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CAUTION:

This Test Method may include safety precautions which are believed to be appropriate at the time of publication of the method. The intent of these is to alert the user of the method to safety issues related to such use. The user is responsible for determining that the safety precautions are complete and are appropriate to their use of the method, and for ensuring that suitable safety practices have not changed since publication of the method. This method may require the use, disposal, or both, of chemicals which may present serious health hazards to humans. Procedures for the handling of such substances are set forth on Material Safety Data Sheets which must be developed by all manufacturers and importers of potentially hazardous chemicals and maintained by all distributors of potentially hazardous chemicals. Prior to the use of this method, the user must determine whether any of the chemicals to be used or disposed of are potentially hazardous and, if so, must follow strictly the procedures specified by both the manufacturer, as well as local, state, and federal authorities for safe use and disposal of these chemicals.

Training standard for paper machine tender

1. Scope

The purpose of this standard is to provide guidelines for skills and knowledge needed by a paper machine tender, often referred to as the paper machine first hand. The standard will be useful as a measure of the capabilities and understanding that a person must have to successfully perform the machine tender function. Within the limitations described, the incumbent or candidate for this function should have the capability to know, understand, and appropriately utilize all of the standard skill and knowledge functions described. Secondly, as the first standard of this type based on the information sources referenced, this particular standard may serve as a model to see if similar standards would be useful for other pulp and paper mill job classifications.

2. Safety precautions

There are no particular safety precautions to reference for this guideline, although safety is an important element of the training process (See Section 6.9).

3. Limitations

The inherent limitations related to compiling standards of this sort relate to the wide variety of types of equipment used to manufacture different paper and paperboard products. For example, many formers are used today with specific equipment designs that differ significantly from a traditional fourdrinier, e.g., twin wire formers such as gap formers, gap roll/blade formers, hybrid formers; multi-ply formers, such as vat formers, and multiple fourdrinier and multi-layered headbox formers; a wide variety of tissue formers, etc. It would not be possible to develop a single standard that would cover all of the special nuances of each of these former types. Nonetheless, there are equipment similarities and fundamentals of operation that are common to all of these equipment types, and every effort has been made to identify and note the basic skills and knowledge elements that are required. Users of these standards may wish to incorporate other items as deemed necessary to cover specific equipment operations.

4. Information sources

The basis for this standard consisted of multiple meetings with qualified machine tenders throughout all sections of the country where paper products are manufactured. A modified DACUM process was used to identify

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tasks that need to be monitored and controlled as well as the knowledge and skills necessary to successfully function in this job classification. Additionally, some other information has been added based on comments from other subject matter experts who reviewed the DACUM data.

5. Requirements

- 5.1 A paper machine tender should have the following knowledge, skills, and capabilities:
 - 5.1.1 *Papermaking process*: Define the paper forming process and related product quality considerations.
 - 5.1.2 *Equipment and machine clothing*: Describe the equipment and clothing used in the papermaking process and how to operate/utilize the equipment.
 - 5.1.3 *Equipment operation and clothing installation*: Start, stop, and monitor equipment operations and install machine clothing.
 - 5.1.4 *Process control equipment*: Describe and be able to use the equipment used to control the papermaking process, as well as product quality.
 - 5.1.5 *Process control tasks*: Start, stop, and use associated monitoring and control equipment.
 - 5.1.6 *Academic knowledge and skills*: Have knowledge of and be able to use practical math, chemical technology, and computer skills required in paper making.
 - 5.1.7 *Troubleshooting knowledge and skills*: Be able to identify quality and runnability problems, i.e. “troubleshoot” problem areas.
 - 5.1.8 *Preventive/predictive maintenance*: Define equipment maintenance requirements, and assist the Maintenance Department in repair, preventive and predictive maintenance procedures.
 - 5.1.9 *Safety and safe work practices*: Have a thorough, practical knowledge of safety issues and procedures.
- 5.2 As much as possible, all of the paper making processes and related procedures are presented in a sequential, logical process flow. Section 6 lists the processes in order and for each shows a list of requirements for the training.

6. Requirements for training

- 6.1 *Papermaking processes*
 - 6.1.1 *Paper forming and consolidation*
 - 6.1.1.1 Be able to describe the characteristics of hardwood, softwood, and broke and relate to paper machine furnish as a function of species, freeness, fiber length, consistency, cleanliness, etc.
 - 6.1.1.2 Describe the functional components of the stock preparation system: pulping (repulping) equipment for wet/dry lap, refining equipment, wet-end additive addition systems, and blending/metering stock equipment.
 - 6.1.1.3 Explain the pulp cleaning system and its effect on runnability and sheet properties.
 - 6.1.1.4 Define high and low intensity refining – how each is achieved with refining tackle, how each is measured and controlled.
 - 6.1.1.5 Describe factors affecting drainage, e.g., furnish, former type, wire type, jet/wire ratio, pulp consistency.
 - 6.1.1.6 Identify forming configurations related to formation devices and systems.
 - 6.1.1.7 Explain forming, jet/wire ratio, fiber orientation and their effects on sheet paper characteristics such as tensile, tear, TEA, etc.
 - 6.1.1.8 Discuss water removal and how various devices can impact sheet characteristics.
 - 6.1.1.9 Define filler/fines retention (first pass retention).
 - 6.1.1.10 Describe the broke system and its effect on sheet properties and machine runnability.
 - 6.1.1.11 Describe the cleaning systems (mechanical and chemical showering) used in the paper machine wet end and press section and their effects on sheet properties and machine runnability.
 - 6.1.1.12 Identify factors affecting pressing and explain the theory of pressing (4 phases).
 - 6.1.1.13 Identify press configurations and their various applications.

- 6.1.1.14 Define nip impulse vs. dwell time effects in the press section.
- 6.1.1.15 Interpret hydraulic pressure in the press section and its effect on sheet characteristics.
- 6.1.1.16 Describe the causes of wear and corrosion of roll structures.
- 6.1.1.17 Describe the causes of wear and corrosion of doctor blades.
- 6.1.1.18 Translate the overall correlations between sheet/paper properties and paper machine wet-end variables.
- 6.1.1.19 Describe the steam system, e.g. superheated steam, desuperheaters, etc.
- 6.1.2 *Quality*
- 6.1.2.1 Define mechanical and strength properties, e.g. basis weight, density, bulk, formation, moisture content, caliper, tensile, TEA, softness, etc.
- 6.1.2.2 Define surface properties, e.g. roughness, pick strength, abrasion resistance, etc.
- 6.1.2.3 Define optical properties, e.g. brightness, opacity, gloss, color.
- 6.1.2.4 Define permeability to fluids, e.g. sizing degree, oil resistance, water absorbency, air resistance, etc.
- 6.1.2.5 Describe paper defects, e.g. curl, sort/hard edges, cockles, holes, dirt, pin holes, schlereids, shives, etc.
- 6.1.2.6 Describe paper roll quality, e.g. Smith needle, Schmidt hammer, density, TNT (tension/nip load/torque), appearance, etc.
- 6.1.2.7 Describe paper property MD and CD profiles, e.g. basis weight, caliper, moisture, etc.
- 6.1.2.8 Describe the role of sizing and surface treatments, e.g. coating application(s).
- 6.2 *Equipment and machine clothing*
- 6.2.1 Describe and utilize the fiber stock feeding system components, e.g., mix stock chest tank, machine chest tank, stock proportioning system, etc.
- 6.2.2 Define and control low intensity refining on individual pulp species.
- 6.2.3 Describe and operate the machine approach system components – basis weight valve, fan pump, cleaners, screens, and manifold.
- 6.2.4 Describe and operate the wet end chemical additive system.
- 6.2.5 Describe and operate the components in the deaeration/defoamer system.
- 6.2.6 Describe and operate the machine white water system, including both the machine short and long circulation loops, as well as fiber recovery (saveall) equipment.
- 6.2.7 Describe and operate the high intensity refiner(s) on the pulp blend to the paper machine.
- 6.2.8 Describe and operate the machine headbox.
- 6.2.9 Describe and operate the appropriate machine former, e.g. fourdrinier, gap, hybrid, multiply, or tissue formers.
- 6.2.10 Describe and utilize dewatering/drainage equipment including hydrofoils and low and high vacuum systems (if applicable).
- 6.2.11 Utilize the forming area high pressure water shower system for start-up, during normal operations, and during shut-down situations.
- 6.2.12 Define and describe forming fabric installation procedures.
- 6.2.13 Utilize proper inspection protocols to ensure forming fabric performance.
- 6.2.14 Describe and properly utilize the forming fabric tension control system.
- 6.2.15 Describe and properly utilize the forming fabric guides.
- 6.2.16 Describe and utilize the forming wire squirts.
- 6.2.17 Describe and operate pulpers in the machine system, e.g. couch and press pulpers.
- 6.2.18 Describe and utilize the mechanical roll cleaning systems in both the wet end and press sections.
- 6.2.19 Utilize the wet end chemical cleaning system.
- 6.2.20 Describe the role of the press section, its components and their functions.
- 6.2.21 Utilize, relative to the press section, roll crown as well as variable crown rolls, their components and functions.
- 6.2.22 Describe press clothing installation procedures.