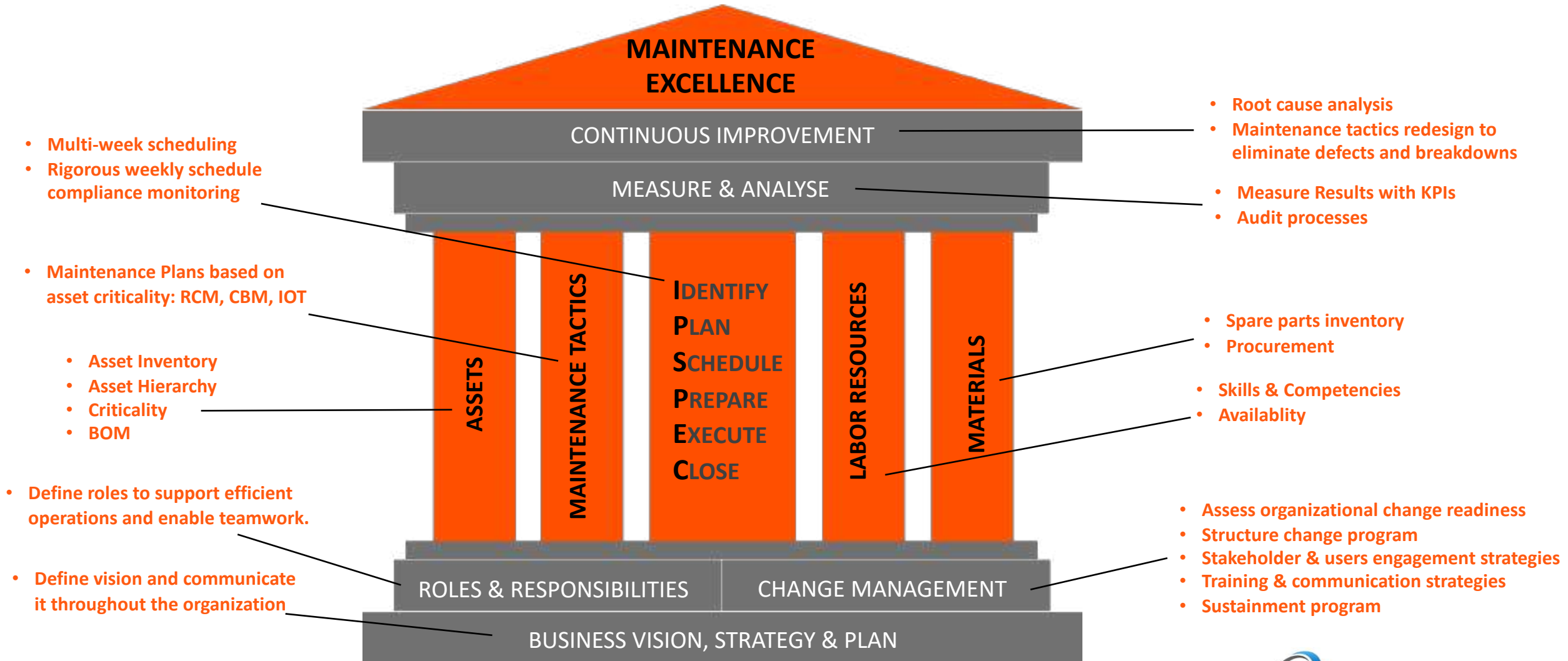


Efficient scheduling is key to ensure on-time execution.

It provides the highest ROI and “biggest bang for the buck”, but it is also the most challenging process to implement successfully.

MAINTENANCE EXCELLENCE JOURNEY

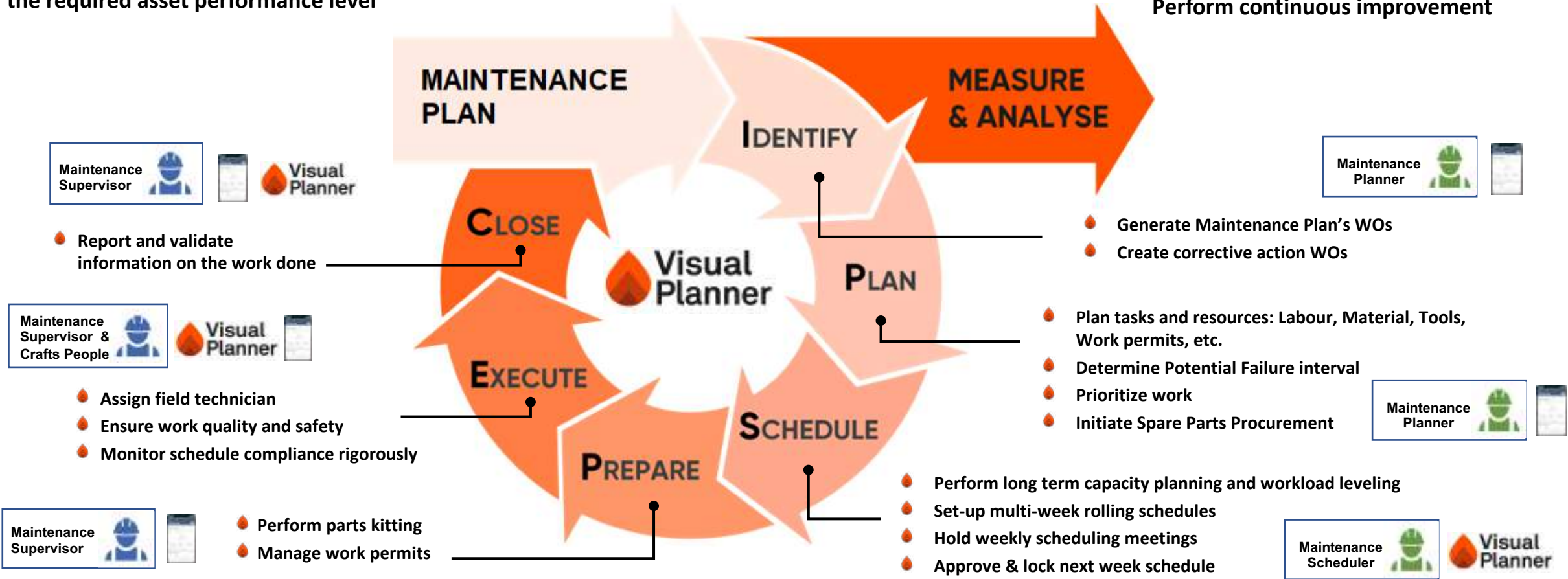
DOING THE RIGHT MAINTENANCE, AT THE RIGHT MOMENT, AT THE LOWEST COST



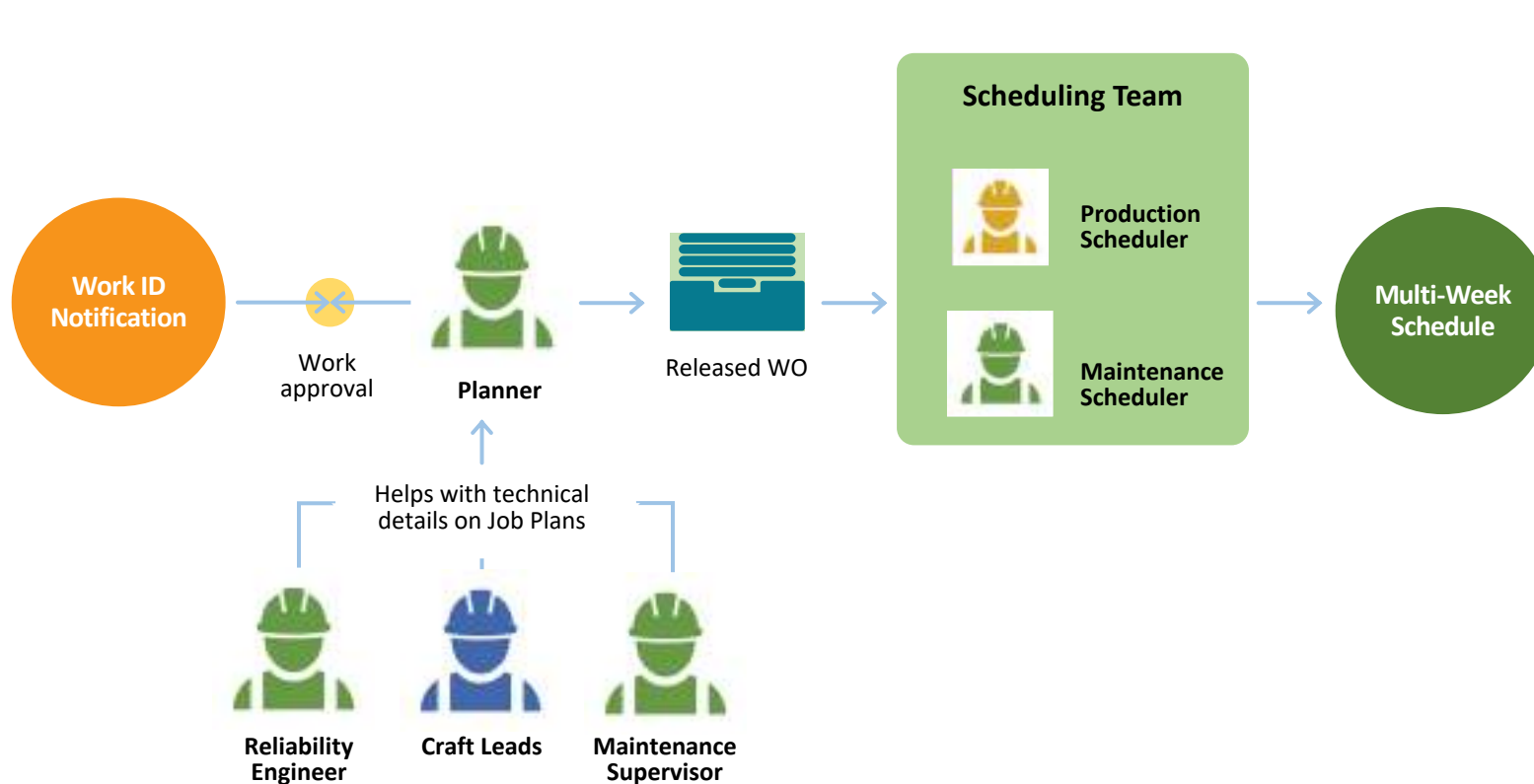
IPSPEC: PLANNED MAINTENANCE EXECUTION CYCLE 4.0

Develop Maintenance Plans 4.0 to achieve the required asset performance level

Set KPIs to measure gains
Perform continuous improvement

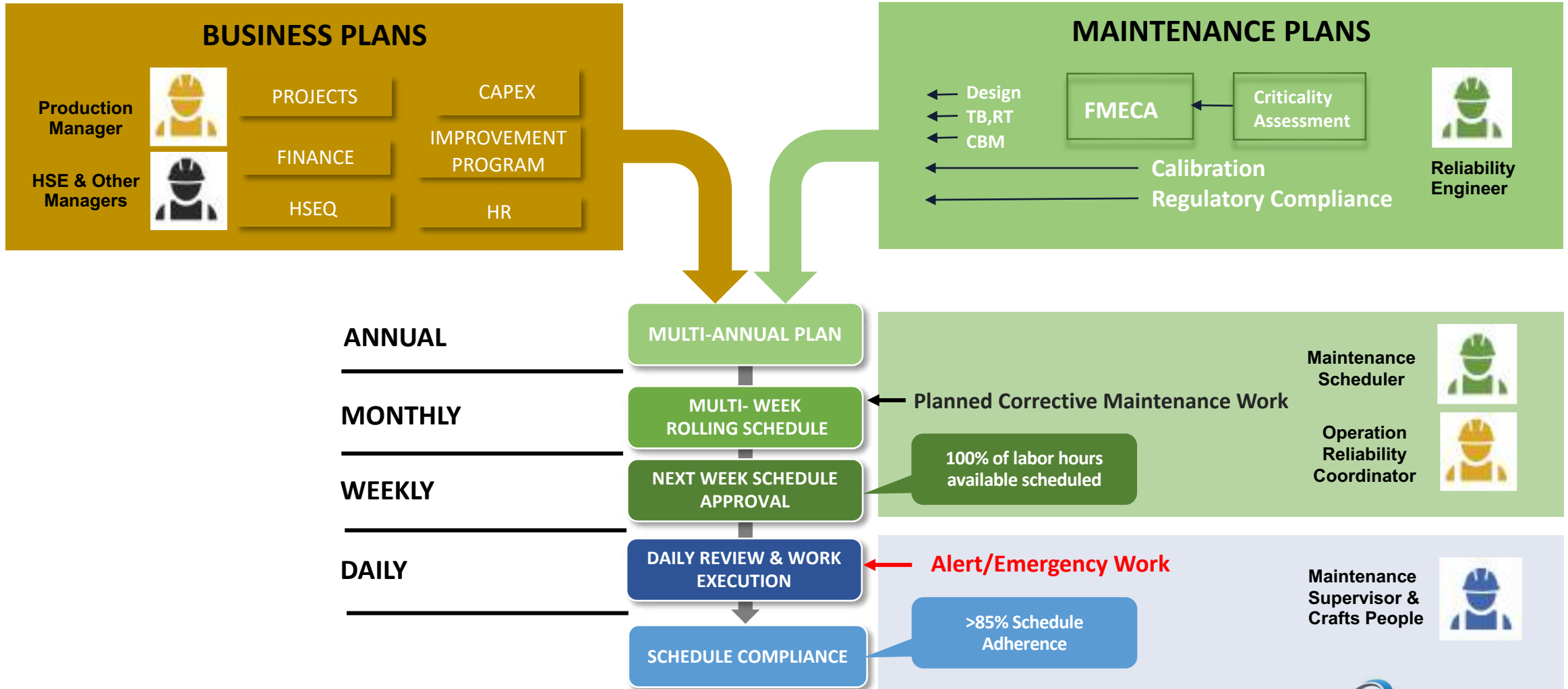


PLANNING AND SCHEDULING PROCESS AND ROLES

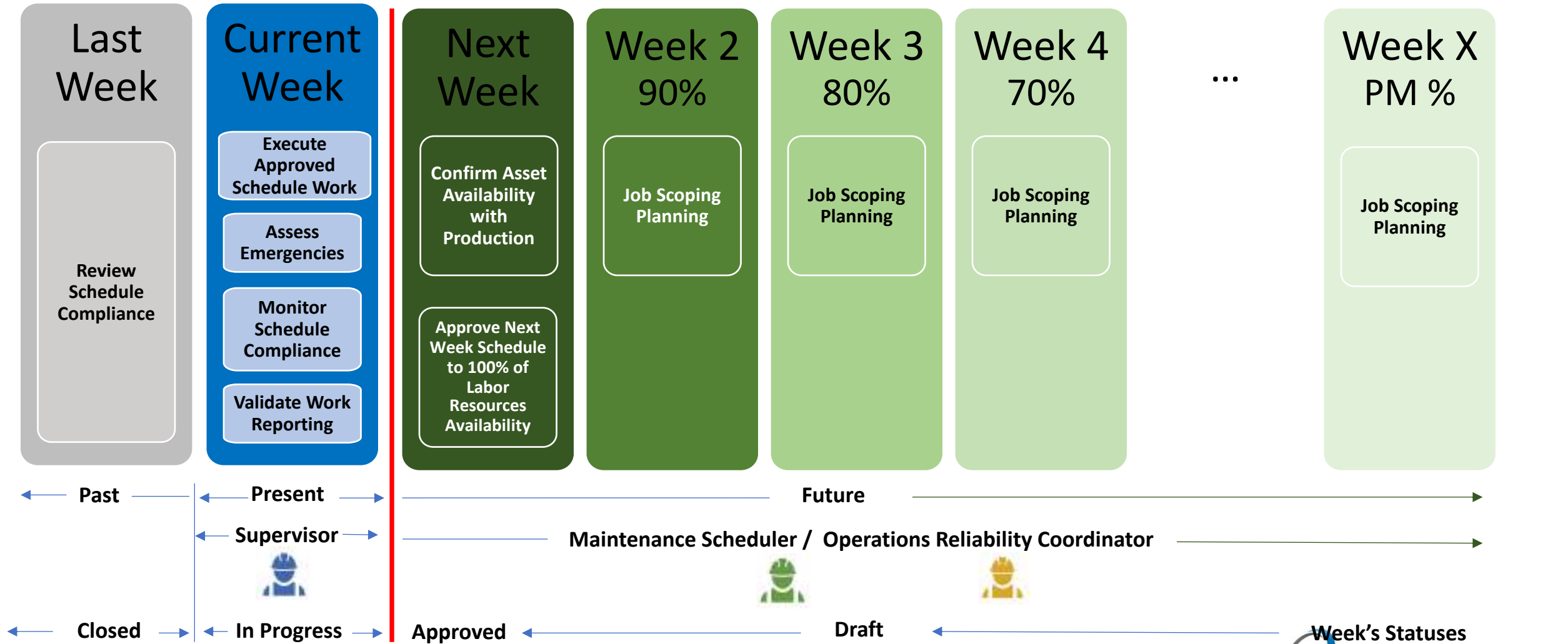


*Reliability engineers,
planners,
schedulers,
maintenance supervisors,
and operations supervisors,
are on the same
Team,
with the common goal of
preventing failures to
maximize production.*

EFFICIENT SCHEDULING FROM LONG TO SHORT TERM



MAINTENANCE 4.0 EFFICIENT MULTI-WEEK SCHEDULING PROCESS



ANNUAL

MULTI-ANNUAL PLAN

  
Reliability Engineer Maintenance Planner Maintenance Scheduler

MONTHLY

MULTI-WEEK ROLLING SCHEDULE

 
Maintenance Scheduler Production Scheduler

WEEKLY

NEXT WEEK SCHEDULE APPROVAL

DAILY

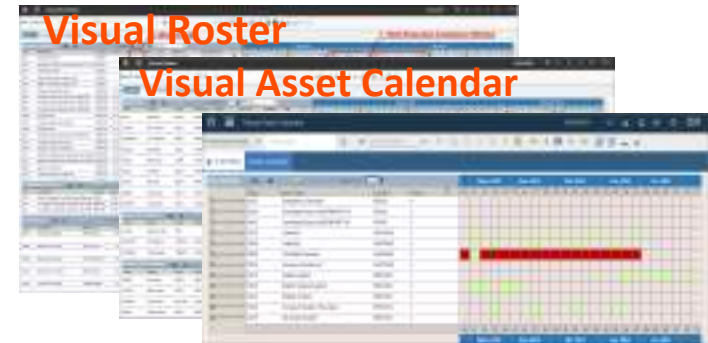
DAILY REVIEW & WORK EXECUTION


Maintenance Supervisor & Crafts People

Visual PM



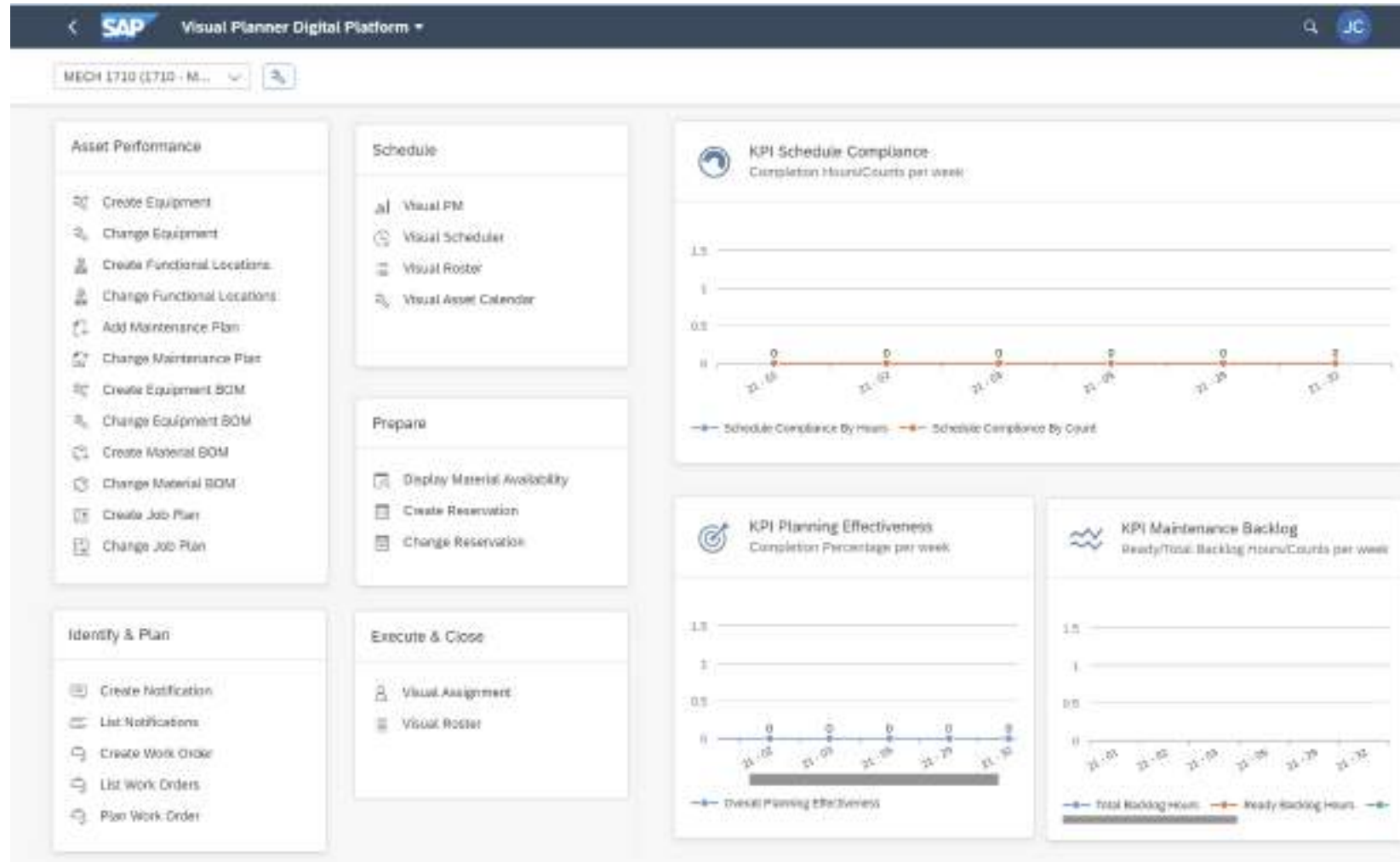
Visual Scheduler



Visual Assignment



VISUAL PLANNER DIGITAL PLATFORM



Visual PM – Strategic Preventive Maintenance Workload Balancing

List of maintenance plans

SAP Visual PM +

MECH(1710 - M03) Mechanical Maintenance Supervisor

Planned Operations (53)

Call	Equipment Description	MOC	M	Maint. Interval	Re.	Unit
2000031	Mult air blower	B	01	04-Mult air blower inspection	9.0	MDR
2000034	Bulane recovery blower	B	06	04-Bulane recovery blower inspection	9.0	MDR
2000037	Incrator fan blower	B	02	04-Incrator fan blower inspection	9.0	MDR
2000038	Substr Cass air blower	B	04	04-Substr Cass air blower inspection	9.0	MDR
2000039	LP blower compressor gas box	B	01	04-LP blower compressor gas box insp	9.0	MDR
2000040	Dyoxer compressor	B	06	04-Dyoxer compressor inspection	9.0	MDR
2000040	Feed gas compressor	B	01	04-Feed gas compressor inspection	9.0	MDR
2000042	Flash gas compressor	B	06	04-Flash gas compressor inspection	9.0	MDR
2000043	Instrumen air compressor	B	01	04-Instrumen air compressor inspection	9.0	MDR
2000044	Injection gas compressor stage 1	B	100	04-Injection gas compressor stage 1 ins	9.0	MDR
2000046	Injection gas compressor stage 2	B	101	04-Injection gas compressor stage 2 ins	9.0	MDR
2000048	LP gas compressor	B	102	04-LP gas compressor inspection	9.0	MDR
2000047	N2 unit air compressor	B	103	04-N2 unit air compressor inspection	9.0	MDR
2000048	Propene bol-UP water compressor in	B	104	04-Propene bol-UP water compressor in	9.0	MDR
2000048	Refrigeration compressor	B	105	04-Refrigeration compressor inspection	9.0	MDR



Move one or more calls via drag/drop



Reliability Engineer



Maintenance Planner

Visual Scheduler – Establish the weekly schedule

The screenshot displays the SAP Visual Scheduler interface. On the left, there are three panels: 'Scheduled Assignments (90)' with a table of work orders, 'Unscheduled Work Backlog (1)', and 'Work Centre Availability (2)'. The main area shows a Gantt chart for October 2019, with work orders represented as horizontal bars. Below the Gantt chart is a detailed daily workload view for October 2019, showing a grid of colored blocks representing work hours for different work centers.

Scheduled Work Order List

Scheduled Work Orders and Compliance Window

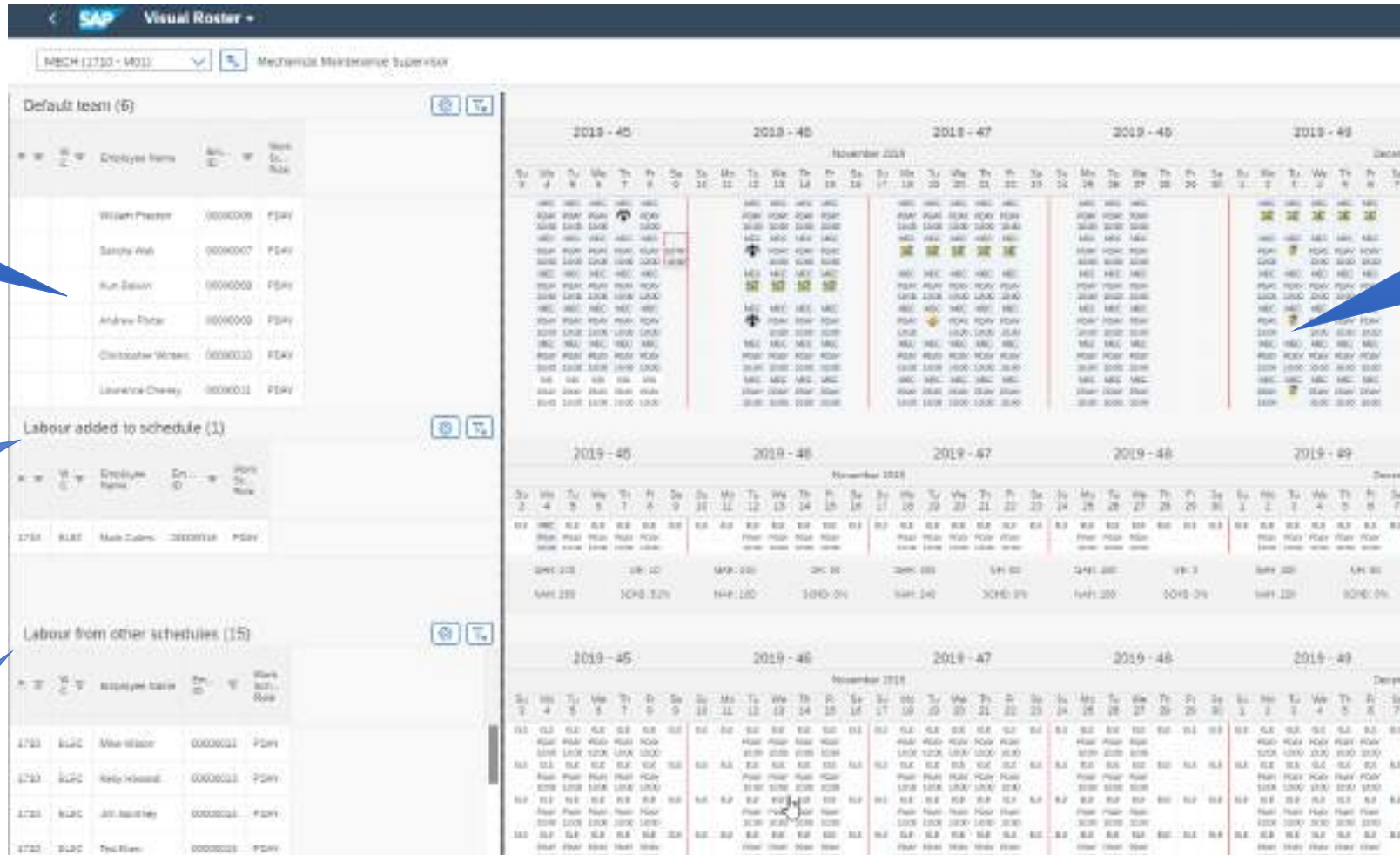
Maintenance Scheduler

Total weekly available hours

Production Scheduler

Detailed daily workload

Visual Roster – Plan Individual Resource Availability



People on selected team

People added to team

Other available people

Overview of work schedule and planned absences



Maintenance Scheduler



Production Scheduler

Visual Assignment - Rapidly assign the operation to a qualified, available resource



Maintenance Supervisor & Crafts People

Express Assignment

The screenshot displays the SAP Visual Assignment interface. On the left, there are lists for 'Scheduled Assignments (55)', 'Unscheduled Work Backlog (0)', and 'Laborer Availability (%)'. The main area shows a Gantt chart for November 2023 with resource bars and task assignments. A blue arrow points from the 'Individual workload' text to the Gantt chart.

Individual workload

This screenshot shows the 'Daily Assignments (7)' and 'Weekly Assignments (35)' sections. Below these is a detailed resource grid for November 16, 2023, with columns for various resources and their status. A blue arrow points from the 'Express Assignment' text to the grid.

Visual Asset Calendar

SAP Visual Asset Calendar

1710 - INST

Selected Assets

Technical Object	Tech object desc.	Location	Prod. W.C.	ABC In...	PL. Se...	Sy... St...	User St...	C T
1710	Central Services					CR...	Fu...	
1710-CWS	Cooling Water System	YB_1706			YIS	CR...	Fu...	
1710-...	Cooling Towers	YB_1708			YIS	CR...	Fu...	
171...	Cooling Tower#01	YB_1706			YIS	CR...	Fu...	
10000567	Gas flow control valve			B		AV...	Eq...	
10000602	Sulphur dioxide analyzer			B		AV...	Eq...	

November 2020

December 2020

Equipment Available

Equipment Not Available



Maintenance Scheduler



Production Scheduler

CONNECTED WORKER



- Execute maintenance Work from mobile devices
- Create notifications
- Plan Work
- Enter information on the work completed
- Perform Operator rounds
- Manage Safety and Risk Assessments
- Perform Inventory management

MONITORING SCHEDULE COMPLIANCE RIGOROUSLY

Weekly Meeting

- Meeting Agenda


- Review last week's schedule compliance
- Review current week schedule progress
- Agree on the next week's schedule

Attendees : Planners, schedulers, Maintenance and Operation Supervisors
Should be held on Thursday of every week.

Daily Meetings

- Meeting Agenda

- Assess day/shift priorities
 - Ensure highest Schedule compliance
- Attendees : Maintenance and operation supervisors
Should be held at the beginning of every day/shift

SCHEDULE COMPLIANCE									
									
Schedule: MILLER - 2016-07									
Period: 2016-02-14 - 2016-02-21									
Scheduled Work					Scheduled Breakers				
Scheduled WOs		Completed Work		Compliance %		Count	Hours	% by Count	% by Hours
Count	Hours	Count	Hours	By Count	By Hours				
12	18820	10	12220	83.0%	93.8%	Emergency	2	1100	14.3%
Scheduled Work completed vs Net Available Hours					Resource Utilization				
87.8%					84.3%				
Overall Planning Effectiveness					94.2%				
Schedule Breakers									
WO #	Description	Location	Asset	Craft	S&S Level	Type	Pr.	Net Hrs	Schedule Breaker code
4103	Repair kit wiring	BR40	1140	MECH	FIRSTCLASS	EM	1	3:00	Emergency
4015	Repair kit wiring	BR40	1140	MECH	FIRSTCLASS	EM	1	3:00	Emergency
Non-completed Assignments									
WO #	Description	Location	Asset	Craft	S&S Level	Type	Pr.	Justification Code	
302	Install Additional Lighting	04NF10		ELECT	FIRSTCLASS	CR	5	Replaced by emergency work	
4101	Replace brake pads	04PF10	1200	MECH	FIRSTCLASS	CR	4	Replaced by emergency work	
4101	Replace brake pads	04PF10	1200	MECH	SECONDCLASS	CR	4	Replaced by emergency work	

KEY PERFORMANCE INDICATORS

Reliability Indicators

- Schedule compliance
- Percentage of planned work vs unplanned work
- Backlog and WO Aging
- PM compliance
- Preventive maintenance hours vs corrective maintenance hours
- Emergency breakdowns

Planning and Scheduling Efficiency Indicators

- Planning accuracy
- Resource utilization
- Overtime



- Compliant with SMRP's Body of Knowledge

BUSINESS CASE

Current Situation

- 14,000 major assets
- 6 Planners-Schedulers
- 10 Maintenance Supervisors
- 130 Maintenance Technicians

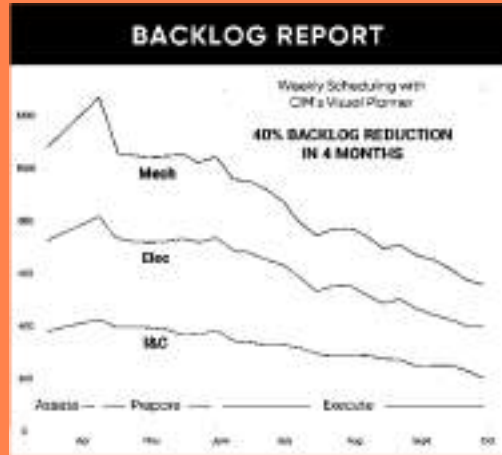
Organization's Challenges

- Costly emergency breakdowns
- Backlog out of control
- High overtime costs

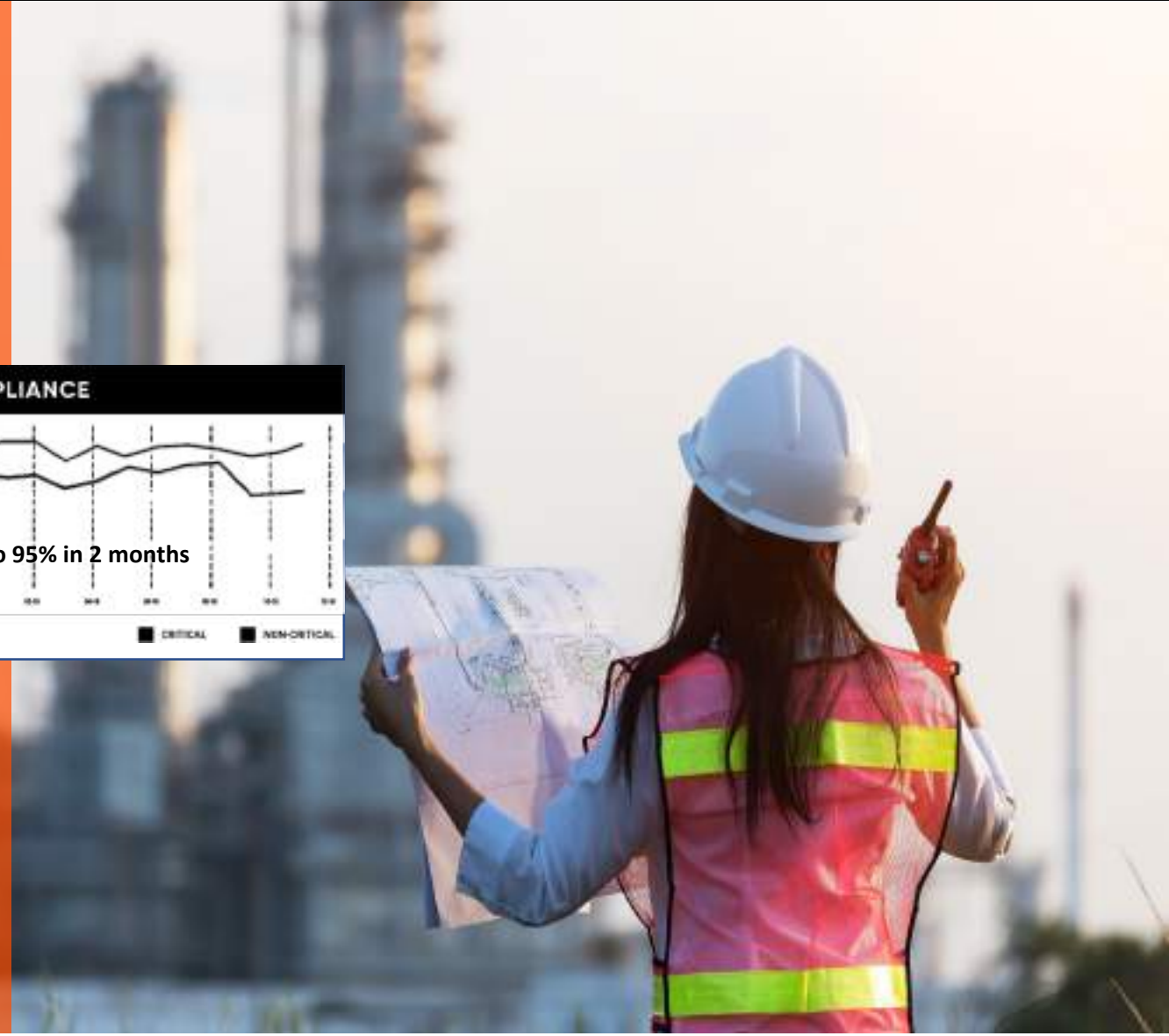
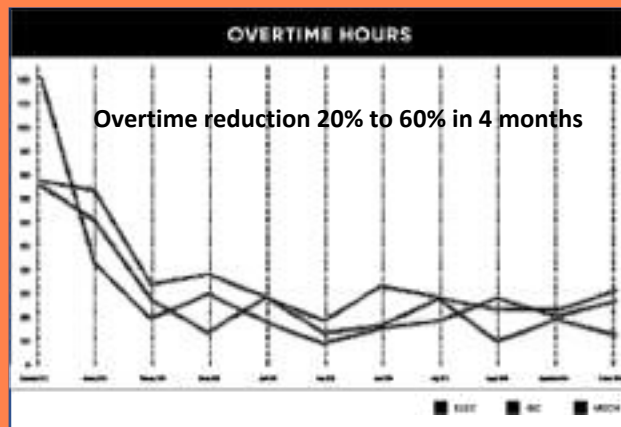
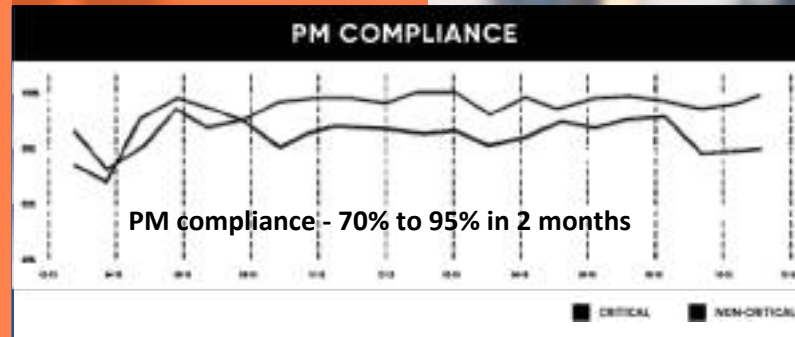


BENEFITS

BUSINESS CASE SUCCESS STORY



*12%-35%
more work done with
the same workforce*



BENEFITS

■ Direct Cost Reduction

- Reduced Overtime hours between 20% and 60%
- Reduced Contractor costs
- Reduced number of Planners-Schedulers required

■ Other Benefits

- Increased Maintenance Technician's productivity by 12%
- Reduced backlog by 50% after 6 months and kept under control since
- Increased PM compliance from 70% to > 95% in two months
- Reduced Emergency Breakdowns
- Reduced Safety Issues
- Reallocated Planners-Schedulers to more productive reliability tasks



***Direct maintenance costs
were reduced 6 times
more than the
implementation cost the first
year, and every year
thereafter.***

***The project paid for
itself in 2 months.***

CiM's MAINTENANCE EXCELLENCE PROGRAM

Perform Maintenance Diagnostic

- Roles and responsibilities
- Work management process
- Data: Assets, BOM, spare parts, job plans, PMs, routes, priorities...
- Metrics in use

Deliver Report and Maintenance Excellence Action Plan

- Findings summaries
- Financial benchmark
- Maintenance health index chart
- Recommendations and implementation

Execute Action Plan and Perform Continuous Improvement

- Lead Client Team or perform Asset inventory & define maintenance tactics
- Implement Rigorous Work Week management for routine maintenance
- Measure results and assist client to achieve continuous improvement



The maintenance diagnostic's objective is to measure the corporation's current maintenance operations situation and develop the action plan required to achieve maintenance excellence

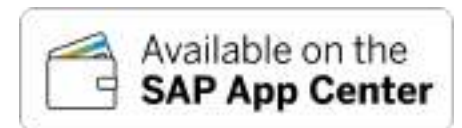
ABOUT VISUAL PLANNER

An award-winning solution

- Introduced in 2003 to enable organizations transition to planned mode by implementing a most efficient Work Week management process with a multi-week rolling schedule.
- Provides a high return on investment of only a few months, while ensuring that the maintenance work required to prevent asset failures is always be done on time.
- Used by over 10,000 maintenance professionals worldwide, providing outstanding value to organizations of all industrial sectors.



Visual Planner received the first ever ISMLE award from IBM as the best add-on of all the IBM Tivoli suite softwares.



VISUAL PLANNER ACROSS THE WORLD



“ Implementing a solid Work Week Management process with Visual Planner provided us the highest and quickest ROI of all the Maximo projects we have ever done. ”

Project Engineer,
Major US Power Generation Company

CiM ACHIEVE
MAINTENANCE
EXCELLENCE



OTHER SCHEDULING TOOLS AVAILABLE FOR SAP PM

SAP – Multiple Resource Scheduling (MRS) (Germany)

- MRS is a Field Service Management (FSM) tool designed to manage crews to perform short term corrective request on distributed assets. For example: Power Transmission and Distribution network, Communication companies, etc... It does not have the week concept and is not suited for an industrial site.



Graphical Work Order Scheduler (GWOS) – Prometheus (USA)

- GWOS has also been designed to facilitate the task of the scheduler to schedule work according the labour resource available using Drag&Drop.
- It use a general scheduling approach base on date-time and labour availability. It does not provide a long-term approach to be able to balance the PMs in advance.
- The week is specified by loading the revision field of the work order with a week number. This approach is not flexible enough. It does not allow to report accurately the schedule compliance especially when work is started in one week and finished in another one, or it is rescheduled to another week, which generally represents a good percentage of the maintenance work done. This approach does not allow to monitor schedule breaker rigorously which is essential to implement an efficient Work Week Management process.
- The functionality available covers about 50% of the scheduling requirements for operations



- It has been around for the longest time for SAP PM.

Solution Functionality Comparison Overview

MRS	Prometheus GWOS	Visual Planner
Traditional GUI based interface	Traditional GUI based interface	SAP Fiori based GUI
On-site SAP add-on	On-site SAP add-on	Cloud based solution
Gantt format used to display operations and their scheduled sequence	Gantt format used to display work orders and their scheduled sequence	Calendar based screens with icons to display operations and their assignment status
	Gantt view showing operations as time bar with resources availability per date-time.	User friendly multi-weeks schedule clearly showing equipment, parts, PF interval and resource availability per week in a single view
Drag and drop re-scheduling	Drag and drop re-scheduling	Drag and drop and OneClick re-scheduling and Assignment
		Graphical screen to manage net resource availability
		Graphical screen to perform long-term preventive maintenance capacity planning and workload levelling.

THE VISUAL PLANNER DIFFERENCE

Technical

- Native on S/4HANA
 - No specific configuration or adaptation required, faster implementation time
- Directly connects to SAP transactions/tables
 - Executes standard transactions such as IP10 and CM25
 - No additional interface programming is required
- Offers mobile experience
 - In-mine, or in-plant usage for on the go assignment optimization, craft people availability management
 - Accessible from anywhere
- Compatible with ECC
 - For a global, all connected workforce optimization, SAP version agnostic

THE VISUAL PLANNER DIFFERENCE

Functional

- Integration with SAP's OneHR
 - Supports accurate resource availability and skills inventory for better planning
- Keeps track of the execution window to get the work done before failure
 - Manufacturer based execution window is kept for optimal maintenance behavior
- On the fly assignment of work
 - One click assignment of Work Order operations to craft people
- Always visible backlog information
 - Ability to promote backlog WO to current schedule to lower workloads
 - Optimizes sub-contractors utilization through better planning