“Training the Industrial Athlete of the Future”

Production Standards

August 2007 Update

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Background

In 1998, the federal National Skill Standards Board (NSSB) officially recognized the Manufacturing Skills Standards Council as the "Voluntary Partnership" for Manufacturing under the terms of the National Skill Standards Act. The MSSC was responsible for building a nationwide system of industry-led, core skill standards, assessments and certifications for production and production support workers (entry-level thru first-line of supervision) in all manufacturing sectors.

MSSC built standards in six industry-wide technical competency areas or "concentrations." In developing nationally validated, legally defensible standards, the MSSC involved 700 companies, 4,000 workers, 350 subject matter experts, and some $9,000,000 in public funds and in-kind industry contributions. In 2001, the NSSB formally endorsed these MSSC standards.

Subsequently, the MSSC has developed a nationwide system of curriculum, assessment and certification based upon the standards for the "Production" concentration, leading to a "MSSC-Certified Production Technician (CPT)" credential. According to the U.S. Department of Labor's *Occupational Outlook,"* there are now about 7 million individuals in manufacturing production occupations, more than half of the total number of manufacturing jobs in the U.S.

In 2007, the MSSC updated its original "Production" standards to ensure that they reflect the skills and knowledge used today in high-performance, advanced manufacturing workplace. This update involved teams of subject matters experts and review by over 250 companies representing all manufacturing sectors. The updated standards, completed in August 2007, continue to be organized around the MSSC's original four critical work functions of Production:

- ***Safety***
- ***Quality Practices and Measurement***
- ***Manufacturing Processes and Production; and***
- ***Maintenance Awareness.***

The standards for each of the four functions are organized under two headings:

- ***Work Standards***- These define the key activities and related performance indicators that represent the work carried out.

- ***Worker Standards***- These define the basic technical knowledge and skills required by a mid-level production technician to perform the work.

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MSSC Work Standards

SAFETY

Key Activities and Performance Indicators

1. Work in a Safe and Productive Manufacturing Workplace

a. Ways in which manufacturing affects the national and global economies are recognized
b. Systems of safety used by high-performance manufacturers to produce quality products at lowest possible costs are recognized
c. Role of production workers in helping to ensure competitive levels of cost, quality and delivery in a safe work environment is identified
d. External and internal customers are identified.

2. Perform safety and environmental inspections

a. Potential hazards in the work are identified, reported and monitored
b. Corrective action is taken to eliminate potential hazards
c. Health, safety and environmental documentation and policies are thorough and regularly reviewed
d. Inspections meet all relevant health, safety and environmental laws and regulations
e. Inspections are performed according to company schedule and procedures
f. Inspections are documented
g. Inspection records are stored correctly.

3. Perform emergency drills and participate in emergency teams

a. Training and certification on relevant emergency and first aid procedures are complete and up-to-date
b. Procedures for responding to fire and electrical emergencies are clearly defined

c. Emergency response complies with company and regulatory policies and procedures
d. Emergency drills and incidents are documented promptly according to company and regulatory procedures

4. Identify unsafe conditions and take corrective action

a. Conditions that present a threat to health, safety, and the environment are identified, reported, and documented properly
b. Corrective actions are identified
c. Appropriate parties are consulted about corrective action
d. Corrective actions are taken promptly according to company procedures
e. Ongoing safety concerns are tracked and reported until corrective action is taken

5. Provide safety orientation for all employees

a. Orientation covers all topics and procedures needed to facilitate employee safety
b. Orientation identifies needs and processes to raise safety concerns, ask questions, and receive additional training
c. Orientation is provided on use of personal protective equipment
d. Orientation is documented according to company requirements
e. Orientation meets all relevant laws, policies and regulations
f. Safety training is delivered regularly

6. Train personnel to use equipment safely

a. New operators are given a complete orientation to the equipment and guidelines for ergonomic safety
b. All important information regarding equipment safety, including material handling equipment, is communicated clearly and effectively
c. Suggestions regarding training materials and content are made to the correct parties
d. Evaluations and feedback are utilized to improve training materials and methods
e. During training, trainee has the correct tools to do the job
f. Post-training evaluation indicates that workers can operate equipment safely
g. Training and facilitation techniques used are appropriate for trainees
h. Quality and effectiveness of training are documented appropriately

7. Suggest processes and procedures that support safety of work environment

a. Health and safety representatives are consulted in the development of suggestions
b. Operator feedback is solicited and used to create a safer, more effective work environment
c. Suggestions are made to correct parties, according to company procedure
d. Suggestions are properly documented
e. Content of suggestions appropriately responds to safety, quality and productivity issues

8. Fulfill safety and health requirements for maintenance, installation, and repair

a. Communication regarding safety is made regularly to all employees
b. Job safety analyses are reviewed regularly according to company policy
c. Hazardous materials procedures and policies, such as Material Safety Data Sheets (MSDS) and right-to-know, are accurately followed
d. Environmental testing of workplace is performed on a regular basis as required by company policy and regulation
e. Equipment is audited to ensure there are no by-passes of safety guards
f. All regulatory and company safety procedures are followed, including those related to lock-out/tag-out, confined space, and ergonomics
g. Good housekeeping procedures are followed

9. Monitor safe equipment and operator performance

a. Monitoring is performed regularly
b. Out-of-compliance or unsafe conditions are reported immediately
c. Corrective action is taken on out-of-compliance or unsafe conditions
d. Equipment is checked to ensure it is operating according to safety specifications
e. Tools are checked to ensure they are in compliance with safety specifications
f. Accident and injury data is forwarded to appropriate personnel for inclusion in OSHA recordables
g. Information on equipment use is gathered from operators to reveal existing or potential safety problems.
h. All safety monitoring data is accurately documented

10. Utilize effective, safety-enhancing workplace practices

a. Communications are clear
b. Teamwork is effective
c. Production job assignments are made properly
d. Training programs are run efficiently

MSSC Worker Standards

SAFETY

Basic Technical Knowledge and Skills[1]

Safe and Productive Workplace

1. Knowledge of ways in which manufacturing affects the national economy and standard of living
2. Knowledge of ways in which the global economy affects manufacturers
3. Knowledge of major sub-industries within manufacturing
4. Knowledge of common safety practices and systems
5. Knowledge of responsibilities of a frontline production worker in a high-performance, safety-conscious work organization
6. Skill in recognizing different and common needs of internal and external customers
7. Skill in maintaining customer contact about product specifications and printed specs to ensure understanding of needs, including those related to safety

Safety procedures

1. Knowledge of how to locate and use Material Safety Data Sheets (MSDS)
2. Knowledge of company first aid or first response procedures
3. Knowledge of material handling techniques to safely move materials
4. Knowledge of how to be proactive in responding to a safety concern and document occurrences
5. Knowledge of emergency exits
6. Knowledge of various emergency alarms and procedures
7. Knowledge of clean-up procedures for spills
8. Knowledge of Lock Out/Tag Out requirements
9. Knowledge of how to inspect work area and report possible safety risks
10. Knowledge of machinery and equipment safety functions to determine if all safeguards are operational
11. Knowledge of safety procedures in case of smoke or chemical inhalation

12. Knowledge of procedures for handling hazardous material
13. Skill in developing safety checklists
14. Knowledge of equipment shutdown procedures
15. Skill in performing leak checks to determine if toxic or hazardous material is escaping from a piece of equipment
16. Knowledge of proper and safe installation techniques as described in manuals, checklists, and regulations

Personal Safety Practices

1. Skill in identifying and reporting unsafe conditions
2. Skill in selecting and using personal protective equipment
3. Knowledge of ergonomic impact of work techniques
4. Knowledge of proper techniques for lifting loads
5. Knowledge of safety requirements for platforms, man lifts, and ladders
6. Knowledge of safety requirements for material handling equipment such as forklifts, cranes, rigging, and pry trucks
7. Knowledge of safety requirements for manual, electrical-powered, and pneumatic tools
8. Knowledge of safety requirements for operation of automated machines/ automated processes

Safety Policies and Regulations

1. Knowledge of basic filing procedures to properly store inspection records
2. Knowledge of safety requirements and environmental regulations related to performing inspections
3. Knowledge of policies and procedures needed to perform audits and train employees about hazardous conditions
4. Knowledge of company safety standards for handling potential hazards
5. Knowledge of how to safely store, identify, and use hazardous materials and pressurized vessels
6. Knowledge of OSHA and other health and safety requirements as applied to the workplace
7. Knowledge of government policies, procedures, and regulations governing the safe use of equipment
8. Knowledge of procedures to prevent or reduce emissions and spills
9. Knowledge of Hazardous Materials (HAZMAT) procedures information
10. Knowledge of Material Safety Data Sheets (MSDS)
11. Knowledge of applicable safety standards
12. Knowledge of which tools and equipment require safety certification
13. Knowledge of what the law requires companies to post or publish in order to keep employees abreast of OSHA and other government regulations
14. Knowledge of EPA required documentation for (a) disposal of hazardous waste generated during maintenance or (b) transportation of contaminated items

15. Knowledge of accident documentation procedures

Safety-related Maintenance Procedures

1. Knowledge of equipment operation and design parameters to determine if machine is operating safely
2. Skill in reviewing environmental data systems in the factory
3. Skill in making adjustments to equipment to ensure that it is operating within established safety and environmental parameters
4. Skill in regularly monitoring equipment for unsafe conditions

Safety Training

1. Skill in developing and/or delivering safety training per guidelines
2. Knowledge of health and safety education requirements
3. Knowledge to identify safety training courses
4. Knowledge of equipment manual and standard practice manual to repair equipment safely
5. Knowledge of certifications needed fro regulatory compliance (i.e., Cardio Pulmonary Resuscitation (CPR), Fire extinguisher, and Blood born Pathogens)
6. Skill in conducting equipment safety demonstrations
7. Skill in training other workers in proper safety procedures during maintenance process
8. Knowledge of the tools and materials needed to operate equipment to train others
9. Skill in using monthly safety meetings to improve the safety environment and communicate changes in regulations

Communication Skills that Enhance Safety

1. Knowledge of ways to improve reading, listening and writing skills
2. Knowledge of techniques for making effective presentations to internal and external customers, including safety orientations
3. Skills in using different forms of communication, such as e-mail, fax and phone
4. Skills in providing effective feedback and making suggestions
5. Skill in communicating customer needs effectively to others including shift-to-shift, co-workers, & managers, including needs that impact safety.

Teamwork skills that Enhance Safety

1. Knowledge of the characteristics of a high-performance team
2. Knowledge of roles and responsibilities of production team members
3. Skill in using teamwork to deal with customer requests

4. Knowledge of ways to align team goals to customer and business production needs
5. Skills in ensuring that team goals are specific, documented, measurable and achievable
6. Skill in communicating production information to team members
7. Skill in using team problem-solving and conflict resolution processes

Training skills that Enhance Safety

1. Knowledge of how training needs are assessed regularly to identify new requirements and training issues
2. Skill in conducting training in an effective and appropriate manner to achieve training goals
3. Knowledge of ways to ensure that training materials are documented and available
4. Skill in ensuring that training is relevant to equipment, tools, materials, and processes at the workstation
5. Knowledge of ways to provide appropriate cross-training
6. Knowledge of ways to ensure that training documentation is accurate and current and meets all company and regulatory requirements

MSSC Work Standards

MSSC QUALITY PRACTICES & MEASUREMENT

Key Activities and Performance Indicators

1. Participate in periodic internal quality audit activities

a. Audit data are relevant and correct
b. All relevant audit forms are completed correctly and forwarded to the proper parties in a timely manner.
c. Conformances to quality standards are properly assessed and documented.
d. When appropriate, include observation of operation in audit to ensure process and product meet specifications
e. Audit performed in accordance with company and other required schedules and procedures
f. Ongoing audits are performed to optimize the outcomes of corrective actions

2. Check calibration of gages and other data collection equipment

a. Calibration schedule is followed according to specifications
b. Instrument certification is checked by reviewing documentation and through observation during use
c. Instruments out of calibration are promptly recalibrated or referred to the appropriate parties for recalibration repairs

3. Suggest continuous improvements

a. Potential improvements are recognized through observation and data analysis
b. Measurable & data-driven benefits to the company/customers/employees are included in suggestions
c. Suggestions are made according to proper procedures and documentation.

d. Suggestions show that all relevant data were reviewed before making suggestions

4. Inspect materials and product/process at all stages to ensure they meet specifications

a. Sampling and inspection occur according to schedule and procedures
b. Inspection tools and procedures are selected and used correctly
c. The calibration of testing equipment is verified
d. Materials are inspected against correct specifications
e. Products, processes and materials that do not meet specifications are identified promptly
f. Implementation of corrective actions is verified through spot checks
g. Inspection documentation is properly documented and reported to the correct parties

5. Document the results of quality tests

a. Data forms are checked to ensure that they are complete and accurate
b. Information is evaluated and interpreted correctly
c. Data is forwarded to correct parties
d. Correct analytical tools, including statistical process controls (SPC), are selected and used properly
e. Reports are stored properly for the specified time frames

6. Communicate quality problems.

a. Quality problems are reviewed with production operators
b. Quality problems are communicated promptly to appropriate parties
c. Quality problems are documented according to established processes
d. Defect trends are summarized and reported to appropriate parties

7. Take corrective actions to restore or maintain quality

a. Appropriate corrective actions are identified and approvals received when needed
b. Recommendations for action are clear, concise and supported by data
c. Recommendations are made promptly to the appropriate parties
d. Adjustments are made in a timely manner to eliminate deviations and bring the process back into control
e. Adjustments and follow-up product quality checks are properly documented in correct format
f. Corrective action/quality improvements are implemented in a standardized manner

8. Record process outcomes and trends

a. Records on quality process are maintained to appropriate standards.
b. Outcomes of quality processes are charted according to appropriate methods and standards.
c. Data on quality process performance is accurate
d. Quality process performance data is analyzed to identify trends.
e. Quality process performance data is reported to appropriate parties in a timely manner
f. Previous documentation on similar process issues is examined to identify possible solutions

9. Identify fundamentals of blueprint reading

a. Objects are effectively visualized in a drawing
b. Blueprint features are correctly identified
c. Dimensions of an object in a technical drawing are accurately read and understood
d. The functions of sectional drawings are recognized

10. Use common measurement systems and precision measurement tools

a. Both U.S. measurement and standard international metric systems are used and converted
b. Parts are measured correctly using a machinist's rule and tape measure
c. Part dimensions are measured correctly using a caliper and micrometer
d. A computer is used correctly to measure data from a digital gage

MSSC Worker Standards

QUALITY PRACTICES AND MEASURMENT

Basic Technical Knowledge and Skills[2]

Overall Quality Process

1. Knowledge of quality standards and how they apply to products to make effective decisions about quality problems
2. Knowledge of quality procedures and product specifications to identify nonconformance
3. Knowledge of the roles and responsibilities for quality in an organization
4. Skill in identifying product defects and defect patterns
5. Knowledge of how to check and test good products and non-conforming products
6. Knowledge of corrective action methods for dealing with non-conformances to avoid future occurrences
7. Knowledge of procedures for rejecting substandard products
8. Skill in developing and documenting quality procedures, check lists and methods
9. Skill in identifying inaccuracies in quality data and responding to them
10. Knowledge of quality terminology
11. Knowledge of company quality assurance procedures

Quality Systems and Inspection Tools

1. Knowledge of quality systems such as Statistical Process Control (SPC), Six Sigma, Total Quality Management (TQM), Lean Management, "Plan-Do-Check-Act," and International Standards Organization standards, especially ISO 9001:2000 for manufacturers
2. Skill in selecting and using quality systems to identify problems and record quality issues
3. Knowledge of statistical quality tools (e.g., Root Cause Failure Analyses and Pareto charts) in reaching accurate decisions about quality data

[2] Knowledge: Familiarity, awareness, understanding. Skill: Proficiency, ability to apply knowledge

4. Knowledge of how to accurately troubleshoot and categorize defect types to determine root cause.
5. Knowledge of how to create control charts (e.g., variables and attributes)
6. Knowledge of how to record and analyze quality issues in the production process, using tools such as Root Cause Failure Analyses (RCFA)
7. Knowledge of Pareto analysis to identify priorities for solving multiple sub –standard product problems
8. Skill in determining accuracy and precision when using measuring equipment
9. Knowledge of performance indicators that can be readily understood by operators
10. Knowledge of how to use inspection tools, equipment and procedures
11. Knowledge of inspection equipment calibration standards and requirements
12. Skill in verifying calibration of inspection equipment
13. Knowledge of appropriate automated inspection system
14. Skill in using hand-held inspection devices to examine materials.
15. Skills in maintaining and storing inspection tools

Corrective Action

1. Skill in determining corrective action
2. Knowledge of company's corrective action procedures to follow up on quality problems and corrective measures
3. Knowledge of health and safety standards to ensure quality problems are addressed correctly without impairing health and safety
4. Knowledge of how to conduct follow-up activities to validate that corrective action has been taken
5. Knowledge of how to access and previous documentation to help develop solutions
6. Knowledge of when to stop process to prevent production of defective product
7. Skill in correctly tagging and segregating non-conforming material
8. Skill in investigating non-conformances (e.g., rejection tags) to determine root cause and recommend corrective action

Quality Documentation

1. Knowledge of how to complete proper forms to document problems and corrective action
2. Skill in using computer systems to document and track substandard and scrapped parts, materials, and assemblies as required by quality processes
3. Knowledge of documentation process and requirements to ensure verifiable evidence of product quality
4. Knowledge of quality system protocol for performing an audit

5. Knowledge of the procedure for reviewing quality problems with operators to provide feedback
6. Knowledge of correct approval procedures to document inspection results
7. Knowledge of procedures for recording and storing product history and maintaining records
8. Knowledge of how to use route sheets and statistical method charts to document process
9. Knowledge of follow-up and reporting documentation procedures to ensure proper communications

Blueprint Reading Fundamentals

1. Knowledge of visualizing objects from a multi-view drawing
2. Knowledge of identifying product features from a multi-view drawing
3. Knowledge of identifying dimensions and tolerances of an object from a multi-view drawing
4. Knowledge of interpreting geometric dimensioning and assembly tolerances on a drawing
5. Knowledge of interpretation of title blocks
6. Skill in interpreting assembly drawings

Basic Measurement

1. Skill in converting measurements in U.S. measurement and standard international metrics systems
2. Skill in using a machinist's rule to measure parts
3. Skill in using a tape measure to measure parts
4. Skill in using dial and digital calipers to measure parts
5. Skill in using a micrometer to measure parts
6. Skill in using a dial indicator to measure parts
7. Skill in collecting measurement data from a digital gage using a computer

MSSC Work Standards

MANUFACTURING PROCESSES & PRODUCTION

Key Activities and Performance Indicators

1 . Identify customer needs

a. The different and common needs of internal and external customers are recognized
b. Customer contact about product aspects and printed specifications is maintained to ensure understanding of needs
c. Customer needs are reviewed on a regular basis
d. Customer specifications are up-to-date
e. Customer needs are communicated effectively to others including shift-to-shift, co-workers, and managers
f. Issues preventing customer needs from being met are addressed proactively

2. Determine resources available for the production process

a. Raw materials are checked against work orders
b. Tools and equipment are checked against work orders
c. Discrepancies are communicated to the proper parties
d. Necessary resources are at the workstation when required
e. Workers with appropriate skills are scheduled according to production needs

3. Set up equipment for the production process

a. Proper repairs and adjustments are made to production equipment prior to putting into service
b. Set-up meets process requirements and product specifications.
c. First piece or production run meets specifications
d. Set-up procedures are documented for repeatability
e. Set-up meets ergonomic and other relevant health, safety, and environmental standards
f. Set up meets equipment specifications

4. Set team production goals

a. Team goals are specific, measurable, and achievable
b. Team goals are aligned with customer and business needs

c. Team goals focus the team in order to meet team objectives
d. Team goals are documented and communicated to all parties

5. Make job assignments

a. Jobs assignments match skills with the production work to be done
b. Job assignments maximize the use of available skills
c. Job assignments ensure business and customer needs are met
d. Workers are notified of job assignments effectively

6. Coordinate work flow with team members and other work groups

a. Production schedules are met effectively
b. Team members are notified of schedule requirements in a timely way
c. Production workflow runs efficiently
d. Downtime is minimized
e. Relationships with others facilitate effective workflow
f. Workers actively participate in meetings and problem-solving groups

7. Communicate production and material requirements and product specifications

a. Communication reflects knowledge of production requirements, levels, and product specifications
b. Communication reflects knowledge of material specifications and delivery issues and schedules
c. Communication is demonstrates knowledge of customer and business production needs
d. Communication is initiated cross-functionally and made in a timely and accurate manner to the correct parties
e. Communication is clear and relevant to production and products
f. Communications are tracked and documented, as appropriate

8. Perform and monitor the process to make the product

a. Process control data indicate that the manufacturing process is meeting product specifications
b. Manufacturing process cycle time meets customer and business needs
c. Product meets customer specifications
d. Products are labeled appropriately for compliance or non-compliance
e. Production operations comply fully with all health, safety, and environmental policies and practices

9. Document product and process compliance with customer requirements

a. Documentation of compliance is legible
b. Documentation of compliance is written in the appropriate format and correctly stored
c. Documentation of compliance is forwarded to the proper parties
d. Documentation is complete and "sign off" is obtained
e. Products are labeled appropriately for compliance or non-compliance

10. Prepare final product for shipping or distribution

a. Packaging materials meet packaging and shipping specifications, including proper labeling and safety requirements
b. Completed documentation of customer packaging and shipping instructions accompany product to next destination
c. Product availability is communicated to the proper parties in a timely manner
d. Product and all relevant information—such as quantity, destination, and packaging instructions--are checked against the work order
e. Product is correctly stored or staged for shipping
f. All laws and regulations with regard to labeling, packaging, and transport are followed.
g. Material handling procedures are followed to prevent product damage

MSSC Worker Standards

MANUFACTURING PROCESSES AND PRODUCTION

Basic Technical Knowledge and Skills[3]

Work Flow Planning and Control

1. Knowledge of principles of Lean Manufacturing and High Performance Work Organizations
2. Skill in making job assignments and coordinating workflow
3. Skill in knowing that the appropriate resources are available to meet customer specifications
4. Skill in ensuring that set-up and operation procedures are available and up-to-date
5. Skill in correctly reading and interpreting a production schedule and manufacturing work order
6. Knowledge of production process, including flow and bottlenecks
7. Knowledge of lead-time required for a production plan
8. Skill in correctly reading and interpreting bills of materials and routing sheets
9. Knowledge of methods of productivity measurement and improvement
10. Knowledge of principles and practice of Just-in-time (JIT) inventory control
11. Knowledge of ways to perform a physical inventory

Production equipment operations

a. Skill in starting and operating production machines
b. Skill in perform emergency shutdown of production machines
c. Skill in recognizing and addressing machine malfunctions
d. Knowledge of common types of mechanisms used in machines
e. Knowledge of ways in which force and torque are used in machine operations
f. Knowledge of the impact of friction on machine operation and methods
g. Knowledge of the use of cams
h. Knowledge of the ways in which machines use pulley and gear drives
i. Knowledge of the ways in which manufacturing processes are used to make and finish parts

[3] Knowledge: Familiarity, awareness, understanding. Skill: Proficiency, ability to apply knowledge

j. Skill in using basic types of manual machine tools, such as drill press and cutoff saw
k. Knowledge of basic machine tooling

Production Materials, Tools and Equipment

1. Knowledge of various materials used in production
2. Knowledge of machinery operation, set up and testing
3. Skill in reading and interpreting gages (i.e., analog, digital and vernier)
4. Knowledge of how to determine whether additional tools need to be purchased
5. Knowledge of lubricants and coolants to make the proper selection
6. Skill in setting up, programming, and operating the computerized control process
7. Knowledge of equipment capabilities to maximize productivity
8. Skill in making machine adjustments
9. Knowledge of how to order tools and materials

Work Orders and Documentation

1. Skill in interpreting work orders to meet customer needs
2. Skill in reviewing order sheets to determine if on-site adjustments are needed.
3. Knowledge of how to use diagrams and technical drawings.
4. Skill in interpreting route sheets and operation sheets to set-up and operate machine.
5. Skill in completing compliance tag to indicate that the sub-assembly meets the customer requirements.
6. Knowledge of customer shipping instructions to determine packing requirements.
7. Knowledge of available packing materials to determine packing requirements.
8. Knowledge of available packing materials to determine the safest method of shipping the product.

MSSC Work Standards

MAINTENANCE AWARENESS

Key Activities and Performance Indicators

1. Perform preventive maintenance and routine repair

a. Preventive maintenance schedule is prepared and checked as appropriate
b. Preventive maintenance is performed to schedule
c. Preventive maintenance is documented completely and in a timely manner
d. Repair needs are communicated to the correct parties using the right procedures and forms
e. Any necessary repair work is checked through follow up
f. Necessary supplies are available to perform preventive maintenance
g. Preventive maintenance schedules, documentation, equipment needs and outstanding repairs are communicated effectively from shift-to-shift, to team members, to managers and to others as required
h. All safety procedures are followed when doing repairs

2. Monitor indicators to ensure correct operations

a. Current equipment performance is regularly compared to optimal equipment operations
b. Abnormal equipment conditions are investigated
c. Abnormal equipment conditions are corrected in a timely manner
d. Equipment is monitored to ensure that the corrective action solved the problem
e. Documentation of equipment repair history is complete, up-to-date and accurate

3. Perform all housekeeping to maintain production schedule

a. Tools are stored in the proper location
b. Materials are stored in a safe manner
c. Unsafe conditions are identified and reported promptly
d. Corrective action is taken to correct unsafe conditions
e. Workstation clean and clear of safety hazards
f. Scheduled housekeeping inspections are passed
g. Workstation to organized to maximize efficiency

4. Recognize potential maintenance issues with basic production systems, including knowledge of when to inform maintenance personnel about problems with:

a. Electrical systems
b. Pneumatic systems
c. Hydraulic systems
d. Machine automation systems
e. Lubrication processes
f. Bearings and couplings
g. Belts and chain drives

MSSC Worker Standards

MAINTENANCE AWARENESS

Basic Technical Knowledge and Skills[4]

Overall Maintenance Process

1. Knowledge of principles of Total Productive Maintenance (TPM)
2. Knowledge of equipment to be maintained and monitored
3. Skill in troubleshooting to identify a problem with equipment
4. Skill in following preventive maintenance schedules
5. Knowledge of job specific guidelines or collective bargaining agreement that affect maintenance
6. Skill in recognizing significant wear and tear on equipment components
7. Knowledge of the procedures for logging repairs and work order requests
8. Knowledge of the most common causes of failure of equipment to diagnosis problem quickly
9. Knowledge of what the equipment alarms mean
10. Skill in making on-process adjustments during production

Maintenance of Tools and Equipment

1. Knowledge of materials management to know what is recyclable and what is not
2. Skill in using appropriate maintenance tools to maintain machines
3. Knowledge of how to use monitoring or diagnostic devices to find out when equipment is operating correctly

Documentation of Maintenance

1. Knowledge of statistical methods chars to ensure that equipment is producing a quality product
2. Knowledge of forms and procedures for correctly documenting processes (e.g., preventative maintenance forms)
3. Knowledge of diagrams, schematics, manuals and specifications to understand how to repair equipment
4. Skill in documenting repairs, replacement parts, problems and corrective actions to maintain log to determine patterns of operation

[4] Knowledge: Familiarity, awareness, understanding. Skill: Proficiency, ability to apply knowledge

5. Skill in reviewing maintenance log/checklist to ensure that recommended preventative procedures are followed

Maintenance-related Safety

1. Knowledge of set-up to verify machine safety
2. Knowledge of safety procedures to prevent accidents
3. Knowledge of the certification/license requirements to operate specific equipment.
4. Knowledge of how to use and store hazardous materials and chemicals (e.g., compliance with MSDS)
5. Knowledge of Lock out/Tag out policies and procedures.
6. Skill in visually inspecting equipment to ensure safety compliance before operating.
7. Skill in identifying and reporting unsafe work conditions.
8. Knowledge of materials management to know what is recyclable and what is not.

Potential maintenance issues with basic production systems

1. Knowledge of electrical systems reliability issues, including knowledge of when to inform maintenance personnel
2. Knowledge of pneumatic systems reliability issues, including knowledge of when to inform maintenance personnel
3. Knowledge of hydraulic systems reliability issues, including knowledge of when to inform maintenance personnel
4. Knowledge of machine automation systems reliability issues, including knowledge of when to inform maintenance personnel

Proper lubrication procedures

1. Skill in taking oil samples and analyzing them correctly
2. Skill in using lubricants correctly for various types of equipment
3. Skill in operating grease guns correctly for various types of lubrication
4. Skill in storing and disposing of lubricants safely

Bearings and coupling reliability

1. Knowledge of proper functioning of mechanical power transmission equipment, including knowledge of when to inform maintenance personnel
2. Knowledge of proper functioning of bearings and shafts, including knowledge of when to inform maintenance personnel
3. Knowledge of proper functioning of couplings, including knowledge of when to inform maintenance personnel

Belt and chain drive reliability

1. Knowledge of proper functioning of belt drive systems, including knowledge of when to inform maintenance personnel
2. Knowledge of proper functioning of roller chain drive systems, including knowledge of when to inform maintenance personnel
3. Knowledge of proper adjustment of chain sags is recognized, including knowledge of when to inform maintenance personnel