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BEST PRACTICES GUIDE ON THE PROCESSING TECHNIQUES OF DENIM

MAY 2019





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INTRODUCTION

Firstly, ICS wishes to express its special thanks to the **Casino Group** for realizing this Best Practices Guide on the processing techniques of denim and allowing ICS to share it.

The purpose of this guide is to highlight the risks related to the processing of denim and to provide suppliers with a global view of the health and safety risks related to these operations as well as the measures recommended to curb them.

ICS expects the members' suppliers to implement all the safety measures required to curb the negative impacts of their production activities and protect workers from the hazards related to the different processing techniques of denim, in compliance with the local regulations.

This best practices guide covers (for the most common denim processing techniques) a summary of the measures recommended, the management conditions of chemicals and the environmental considerations relating to the management of the waste generated from denim processing.

This guide is intended to be as inclusive as possible but does not exclude the implementation of additional measures to meet with the special local recommendations, the implementation of innovative production processes, the international benchmarks thereof and the safety recommendations of the suppliers of chemicals used.

In 2010, ICS members voted and published a common letter to ban sandblasting in production processes due to its health and safety risks. Therefore, ICS asks the suppliers to preserve their workers' health by not using this process.

Denim processing methods can be dangerous if the safety precautions are not followed. The supplier must set up a Health and Safety Committee headed by a Health and Safety Manager in order to assess all the impacts related to its activity and to produce a risk matrix from this including:

- the risks of accidents in the workplace,
- the long-term health risk to workers.

The risk matrix must result in the supplier implementing:

- a regular check of the health of the personnel in direct contact with hazardous chemicals, even if this is not laid down in the local regulation,
- the means to eliminate the risks as soon as this is technically and economically possible,
- the supply of equipment (in particular personal protective equipment PPE) adapted to the personnel concerned,
- the suitable procedures, equipment and training to meet with emergency situations (in particular related to the exposure of hazardous chemicals).

The implementation of these initiatives must be backed by training of the personnel concerned (gestures and postures adapted to the workstation, wearing of PPE, emergency measures) and be



covered by regular internal inspections (maintenance of installations, quality of the environment, adherence to the safety measures, check of the safety and emergency devices) to ensure the maintenance thereof over time.

Specific attention must be paid to the personnel handling chemicals. The supplier must draw up a list of the persons concerned, ensure the training thereof in the use and handling of chemicals and ensure that they fully understand the Material Safety Data Sheets as well as the procedure to be followed in the event of an emergency.

During training of personnel, it is particularly necessary to clearly state the risks to safety but also to long-term health in the event of non-adherence to the procedures in place and the suitable use of PPE.

The risk assessment must be permanently re-assessed to account for modifications in industrial processes, new chemicals used, modifications of the factory's structure and accidents incurred in the workplace.

The management of industrial accidents must include in particular:

- a full record of each accident,
- a cause analysis,
- an associated corrective or preventive action:
 - the corrective actions include for instance a change in the type of PPE for improved effectiveness, replacement of faulty equipment, change in documents or the frequency of training,
 - the preventive actions include for instance the updating of the risk matrix to include a new identified risk.

The supplier shall ensure specific focus be put on the chemicals heavily used in processing denim. Some may pose health problems if they are not stored and handled using the necessary precautions. When a chemical identified as hazardous such as Potassium Permanganate (KMnO4), Sodium Hypochlorite (NaClO) or Hydrogen Peroxide (H2O2) is used, it is of prime importance for the workers to follow this guide.

If a processing technique described in this guide is sub-contracted, the supplier shall be responsible for forwarding this document to its sub-contractor.

<u>Definition of "hazardous" chemicals</u>: this relates to a chemical agent which, due to certain characteristics and its classification may present a risk to the health of workers and to the environment. There are three hazard classes: physical (for explosive chemicals, flammable gases, etc.), health (toxic, carcinogenic products, causing skin corrosion, etc.) and the environment (chemicals hazardous for the aquatic environment, etc.).



HANDWORK

ABRASION BY ABRASIVE WHEEL OR BRUSHING

APPLICATION

• Abrasion by abrasive wheel.

POTENTIAL RISKS

- Lung diseases caused by the dust generated (fibrils),
- Irritations/Infections of the nose and eyes caused by the dust generated (fibrils),
- Skin injuries caused by contact of the rotary part with the skin, likely to be aggravated by the wearing of jewellery,
- Loss of hearing ability related to the environmental noise,
- Pulling out of hair caused by contact with the rotary part,
- Back problems caused by unsuitable postures.

SAFETY ADVICE

- Install a fan, soundproofing and suction system providing for satisfactory ambient air quality at all times as well as a noise level as low as possible,
- Install protective casings on each machine in order to minimum the noise level,
- Adapt the height of the workstations to the employee's stature,
- Use an electrical rather than a pneumatic system and guarantee the safety of the electrical system (insulation of wires and electric panels, wiring out of the reach of personnel, regular inspections of the electrical system),
- Ban jewellery and loose hair,
- Use suitable PPE (see below).

PERSONAL PROTECTIVE EQUIPMENT

- Half-face respirator,
- Multi-purpose gloves
- Work clothes (covering the arms and legs),
- Standard protective goggles,
- Ear plugs if the noise level is greater than 85dBA.





ABRASION BY EMERY PAPER/WHISKERING

APPLICATION

• The surface of the denim is worn with emery paper.

POTENTIAL RISKS

- Lung diseases caused by the dust generated (fibrils),
- Irritations/Infections of the nose and eyes caused by the dust generated (fibrils),
- Skin irritations caused by repeated contact with the abrasive material,
- Back problems caused by unsuitable postures.

SAFETY ADVICE

- Install a fan and suction system providing for satisfactory ambient air quality at all times ,
- Adapt the height of the workstations to the employee's stature,
- Use an electrical rather than a pneumatic system and guarantee the safety of the electrical system (insulation of wires and electric panels, wiring out of the reach of personnel, regular inspections of the electrical system),
- Ban jewellery and loose hair,
- Use suitable PPE (see below).

PERSONAL PROTECTIVE EQUIPMENT

- Half-face respirator,
- Multi-purpose gloves,
- Work clothes (covering the arms and legs),
- Standard protective goggles.



RESIN AND HARDENING PROCESS

APPLICATION OF RESIN

APPLICATION

• Spraying of resin/plunging in a resin tank.

POTENTIAL RISKS

- Lung diseases and irritations caused by the chemical emissions,
- Irritations and burns to the mucosa due to contact of skin with the chemicals,
- Increased risk of cancer generated by prolonged exposure to certain carcinogenic chemicals (formaldehyde).

SAFETY ADVICE

- Install a fan and suction system providing for satisfactory ambient air quality at all times,
- Presence at the workstation of the minimum quantity of chemicals required for the daily production and previously prepared,
- Fit out the spray booths, washing machines and hot components with independent ventilation systems,
- Eliminate any source of heat close to hazardous chemicals,
- Follow the handling and storage instructions on the Material Safety Data Sheets.

PERSONAL PROTECTIVE EQUIPMENT

- Nitrile or Rubber gloves,
- Half-face respirator,
- Protective goggles,
- Boots,
- Laboratory coat,
- Additional PPE if required in the Material Safety Data Sheet.

MEASURES TO BE TAKEN IN CASE OF CONTACT WITH/INGESTION OF/ A CHEMICAL

Systematic consultation of the Material Safety Data Sheet (which must be systematically present at the place of production) and follow the instructions in the event of contact or ingestion. If indicated, workers should rinse the part in contact in clean water (eye wash station connected to running water compulsory at less than 6 m from the area of use of the chemical).





HARDENING WITH RESIN PROCESS

APPLICATION

• The finished garment is placed in a hot oven for 10 to 25 minutes to allow for the resin to bond to the product.

POTENTIAL RISKS

- Burns caused by contact with the hot components of the oven,
- Irritation of airways due to the release of fumes.

SAFETY ADVICE

- Fit out the oven with a system to extract fumes to the outside of the building and a steam suction system at the opening the oven,
- Fit out the oven with the necessary protection to prevent any contact from the operator with the hot components of the machine and to guarantee operating temperature control,
- Fit out the flow system with overhead conveyors,
- Follow the safety instructions given in the user guide of the appliance when opening the hot oven,
- Eliminate any source of heat close to hazardous chemicals,
- Follow the handling and storage instructions on the Material Safety Data Sheets.

PERSONAL PROTECTIVE EQUIPMENT

- Gloves,
- Half-face respirator,
- Apron.



MEASURES TO BE TAKEN IN THE EVENT OF AN ACCIDENT

Use of extinguishers suited to the work in the event of a fire. Rinsing burnt areas in running water (if no contact with a chemical).

If contact with a chemical, systematic consultation of the Material Safety Data Sheet (which must be systematically present at the place of production) and follow the instructions in the event of contact or ingestion. If indicated, rinsing of the part in contact in clean water (eye wash station connected to running water compulsory at less than 6 m from the area of use of the chemical).



CHEMICAL PROCESS (SPRAYER)

APPLICATION

Spray gun.

POTENTIAL RISKS

- Lung diseases and irritations caused by the chemical emissions,
- Irritations and burns to the mucosa due to contact of skin with the chemicals.

SAFETY ADVICE

- Install a fan and suction system providing for satisfactory ambient air quality at all times,
- Use a water curtain systematically to minimise the release of chemicals into the ambient air,
- Presence at the workstation of the minimum quantity of chemicals required for the daily production and previously prepared,
- Fit out the spray booths, washing machines and hot components with independent ventilation systems
- Eliminate any source of heat close to hazardous chemicals,
- Follow the handling and storage instructions on the Material Safety Data Sheets.

PERSONAL PROTECTIVE EQUIPMENT

- Waterproof protective gloves suitable for potassium permanganate,
- Full face respirator,
- Protective goggles,
- Boots,
- Laboratory coat (long sleeved),
- Additional PPE if required in the Material Safety Data Sheet.

MEASURES TO BE TAKEN IN THE EVENT OF AN ACCIDENT

If contact with a chemical, systematic consultation of the Material Safety Data Sheet (which must be systematically present at the place of production) and follow the instructions in the event of contact or ingestion.

If indicated, rinsing of the part in contact in clean water (eye wash station connected to running water compulsory at less than 6 m from the area of use of the chemical).





LASER

APPLICATION

• A laser machine tool is used.

POTENTIAL RISKS

- Damage to eyes and burns to skin due to contact with the material or the laser,
- Lung diseases and irritations caused by fume emissions,
- Bodily injuries related to the moving parts of the machine tool,
- Loss of hearing ability related to the environmental noise.

SAFETY ADVICE

- The procedures for optimum use and installation of the machine tool must be implemented in order to avoid physical contact with the laser and the moving parts of the machine. This must include two-hand control mechanisms,
- Install an alarm or a light signal to indicate the start of the machine,
- Install a fan, soundproofing and suction system providing for satisfactory ambient air quality at all times as well as a noise level as low as possible.

PERSONAL PROTECTIVE EQUIPMENT

- Protective goggles (laser protective goggles),
- Half-face respirator,
- Gloves (fireproof),
- Ear plugs if the noise level is greater than 85dBA.

MEASURES TO BE TAKEN IN THE EVENT OF AN ACCIDENT

Use of extinguishers suited to the work in the event of a fire. Rinsing burnt areas in running water (if no contact with a chemical).





WASHING

RINSE WASH

APPLICATION

- Industrial washing machines are used,
- Dispersing agents are used,
- Desizing agents are used.

POTENTIAL RISKS

- Loss of hearing ability related to the environmental noise,
- Irritations and burns to the mucosa due to contact of skin with the chemicals and heat,
- Bodily injuries caused by a fall on a wet floor.

SAFETY ADVICE

- Install a fan, soundproofing and suction system providing for satisfactory ambient air quality at all times as well as a noise level as low as possible,
- Follow the user manual of the washing machine,
- Cover the floors with a non-slip covering to limit the risks of falls,
- Evacuate the excess water after opening the machines to avoid the risk of falls.

PERSONAL PROTECTIVE EQUIPMENT

- Half-face respirator,
- Long PVC, nitrile or rubber gloves according to the product,
- Laboratory coat,
- Protective goggles (laser protective goggles),
- Non-slip boots,
- Ear plugs if the noise level is greater than 85Dba,
- Additional PPE if required in the Material Safety Data Sheet.

MEASURES TO BE TAKEN IN THE EVENT OF AN ACCIDENT

If contact with a chemical, systematic consultation of the Material Safety Data Sheet (which must be systematically present at the place of production) and follow the instructions in the event of contact or ingestion.

If indicated, rinsing of the part in contact in clean water (eye wash station connected to running water compulsory at less than 6 m from the area of use of the chemical).





STONE WASH

APPLICATION

- The garments are washed in industrial machines with "pumice stone" type stones. Enzymes can be add to increase the stone effect,
- Dispersing agents are also used.

POTENTIAL RISKS

- Loss of hearing ability related to the environmental noise,
- Bodily injuries caused by a fall on a wet floor.

SAFETY ADVICE

- Install a fan and suction system providing for satisfactory ambient air quality at all times as well as a noise level as low as possible,
- Follow the user manual of the washing machine,
- Cover the floors with a non-slip covering to limit the risks of falls,
- Evacuate the excess water after opening the machines to avoid the risk of falls.

PERSONAL PROTECTIVE EQUIPMENT

- Gloves,
- Half-face respirator,
- Apron,
- Non-slip boots,
- Ear plugs if the noise level is greater than 85dBA,
- Additional PPE if required in the Material Safety Data Sheet.



MEASURES TO BE TAKEN IN THE EVENT OF AN ACCIDENT

If contact with a chemical, systematic consultation of the Material Safety Data Sheet (which must be systematically present at the place of production) and follow the instructions in the event of contact or ingestion.

If indicated, workers must rinse the part in contact in clean water (eye wash station connected to running water compulsory at less than 6 m from the area of use of the chemical).



BLEACHING

APPLICATION

- Industrial machines are used,
- Bleaching agents are used.

POTENTIAL RISKS

- Loss of hearing ability related to the environmental noise,
- Bodily injuries caused by a fall on a wet floor,
- Irritation and burns to the mucosa due to contact of skin with the chemicals.

SAFETY ADVICE

- Install a fan, soundproofing and suction system providing for satisfactory ambient air quality at all times as well as a noise level as low as possible,
- Follow the user manual of the washing machine,
- Cover the floors with a non-slip covering to limit the risks of falls,
- Evacuate the excess water after opening the machines to avoid the risk of falls.

PERSONAL PROTECTIVE EQUIPMENT

- Half-face respirator,
- PVC or nitrile gloves,
- Laboratory coat,
- Non-slip boots,
- Ear plugs if the noise level is greater than 85dBA,
- Additional PPE if required in the Material Safety Data Sheet.



MEASURES TO BE TAKEN IN THE EVENT OF AN ACCIDENT

If contact with a chemical, systematic consultation of the Material Safety Data Sheet (which must be systematically present at the place of production) and follow the instructions in the event of contact or ingestion.

If indicated, rinsing of the part in contact in clean water (eye wash station connected to running water compulsory at less than 6 m from the area of use of the chemical).



NEUTRALISATION

APPLICATION

Industrial machines are used for the washing.

POTENTIAL RISKS

- Loss of hearing ability related to the environmental noise,
- Bodily injuries caused by a fall on a wet floor,
- Irritation and burns to the mucosa due to contact of skin with the chemicals.

SAFETY ADVICE

- Install a fan, soundproofing and suction system providing for satisfactory ambient air quality at all times as well as a noise level as low as possible,
- Follow the user manual of the washing machine,
- Cover the floors with a non-slip covering to limit the risks of falls,
- Evacuate the excess water after opening the machines to avoid the risk of falls.

PERSONAL PROTECTIVE EQUIPMENT

- Half-face respirator,
- PVC or nitrile gloves ,
- Laboratory coat,
- Ear plugs if the noise level is greater than 85dBA,
- Additional PPE if required in the Material Safety Data Sheet.



MEASURES TO BE TAKEN IN THE EVENT OF AN ACCIDENT

If contact with a chemical, systematic consultation of the Material Safety Data Sheet (which must be systematically present at the place of production) and follow the instructions in the event of contact or ingestion.



OZONE

APPLICATION

Ozone washing.

POTENTIAL RISKS

- Irritations and burns to the mucosa due to breathing in of the ozone gas released,
- Lung diseases which can lead to death, caused by breathing in strong concentrations of ozone gas.

SAFETY ADVICE

- Install the ozone generators outside the production areas,
- Implement a stopping system of the generator at least 10 metres away from the generator,
- Install an alarm system coupled to an ozone detector,
- Adjust the ozone concentration via a control station with restricted access,
- Provide a safety system to the doors of the machines using ozone gas preventing them from being opened if the ozone concentration is greater than or equal to 1ppm,
- Guarantee that the pipes, pipe fittings and clamps are made of corrosion-proof materials and are strong enough to withstand the pressure generated by the ozone finishing process.

PERSONAL PROTECTIVE EQUIPMENT

Self-contained breathing apparatus (in the event of ozone gas release).

MEASURES TO BE TAKEN IN THE EVENT OF AN ACCIDENT

Use self-contained breathing apparatus (SCBA) in compliance with the training received and follow the emergency instructions of the Material Safety Data Sheet in the event of exposure



BEST PRACTICES IN CHEMICAL MANAGEMENT

The purpose of this section is to present the best practices in:

- storage of chemicals,
- identification of chemicals and availability of the essential information thereof (Material Safety Data sheets),
- Management in the event of spill of a chemical.

These recommendations must allow for:

- Preventing and control of the risks of accidents related to chemicals,
- Reducing the exposure of employees to the hazards and potential hazards of chemicals,
- Maintaining the chemicals in the best conditions to optimise the use thereof and to reduce wasting of resources.

STORAGE AREA

• All chemicals must be stored in marked out area(s), dedicated to this use only, in the factory. These areas must be clearly identified (posting at the entrance to the areas concerned, e.g. as shown below):



- Access to chemical storage areas must be limited to only employees trained in the management of chemicals whose responsibilities and daily tasks require this access.
- Chemical storage areas must be aired to ensure the air circulation required to prevent the build up of gas and emissions of chemicals which can be dangerous to health and can, in certain cases, cause explosions (according to the characteristics of the products stored).



These areas must be safe: there must not be any electric cables or connectors that can be in contact with a chemical substance. Incompatible chemicals must be isolated one after the other in accordance with the information available in the Material Safety Data Sheet and the chemical compatibility matrix:



 Any hazardous liquid chemical must be placed in bunding to control/prevent leaks and spilling of these substances into the work environment.

IDENTIFICATION

• Chemicals must be correctly labelled so that the information relating to the hazards of these products is immediately accessible to any employee of the factory. Labels must include the essential information shown below. This is the GHS (Globally Harmonised System of Classification and Labelling of Chemicals):





The Material Safety Data Sheet of each chemical must be accessible in the local language or in a language that all the employees of the factory can understand. The Material Safety Data Sheet is a vital document to identify the hazards related to the product in question, amongst others. It contains 16 chapters which are as follows:

1- Identification (substance & supplier)	9- Physical and chemical properties
2- Hazard identification	10- Stability and reactivity
3- Composition/information on ingredients	11- Toxicological information
4- First-aid measures	12- Ecological information
5- Fire-fighting measures	13- Disposal consideration
6- Accidental release measures	14- Transport information
7- Handling and storage	15- Regulatory information
8- Exposure controls/personal protection	16- Other information

SPILL MANAGEMENT

In the event of accidental spillage of a chemical, the factory must have an emergency and spill management procedure in place. The factory must organise training and simulations of spillage to train the employees to be ready to respond in the best way in the event of spills of chemicals. This emergency procedure must cover the following points amongst others:

- safety measures in the event of spillage,
- reporting of the accident,
- identification of the product and the severity of the situation,
- steps to be followed according to the severity of the situation and the special features of the product concerned,
- PPE to be used in accordance with the Material Safety Data Sheet of the product concerned,
- Equipment required for cleaning the spill,
- Hazardous waste management.



Denim processing generates both solid (empty bottles of chemicals, scraps of fabric impregnated with chemicals, etc.) and liquid (wastewater discharged from washing machines, "water curtain" used for the potassium permanganate spraying process, wastewater to clean the production areas, etc.) waste which requires the factory's particular attention due to the hazardous character thereof both to human health and the environment. The factories concerned are therefore advised to follow the best practices proposed below in order to control the environmental risks related to solid and liquid waste management:

SOLID WASTE

- Identification of waste and reporting of the quantities generated in an inventory which is regularly updated.
- Drafting and implementation of a solid and hazardous waste management procedure in order to define how the factory must manage the handling of waste, the temporary storage on site thereof and the collection by waste management firms approved and recognised by the local authorities.
- Temporary storage of solid waste in the factory in compliance with the rules pertaining to safety and protection of the environment. Appoint a dedicated, isolated area for the waste, avoid any contact of the hazardous waste with the floor, avoid infiltration of water into the storage area, etc.
- The factory must have signed and dated contracts with the firms in charge of the waste collection.
- The factory must demand from firms in charge of the collection of waste to be transparent with regard to the final destination of the waste and the way it will be processed. The factory is responsible for choosing, insofar as possible, the firms in charge of the waste collection with the most environmentalfriendly practices.

LIQUID WASTE

- Effluent from the denim production areas must be collected via a duly established and documented water disposal network so that the effluent is directed to an effluent treatment plant.
- The effluent treatment must be in accordance with the law, both on and off-site. The factory can, either have its own effluent treatment plant, or be connected to an effluent treatment plant "common" to other factories, e.g. in an industrial estate. Regardless of the situation, the factory must be able to provide proof that the effluent is treated and that the quality of water coming out of the treatment plant is in compliance with the legal standards of water quality in order to be authorised to dispose of it into the sewers or the environment.
 - If the factory is connected to a common effluent treatment plant (CETP), it must have a valid contract entered into with the agency in charge of the CETP. The factory must adhere to the effluent treatment prerequisites in accordance with this contract, if any.
 - If the factory has its own treatment plant, it must be in a position to provide the test reports of the quality of water coming out of the treatment plant in order to prove it is in compliance with the legal standards.