Mondi Packaging Paper

Safe High Pressure Water Washing (HPWW) Requirement
Index

- Introduction 3
- Flow chart of process steps 4-5
- Responsibilities 6
- Risk assessment process 7
- Job safety analyses considerations 8-9
- Compliance 10-12
- Appendix I Best practice guidance 13-22
- Appendix II: Checklist 23-24
Introduction

Definition: High pressure water washing (HPWW) equipment is defined as manual or automatic, mobile or stationary, equipment in two categories, **Pressure Cleaning** (Up to 200 bar) and **High Pressure Cleaning** (Above 200 bar).

Scope: This requirement is relevant to **all high pressure cleaning or high pressure water washing activities above 200 Bar** (i.e. sewage system, pipe, tank, heat exchanger cleaning & paint stripping etc.) at Mondi Packaging Paper Operations and relates to both Mondi employees and equipment as well as any contractor activities and equipment.

Purpose: The purpose of this requirement is to ensure that all high pressure water washing activities at Mondi Packaging Paper Operations are conducted in a manner that guarantees safe operation of such equipment.

Note: Pressure Cleaning (Up to 200 bar), therefore will not require a permit to work (unless required by Local Legislation or site specific rules). Operations shall however ensure that risk assessments are conducted to determine what the risks are and the precautionary measures needed, for example use of shields to protect others in the area, required symbolic safety signs, etc. In addition operations shall clearly define the safe operating procedures, precautionary measures to be followed, training and authorization required as well as the personal protective clothing and equipment to be issued and worn.
Flowchart of Process Steps for Contractor HPWW Activity

Step 1
- Identify the activities requiring HPWW and assess alternative cleaning methods (i.e. automatic cleaning)
- Mondi job requester (Contractor owner)

Step 2
- Arrange for cleaning proposals from contractors, i.e. supply the Mondi Requirement in the tender documents and select only those contractors that provide proof of compliance with the requirement and apply best safety practice
- Contractor owner & Maintenance planner & Purchasing manager

Step 3
- Off-site Contractor preparation: Risk assessment [Mondi methodology], Safe Operating Procedure complying with equipment suppliers manual and Mondi requirements including, Risk elimination hierarchy, Best safety practice, Proof of equipment integrity, Proof of personnel competence [trained, tested, experienced], PPE, etc.
- Contractor owner & Maintenance planner & Contracting Company

Step 4
- On arrival at site: Conduct a specific pre-task risk assessment, Complete the checklist and request a Permit to work (PtW)
- Contractor owner & Contracting Company (PtW Acceptor)

Step 5
- Issue of PtW & Site set up: The Contractor & Mondi contract owner complete the permit to work following an inspection of the equipment & site using the checklist. After full assurance of compliance the Mondi contract owner authorizes and issues the fully completed PtW. The contractor can then set up site and engage in cleaning activities
- Contractor owner (PtW Issuer) & Contracting Company (PtW Acceptor)

Step 6
- Cleaning activities: Perform surface preparation / cleaning
- Mondi contract owner inspects the site during cleaning activity and observes compliance with Mondi requirements, i.e. stops activities that do not comply
- Contractor owner & Contracting Company

Step 7
- On completion of the task: The contractor removes equipment, restores site and the contractor owner verifies safe effective completion of task on the PtW together with the contractor
- Return and sign-off permit
- Contractor owner (PtW verifier) & Contracting Company

Step 8
- Evaluate contractor safety performance
- In case of compliant safe performance place contractor on preferred contractor list
- In case of non compliant performance cease co-operation with the contractor
- Contractor owner & Maintenance planner & Purchasing manager
Flowchart of Process Steps for Mondi Site HPWW Activity

Step 1
- Identify the activities requiring HPWW and assess alternative cleaning methods (i.e. automatic cleaning)
  - Mondi job requester and responsible line manager

Step 2
- Apply this Mondi Requirement and apply best safety practice before engaging in the activity
  - Responsible line manager and team that engages in the cleaning activity

Step 3
- For a specific cleaning activity: Complete a risk assessment [Mondi methodology], Write and implement a Safe Operating Procedure complying with equipment suppliers manual and Mondi requirements including, Risk elimination hierarchy, Best safety practice, Proof of equipment integrity, Proof of personnel competence [trained, tested, experienced], PPE, etc.
  - Responsible line manager, responsible production area manager requesting the task, site safety manager and team that engages in the cleaning activity

Step 4
- On the day of the cleaning activity: Conduct a specific pre-task risk assessment, Complete the checklist and request a Permit to work (PtW) for the activity
  - Responsible line manager, responsible production area manager requesting the task and the team that engages in the cleaning activity

Step 5
- Issue of PtW & Site set up: The Mondi team completes the permit to work following an inspection of the equipment & site using the checklist. After full assurance of compliance with the Mondi requirement the PtW is authorized and issued. The Mondi work team sets up site and engage in cleaning activities
  - Responsible line manager, responsible production area manager requesting the task and the team that engages in the cleaning activity

Step 6
- Cleaning activities: Perform surface preparation / cleaning
  - Inspects the site during cleaning activity and observes compliance with Mondi requirements, i.e. stops activities that do not comply
  - Responsible line manager, responsible production area manager requesting the task and the team that engages in the cleaning activity

Step 7
- On completion of the task: The Mondi work team removes equipment, restores the site and verifies safe effective completion of task (i.e. verifies and signs of the PtW)
  - Responsible line manager, responsible production area manager requesting the task and the team that engages in the cleaning activity
Responsibilities

The Person Raising the Work Order (Contract owner or responsible line manager) for high pressure cleaning is the contract or activity owner and responsible for:

• ensuring that there is not another less hazardous method available or appropriate
• that the chosen contractor complies fully with the Mondi requirements and rules
• inspects the safe job method, ensures safe and fit for purpose equipment including back-out prevention devices, proof of competency etc.
• Issuing and verifying the permit to work

The Purchasing Manager before allocating the work communicated all requirements to potential service providers and selects only those contractors that provide written proof of compliance with the Mondi requirement in their tender reply documentation

The Contracting Cleaning Company or Mondi Cleaning Team (PtW acceptor)

• assesses the risk of the planned activity with the contractor owner or responsible line manager
• assures the Mondi contract owner/responsible line manager in writing that it complies fully with all relevant Mondi requirements
• resents safe job methods, safe and fit for purpose equipment including back-out prevention devices, proof of competency etc. to the contract owner/responsible line manager before a PtW is issued)

The Operators carrying out the work must be satisfied that all hazards have been identified and minimized. They must also be satisfied that the training they have received is adequate for them to start the job. They are responsible for compliance with their own company’s written procedures and the Mondi requirements.

Everyone Involved must be prepared to stop the work if they become aware of any change to the agreed procedure, or changes in circumstances. They must also cease the work immediately if a malfunction occurs, or if an un-authorized or inadequately protected person enters the barricaded area.
Risk Assessment Process

- Completed by Mondi Personnel and the HPWW Contractor before arrival on site before engaging in the activity

1. Identify the Hazard:
What can harm people in the assembly, use and dismantling of the HPWW equipment

2. Assess the Risk of the Hazards:
How severe could injuries be?
How likely is it that people can be harmed?
Calculate the risk level (severity x likelihood) and categorize the risk as high medium or low using a risk matrix

3. Risk Reduction:
State what steps you are going to take to control the risk and prevent injury (Use the Mondi Risk elimination hierarchy). Implement the risk mitigation steps and ensure they are effective
Job safety analysis considerations

Hand lancing hazards:
- Operator contact with water jet due to modification of equipment
- Loss of control of jetting gun or lance due to poor footing/positioning
- Component failure due to improper use or equipment integrity related failure
- Failure to maintain an adequate safe working zone
- Exposing others or self to risk of contact with water-jet or deris

Flex lancing hazards:
- Operator loses control of flex lace and nozzle exist the pipe (back-out)
- Nozzle turns around in the pipe and exists the open end
- Nozzle exists the far end and exposes other to the water-jet
- Not enough room between the nozzle and the wall of the tube to allow water or debris to pass – pressure build up and the flex lance is forced backward towards the operator
- Loss of control of flex lance due to poor footing/positioning
- Component failure due to improper use or equipment integrity related failure
- Failure to maintain an adequate safe working zone
- Exposing others or self to risk of contact with water-jet or debris

General hazards:
- Noise
- Slip, trip & fall
- Confined spaces
- Falling objects
- Working at height
- Fire and explosion
- Electrocution
- Fatigue
- Lack of an emergency plan
● Job safety analysis considerations cont.

● Other methods of cleaning, potential use of automatic cleaning devices (to avoid personnel access)
● Layout of site and ergonomics
● Method for emergency stopping
● Communication between operators and with the control room
● Competency and experience of high pressure cleaning operators
● Equipment adequacy for the task (checklist)
● Availability and suitability of own/contractor’s procedures (safe work method)
● Any special procedures, due, for example, to the nature of the substances involved.

Figure 10: Control Devices for High Pressure Water Pump Assembly
Compliance

Mondi Requirements

- Safe Use of Power Tools - Mondi Requirement 18.17

**Changes to the requirement:**
As a result when revising the SD Performance Requirements we will make the revision to SDPR 18.17 accordingly and will have two categories, Pressure Cleaning (Up to 200 bar) and High Pressure Cleaning (Above 200 bar). Therefore pressure cleaning will not require a permit to work (unless required by Local Legislation or site specific rules).

Operations shall however ensure that risk assessments are conducted to determine what the risks are and the precautionary measures needed, for example use of shields to protect others in the area, required symbolic safety signs, etc.

In addition operations shall clearly define the safe operating procedures, precautionary measures to be followed, training and authorization required as well as the personal protective clothing and equipment to be issued and worn.

- Plant Equipment and Integrity - Mondi Requirement 19.7

- Permit to Work - Requirement 19.3

Mondi Rules

- Permit to Work - Mondi Safety Rule 1

National Legislation

EU Norms

- EN 1829-1:2010, *High pressure water jet machines – Safety requirements - Part 1: Machines*
- EN 1829-2:2008, *High-pressure water jet machines - Safety requirements - Part 2: Hoses, hose lines and connectors*
Requirement 18.17 Explanations:
- **HPWW equipment is regarded as a power tool by Mondi.**
  - Requiring to be numbered and registered
  - Regularly maintained and inspected by certified personnel
  - Task based risk assessment completed including hazards such as:
    - A hazardous area or location (i.e. Confined space or working at height etc.)
    - Falling over
    - Injury to limbs and body (injection and cutting hazards)
    - Noise
    - Whipping
    - Overriding or modification of equipment and safety devices
    - In-competent operators (seasonal, students, part time)
- Hierarchy of risk reduction control will be applied:

<table>
<thead>
<tr>
<th>HIERARCHY OF HAZARD CONTROLS</th>
<th>EXAMPLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOST EFFECTIVE</td>
<td>Eliminate the use of hand-held equipment.</td>
</tr>
<tr>
<td>1. Elimination or substitution</td>
<td>- Remove workers from potential contact with the waterjet.</td>
</tr>
<tr>
<td></td>
<td>- Substitute the use of manual equipment with mechanization.</td>
</tr>
<tr>
<td></td>
<td>- Use a rotary lancing machine for cleaning heat exchangers.</td>
</tr>
<tr>
<td></td>
<td>- Use a deck cleaner for large floor areas.</td>
</tr>
<tr>
<td>2. Engineered control</td>
<td>Use safeguards to protect workers from the hazard.</td>
</tr>
<tr>
<td></td>
<td>- Use a backout preventer when cleaning piping systems.</td>
</tr>
<tr>
<td></td>
<td>- Use a jetting gun positioner for high-flow applications.</td>
</tr>
<tr>
<td>3. Administrative control</td>
<td>Use safe work procedures for high pressure washing tasks.</td>
</tr>
<tr>
<td></td>
<td>- Use a jetting gun to clean the first 36 centimetres (14 inches) of a pipe.</td>
</tr>
<tr>
<td></td>
<td>- Use a mark on the fox-lance to indicate 60 cm (24 in.) to nozzle.</td>
</tr>
<tr>
<td>4. Personal protective equipment (PPE)</td>
<td>Use PPE appropriate for the hazard.</td>
</tr>
<tr>
<td></td>
<td>- Use hardhat with face shield and safety glasses.</td>
</tr>
<tr>
<td></td>
<td>- Use cut-resistant suits to help protect workers from contact with waterjets when no other controls are practicable.</td>
</tr>
<tr>
<td></td>
<td>- Use respiratory protection.</td>
</tr>
</tbody>
</table>

Automatic tube cleaning eliminated human contact
Requirement 19.7 Explanations:

- HPWW equipment is regarded as controlled equipment that has to comply with the Mondi equipment integrity requirement 19.7.
- Operations managers have systems in place for identifying and managing safety-critical and controlled work equipment.
- Responsible engineers have procedures in place for managing safety-critical plant and controlled work equipment (including contracted services).
- Design review & verification applies to items assessed as safety-critical plant or controlled work equipment.
- Periodical, recorded, certificated inspections in place.
- Uniquely numbered, registered, next inspection due date and records kept.
- Contract (or project) managers shall have systems in place to ensure equipment is assessed and identified as that safety critical plant or controlled equipment fully complies with Mondi requirements.

Automatic tube cleaning

Manual cleaning
Appendix I

Best Practice Guidance

- Best practice examples & useful information:
    Good Safe Work Practice
  
  - Suppliers of equipment, safety devices and PPE
  - [http://www.peinemannequipment.com/home/contact/](http://www.peinemannequipment.com/home/contact/)
  - [http://www.peinemann.ru/](http://www.peinemann.ru/)
  - [http://www.uraca.de/uk/about-uraca/](http://www.uraca.de/uk/about-uraca/)
  - [http://www.turtleskin.com/Waterjet-Swipe-Protection.aspx](http://www.turtleskin.com/Waterjet-Swipe-Protection.aspx)
- **Type of cleaning units**

  - **Stationary Units** – fixed high pressure water pump supplies high pressure water via high pressure pipes to jetting (hose and lance) points

- **Mobile Units**

  ![Stationary Unit Diagram](image1)
  ![Mobile Unit Diagram](image2)
  ![Jetting Nozzle](image3)

*Figure 11. Hand lancing involves the use of a manually operated jetting gun. In the image above, a worker uses a jetting gun to clean the open end of a pipe.*
- **Type of cleaning**
  - Lancing (shot gunning – using a high pressure gun or lance)
  - Flex Lancing (using a high pressure flexible hose)
Safe work practice example 1

- Automated & Mechanized Cleaning – the alternative
○ Safe work practice example 2
- Safe Manual Vertical cleaning

○ Safe Manual Horizontal cleaning
Safe work practice example 3

Safety Devices

- Examples of Back-out prevention devices for pipe diameters of up to 1200mm

Figure 4: Back-out prevention showing the adjustable opening

Figure 5: Various Anti-Withdrawal Devices

Figure 6: Typical Anti-Withdrawal Device Setup (prior to tube insertion)
Safe work practice example 4

Safety Devices

Examples of Whip–prevention (hose restraining) devices

Hoses must be connected by means of properly rated couplings, with “whip checks” in place. A whip check is a short length of reinforced nylon cloth or cable looped over each end of two hoses that are connected by a coupling. Whip checks are designed to prevent the ends of the hoses from whipping around if the coupling breaks.

Figure 16. A whip check.

Figure 12: Restraining a Hose Joint

Figure 13: Foot Pedal with Hose Restrainer
Safe work practice example 5

- Safety Devices
  - Flex lance safety devices: Foot-dump; tested certified safe for use lance hose; 60 cm marker; pressure rated rigid metal connecting tube (stinger)
  
  ![Image of a flex lance nozzle, stinger, and high-pressure hose end fitting](figure12.png)

  **Figure 12.** A stinger is a rigid metal connecting tube between the flex-lance hose end fitting and the cleaning nozzle.

  To prevent the nozzle from turning around inside the pipe (line reversal) and shooting out under pressure from the open end of the pipe, attach an appropriately pressure-rated, rigid metal connecting tube (called a stinger) between the flex-lance hose end fitting and the cleaning nozzle.

  ![Diagram of a dump-style jetting gun](figure4.png)

  **Figure 4.** Dump-style jetting gun.

  - Lance or jet gun safety devices: Handgrip; shoulder brace; safety shroud; whip check; trigger safety latch
Safe work practice example 6

- Area barricading, demarcation and set up example

**Work area**

The work area must be clearly identified and controlled with effective signage and barrier tape to restrict access to authorized workers only. Additional personnel or physical barriers may be required to restrict access to areas not visible to the operators.

![Barricade and Signage](image)

Figure 11: Barricade and Signage

- Safe working at height

**Work platforms**

Adequately sized work platforms must be used to provide workers with safe access to elevated work areas (Figure 17). Work from ladders or surfaces not intended for workers can lead to loss of control of high pressure washing lances.

![Different types of work platforms](image)

Figure 17. Different types of work platforms.
Safe work practice example 7

- PPE - Turtleskin
Appendix II

PRE-JOB CHECKLIST FOR HIGH-PRESSURE HYDRO-BLASTING

<table>
<thead>
<tr>
<th>CONTRACT COMPANY:</th>
<th>DATE:</th>
</tr>
</thead>
<tbody>
<tr>
<td>EQUIPMENT BEING SERVICED:</td>
<td>LOCATION:</td>
</tr>
<tr>
<td>METHOD</td>
<td>MAXIMUM kPag:</td>
</tr>
<tr>
<td>☐ SHOTGUN</td>
<td>FLEXIBLE LANCE OR PIPE CLEANING</td>
</tr>
</tbody>
</table>

TRAINING REQUIREMENTS

1. Employees are adequately trained to perform this specific task.

SAFETY REQUIREMENTS

2. All employees have proper safety and personal protective equipment for the job.
3. Employees will not be required to work more than 14 hours in the shift.
4. The equipment operator has the ability to control the pump pressure and flow.

SITE REQUIREMENTS

5. Site selected for equipment setup/location is out of major personnel traffic area and is a safe distance from operating equipment.
6. Contractor has set up equipment in location designated by Process or Mechanical Supervisor.
7. Barricade tape is extended around the hydroblast equipment as required for personnel and operation safety. Signs are adequately placed.
8. If hydroblasting equipment cannot be adequately spaced from process equipment or personnel traffic, additional sturdy barriers/panels are installed to provide protection.
9. Hoses are properly protected and barricaded and they do not present a tripping hazard.
10. Equipment to be cleaned is unable to move and secured as necessary.

CONTAINMENT

11. Arrangements are in place to ensure that the material being blasted is contained of being disposed of properly.

EQUIPMENT REQUIREMENTS

12. Hoses and fittings are of the correct pressure rating and in good condition.
13. All hoses are joined by threaded female couplings, of the correct pressure rating.
   No quick connect fittings are used.
14. Hoses have indicators that reflect regular inspection as per the Australian Standard.
15. Hoses have safety bridges (restraining devices) across couplings.
16. Hoses are free of damaged wire braids.
17. All pressure control valves have a guard to prevent inadvertent actuation.
18. Pumping unit is equipped with safety relief devices and have been checked.
19. The pump suction filter is clean and rated correctly.

Continued over
Appendix II

- Checklist – example cont.

### FLEXIBLE LANCING AND PIPE CLEANING REQUIREMENTS

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>YES</th>
<th>NO</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>The starter bar length is at least 300mm.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>A deflector shield has been placed at the outlet end of the tube bundle.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>The starter bar has a mark 300mm from the end to indicate nozzle location.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>The starter bar and tube nozzle are of the correct pressure rating.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>An anti-withdrawal device is attached to the inlet flange to prevent the nozzle from coming out of the pipe.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>The line mule has a mark 50mm from the end of the nozzle to indicate nozzle location.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>The line mule extension exceeds the inside diameter of the pipe being cleaned, for pipes exceeding 500mm.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### SHOTGUN REQUIREMENTS

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>YES</th>
<th>NO</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>27</td>
<td>The gun barrel is at least 1.2m long.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>The shotgun has at least one control valves to control water flow and pressure, and two control valves where necessary.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>The pump pressure regulator/unloader will unload the pump.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

_________________________    _______________________
WORKGROUP LEADER               DATE