

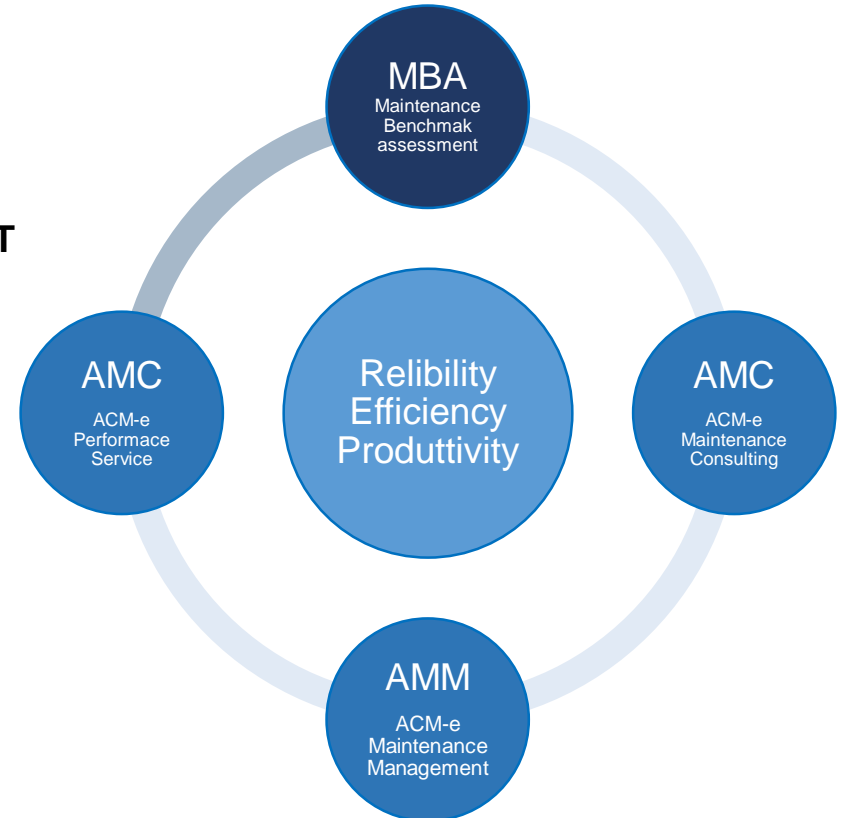
ACM-e Maintenance Engineering and Services Introduction



Maintenance Best practices

Maintenance Best practices

- > **MBA** MAINTENANCE BENCHMARK ASSESSMENT
- > **AMC** MAINTENANCE CONSULTING
- > **AMM** MAINTENANCE MANAGEMENT
- > **APS** PERFORMANCE SERVICE



Principles of Maintenance Best practices

	Main objectives	Main advantages
Qualify and empower maintenance people	To get enhanced skills and motivation, with well defined responsibilities and duties in order to increase each-one ownership and proactivity	Higher maintenance crew dependability with less reworks, higher quality and efficiency
Minimize costs without affecting performance on the long-term period	To precisely identify unnecessary costs, cut them surgically, simplify procedures when possible and invest on resources which can enable efficiency	Overall costs reduction with the same or improved equipment performance
Achieve Reliability and Availability design performance	To deeply understand the gaps between expected and actual equipment technical performance, to determine how to achieve performance targets, through manangement or technological interventions	Less unplanned downtime, less production losses, less production issues due to low quality
Ensure EHS and compliance with normative and regulations	To avoid any impact, even minimal, on Safety, Health and Environment due to wrong working instructions and procedures, unreliable or not properly utilized equipment	Improved Company identity, less troubles related to accidents management, insurance savings
Develop, collect and share maintenance knowledge across the company	To make technical documentation, experiences, lessons learned, historical events, become a true Client's asset to safeguard, manage and archive properly to keep and increase its full value along time	Progressively increase and distribute the knowledge, in order to not depend by single people, avoiding issues due to turnover



Principles of Maintenance Best practices

SUSTAINABILITY

Reliability engineering

Continuous improvement

Total Cost of Ownership (TCO)

Configuration management

Budgeting and costs control

Digitalization processes and KPIs management

OPTIMIZATION

E.A.M.

Supplier supervision

Organizational structure

Training

Work planning

Work measurement

Loss elimination

Facilities and equipment

PROCESSES

Work control

Scheduling

Autonomous maintenance

Equipment and process design

Preventive and predictive maintenance

Procurement

Materials management

CULTURE

Status of asset

Safety culture

Change management

Self assessments

Objectives and goals

Development plans

Quality result

Organizational behaviour

Performance management

PRINCIPLES

Customer satisfaction

Management commitment

Three Levels of Involvement to Maintenance Best in Class



MBA

Maintenance
Benchmark
Assessment

FLEXIBLE OPTIONS FOR YOUR MAINTENANCE'S PARTNER

Three stand-alone or sequential intermediate stages to Maintenance Excellence

AMC

ACM-e Maintenance Consulting

To advise Clients on those areas which show the most significant or strategic rooms of improvement

AMM

ACM-e Maintenance Management

To provide Clients with Management Services relevant to Maintenance, Spare Parts and major Plant Maintenance Shutdowns

APS

ACM-e Performance Service

To provide Clients with Total Maintenance Services, including the outsourcing of Maintenance personnel



Three Levels of Involvement to Maintenance Best in Class - Peculiarities

	Typical contract duration	Supportive systems, tools, methodologies	Contract type	Main ownership of results	Covered Units
AMC Maintenance Consulting	From few months to 1 year	Provided by ACM-e and included in the scope of supply	<ul style="list-style-type: none"> • Daily rate • Lump-sum 	Client	Applicable to any equipment or plant sections
AMM Maintenance Management	Recommended not less than 2 years (2-3 years)	Provided by ACM-e and included in the scope of supply	<ul style="list-style-type: none"> • Cost + fee • Lump-sum • Bonus/malus clauses based on agreed KPIs 	ACM-e	Applicable to any equipment or plant sections
APS Performance Service	Recommended not less than 3 years (3-5 years)	Provided by ACM-e and included in the scope of supply	<ul style="list-style-type: none"> • Lump-sum • Bonus/malus clauses based on agreed KPIs 	ACM-e	Applicable to any equipment or plant sections



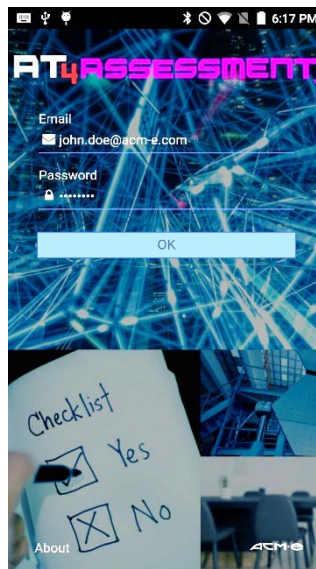
ACM-e Maintenance Benchmark Assessment

ACM-e Maintenance Benchmark Assessment is the initial key-step to properly approach anyone of the next levels of involvement.

- 1 Maintenance organization, people evaluation and skills assessment
- 2 Work orders process, planning and scheduling, tools
- 3 Costs control
- 4 Supply chain and vendors management
- 5 Warehouse management and spare-parts optimization
- 6 Customer Satisfaction and productivity analysis
- 7 Maintenance quality and safety management
- 8 Digitalization process and KPIs management
- 9 Continuous improvement management



According to **EFNS** *European Federation of National Maintenance Societies*, **UNI EN 15628: Maintenance – Qualification of Maintenance personnel** and **ISO 55000: Asset management - Overview, principles and terminology**



ACM-e Maintenance Consulting

1

Maintenance Process and Organization

- Maintenance organization design
- Process mapping, definition of responsibilities and book of roles
- Evaluation of skills vs. roles
- Maintenance and Reliability management development
- Planning and Scheduling
- Maintenance Logistics design and implementation
- Change management preparation and support
- Training plan preparation
- Implementation of ISO 55000

2

Reliability and Availability improvement

- Equipment breakdown structure
- Asset criticality analysis
- Failure Mode Effect and Criticality Analysis (FMECA)
- Reliability Centered Maintenance (RCM)
- RAM performance simulations based on stochastic models
- Asset integrity review
- Risk Based Inspection

3

Preventive Maintenance Optimization

- Preventive, Predictive and Condition Based Maintenance design
- Preventive Maintenance plans elaboration
- Preventive Maintenance Standard Operating Procedures elaboration
- Law driven Maintenance identification and preparation
- Safety Equipment Preventive Maintenance definition
- Normatives compliance evaluation

4

Quality, Safety and Environment Engineering

- QEHS compliance assessment
- Gap analysis and recommendations
- Industrial risk assessment
- Safety procedures and instructions
- Implementation of ISO 9001
- Implementation of ISO 14001
- Implementation of ISO 18001
- Implementation of ISO 20121 (sustainability)

8 ADVANCED SERVICES FOR AMC (MAINTENANCE CONSULTING)



ACM-e Maintenance Consulting

5

Warehouse and spare parts optimization

- Spare parts analysis and classification
- Stocks review and optimization
- Optimal stocks level calculation
- Stock-out assessment and reduction
- Materials standardization
- Materials management processes and workflows design and implementation
- Warehouse automation design and implementation

6

Energy Efficiency improvement

- Detailed Energy Efficiency Assessment
- Elaboration of the portfolio of improvement opportunities
- Feasibility study for some selected main improvement opportunities
- Technology scouting and qualification

7

Maintenance Digitalization and Automation

- Enterprise Asset Management system customization and implementation
- OEE monitoring system
- Dashboard and Business Intelligence design and implementation
- Performance and Condition monitoring
- Safety tracking
- Asset, network and IT infrastructure assessment and upgrade
- Data protection assessment and upgrade
- Field maintenance automation design and implementation
- System integration

8

Training and Coaching

- Training for Maintenance Managers
- Training for Maintenance Engineers
- Training for Maintenance Supervisors
- Technical training on specific technological topics relevant to particular ACM-e's or third party equipment
- Training on the job
- Mid-long term coaching and tutoring
- Skills re-qualification



ACM-e Maintenance Consulting: Training and coaching

TRAINING AND COACHING: COURSES

ACM-e offers courses for all the Maintenance involved people with the use of the latest multimedia tools and technical documentation, which result in efficient operations and reduced operating costs. An effective training program increases the adoption of best practices and improves Client's performance. Standard or tailored training modules cover the following topics:

1. Basic mathematics and rules of Reliability Maintainability and Availability theory
2. Reliability Centered Maintenance (RCM)
3. Reliability and Risk Assessment
4. Root Cause Analysis
5. Failure analysis and reporting
6. Maintenance digitalization and automation
7. EAM (CMMS) design and implementation
8. Condition Based and Predictive Maintenance
9. Preventive maintenance policies
10. Maintenance planning and scheduling
11. Maintenance Key Performance Indicators (KPI)
12. Life cycle cost & budget management
13. Maintenance outsourcing management
14. Human factors and reliability
15. Plant shutdown and overhaul management
16. Overall Equipment Effectiveness (OEE)
17. Energy efficiency analysis and development
18. Maintenance and material management processes
19. Spare parts management
20. Standard Jobs definition and management
21. Workshop organization



ACM-e Maintenance Consulting: Training and coaching

Example of: MAINTENANCE AND MATERIAL MANAGEMENT PROCESSES

Main topics

To provide trainees with all the necessary information, guidelines and recommendations to properly arrange and run processes related to Maintenance and Materials management

Who should attend

Maintenance managers, maintenance engineers, maintenance supervisors, EAM/CMMS engineers, maintenance planners and schedulers, Warehouse managers, materials coordinators, Procurement managers, senior buyers, Quality managers

Expected benefits

Capability to draw, disseminate and implement internal process maps and workflows in order to achieve improved management performance

Training method

Classroom training session, based on slides and real business cases. Group exercise and action planning. The maximum number of trainees is 15. Training to perform at Client's premises or at ACM-e's facility

Duration

2 days for classroom training + 2 days for tutoring



ACM-e Maintenance Management

1

Executive Maintenance Management

- Maintenance and Reliability management and engineering
- Maintenance planning and scheduling
- Maintenance works supervision
- Suppliers qualification and management
- Maintenance cost controlling and budgeting
- Periodical Maintenance assessment and improvement identification
- EAM design, implementation and deployment
- Maintenance periodical training
- Predictive and Condition Based Maintenance design and supervision
- KPIs definition and monitoring relevant to the scope of work and covered units

2

Warehouse and Spare Parts Management

- Warehouse facility and equipment maintenance
- Materials procurement (from request to receiving)
- Materials quality control
- Materials preservation management
- Suppliers qualification and expediting
- Spares classification and optimization
- Stocks obsolescence analysis
- Materials inventory control
- Materials entries and withdrawals management
- KPIs definition and monitoring relevant to the scope of work

3

Plant Shutdown and Overhauling Management

- Plant shutdowns, revamping and overhauling specifications and tendering
- Vendors selection
- Works planning and scheduling
- Works control and supervision
- Works quality control
- EHS management related to the scope of works
- KPIs definition and monitoring relevant to the scope of work

3 ADVANCED SERVICES FOR AMM (MAINTENANCE MANAGEMENT)



ACM-e Performance Service

ACM-e Performance Service

- Safety and Environmental management
- Quality process maintenance management
- Maintenance and Reliability engineering and management
- Maintenance planning and scheduling
- Maintenance works supervision and fulfilment
- Suppliers qualification, evaluation and management
- Maintenance cost controlling and budgeting
- Periodical Maintenance assessment and improvement identification
- Continuous improvement management
- Digitalization process: design, implementation and deployment on advanced platform
- Maintenance training
- Predictive and Condition Based Maintenance design and supervision
- KPIs definition and monitoring relevant to the scope of work and covered units
- Warehouse management
- Purchasing management
- Document updating & management
- Utility management
- Improvement engineering proposals

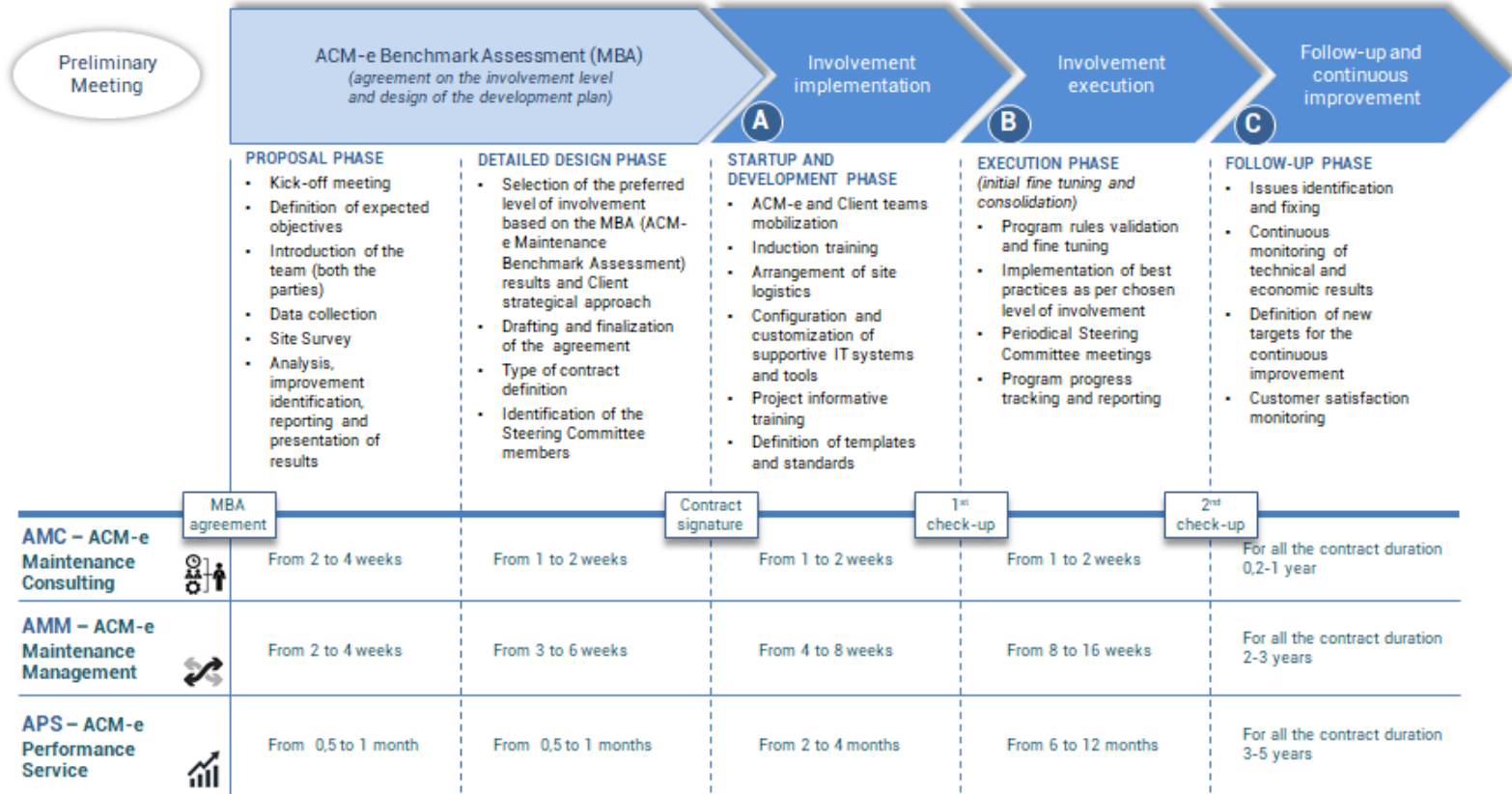
1 FULL ADVANCED SERVICE FOR APS (ACM-E PERFORMANCE SERVICE)

It includes the outsourcing of Client's maintenance personnel for the contract duration; at contract termination, maintenance personnel is re-insourced by Client, to ensure the highest service continuity.

It can be adopted for ACM-e's or third parties supply, on a case by case evaluation, as mainly resulting from the initial Assessment & Benchmarking



Typical ACM-e Involvement Steps and Timing



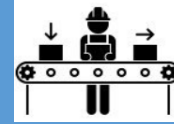
Performance KPIs

PERFORMANCE ON BONUS / MALUS (EXAMPLE)

- Bonus / malus scheme is a % of contract value (normally 5-8%)
- KPIs are agreed and reviewed yearly
- Indicators could be defined by area, process, production line, machine and people
- The range of target could be defined as linear or with neutral zone
- Improvements on dedicated projects will be shared on a win – win approach

PRODUCTIVITY

- Overall Equipment Effectiveness (OEE)
- Technical Downtime (DT)
- Equipment / production line / process availability
- Quality result



area – process – production line, machine and people

RELIABILITY

- Reliability Performance Indicator (RPI)
- Mean time between failures (MTBF)
- Mean time to repair (MTTR)
- Maintenance schedule compliance

EFFICIENCY

- Planned maintenance on TM
- Planned maintenance compliance
- Absenteeism
- Energy efficiency savings

WAREHOUSE

- Yearly stock value (YSV)
- Inventory rotation index (IRI)
- Safety stock defined on total spare

SAFETY

- Global safety indexes (IF-IG)
- Nr. preventive inspections
- Nr. unsafe conditions
- Mean time action follow-up

SUSTAINABILITY

- Legal requirement compliance
- PM on time compliance
- Customer satisfaction
- Training hours

According to **BS EN 15341**: Maintenance key performance indicators

ACM-e Maintenance Services - Introductory concepts

A strategic synergy for World-class Maintenance

to satisfy all customer's needs

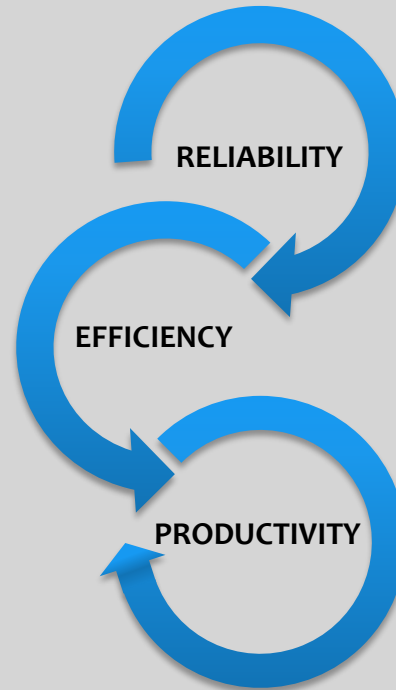
ACM-e (Availability Centered Maintenance) is an engineering and consulting company with a strong and deep specialization in the area of Industrial Maintenance and Reliability.

More than 100 international projects with an extensive track-record related to the design, consulting, maintenance management and implementation of successful Maintenance Performance Based contracts



AT4 Smart Services supplies technological solutions based on deep learning, machine learning and artificial intelligence fully integrated in the Industrial digitalization process to predict and prevent failures.

Advanced digital management platform for the best in class of maintenance compliance ISO55001 and WCM concepts



Customer

CUSTOMER NEEDS and WISHES

- Sustainability
- Processes optimization
- Productivity
- Availability growth and Reliability
- Cost efficiency
- Training
- Maintenance culture
- Maintenance methodologies
- Contracts performance based
- Online KPIs monitoring and management
- Maintenance's partner
- Digitalization's partner

Thank you!

