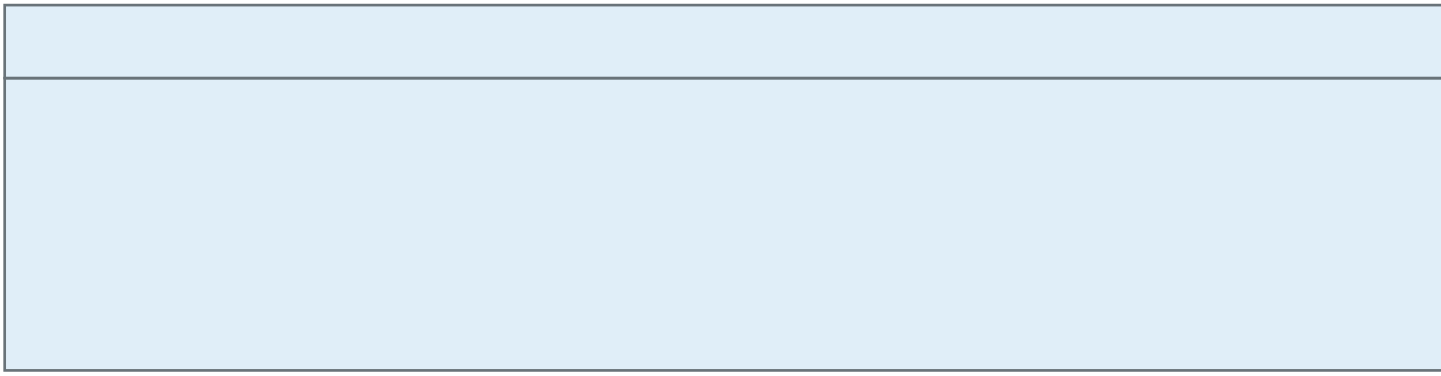
Safe Handling of Hot Rosin and Hydrocarbon Resins

HARRPA

Hydrocarbon, Rosin Resins and Pine Chemicals Producers Association



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1. Introduction

In our industry one of the commonest injuries experienced by our employees is resin burns. These can be particularly nasty - resulting in permanent scaring of the skin - and are extremely painful during the healing process.
Handling of hot rosin and resin during plant operations when the resin is not contained within the plant, presents a particularly high risk of exposure to employees. These operations include pipe breaking, filling containers, sampling, etc. It is thus important that we adopt the very best practices to avoid rosin/resin burns during these operations.

Hot resin presents some unique risks in the workplace that our industry must manage. This project is designed to identify and collate the best practices in our industry, and to share those practices with safety professionals and others in our companies. Our goal is to eliminate resin burns to our employees.

This document on best practices for handling hot rosin and resin is written on behalf of the two Technical Committees of HARRPA.
It is not intended to give answers to all safety aspects related to the handling of these materials. This document shares best practices and ideas from the companies that helped compile it. It should be noted that circumstances may differ, and one should always study the local rules and legislation and take the appropriate measures related to that particular situation.

It is the responsibility of local management to make sure that all precautions are taken to safeguard people and environment.

Objective:

Target audience: Plant operations staff, plant engineers, plant managers, first aiders.
This document is limited to the use of rosin, rosin base resins and low molecular weight hydrocarbon resins. It does not cover other hot liquids.

The document is intended to be used amongst HARRPA Members, but can also be shared with our customers and/or first aid providers.

Disclaimer

This document on best practices for handling hot rosin and resin is written on behalf of the two Technical Committees of HARRPA. It shares best practices and ideas from the companies that helped compile it. The publication is intended for guidance only and while the information is provided in good faith and has been based on the best information currently available, is to be relied upon at the user's own risk. It is not intended to give answers to all safety aspects related to the handling of these materials.

It should be noted that circumstances may differ, and one should always study the local rules and legislation and take the appropriate measures related to that particular situation. It is the responsibility of local management to make sure that all precautions are taken to safeguard people and environment. No representations or warranties are made with regards to its completeness and no liability will be accepted for damages of any nature whatsoever resulting from the use of or reliance on the information contained in the publication.

2. Safety considerations

For safety measures refer to the Safety Data Sheet (SDS). Provide training on safe operating procedures. It is important to avoid open flame ignition sources.

2.1. Personal protective equipment

Any company handling hot rosin and resin must have specific personal protective equipment (PPE) to protect employees handling hot rosin and resin.

Handling is: loading, unloading, connecting and disconnecting hoses or flexible connections before, during and after loading/unloading, sampling hot material, repairing leaks. Basically any operation where employees can be exposed to hot rosin and or resin.

Due to the nature of the material i.e. heated above melting point PPE must comply with Directives 89/656/EEC and 89/686/EEC and amendments. Suitable protective clothing will show the following pictogram:

e.g. EN 531

A	B	C	D	E
X	X	X	X	X

With A —— E: indicating the performance level of the applied material

A: refers to flame spread (5 levels)
B: refers to heat transmission on exposure to flames (convective heat / 5 levels)
C: refers to resistance of material when exposed to radiant heat (4 levels)
D: (not applicable in this context)
E: (not applicable in this context)

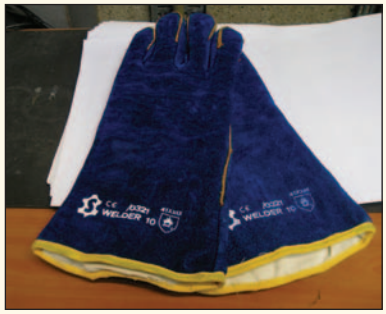
Note: the higher the number the better the test results

During handling of hot rosin and resin, the personal protective equipment required should include as a minimum:

- face protection
- head protection
- body including arms and legs protection
- hands and feet protection

Make sure that safety showers, eye-wash stations and fire-fighting equipment are available as per local rules.

Some examples:



3. Control exposures (line breakings ...)

Provide sufficient and suitable procedures to cover work tasks of the following:

- Sampling
- Filters cleaning
- Line breaking
- Cleaning systems

4. Engineering recommendations

4.1. Materials of construction

Tanks, containers, piping, pumps, valves, etc. dedicated to resin and rosin should be constructed of stainless steel. Consult your supplier for specific recommendations on the stainless steel type required for your service.

4.2. Piping

It is important to exclude dead-ends in your piping design. When possible, maintain inclination on piping line to ensure easy displacement.

4.3. Jacketing

Except for resin with a softening point below 60°C, all components of molten resin piping should be jacketed. Tracing is usually adequate for resins with a softening point below 60°C. Jacketed flexible metal hosing is available for connecting to tank trucks.
If available at high enough pressure, steam can be used as the heating medium on jacketed equipment. Hot oil can also be used if more economical.
For calculations, resin/rosin specific heat capacity should be chosen equal to 2.5 kJ/kg.°C.

4.4. Insulation

Standard insulation technology can be used. However, it is recommended to use foam glass at locations where molten rosin or resin can penetrate through the outer covering of the insulation.

4.5. Valves

Valves used in molten service are quarter-turn plug valves with stainless steel seats and internals.

4.6. Pumps

Jacketed pumps should be used for molten service. The most commonly used pump type is the gear pump. Double mechanical seals are normally used, but packing can also been used successfully. Consult your pump supplier.
All pumps should be insulated and equipped with either an internal or external pressure relief device. Generally, pumps are equipped with a recirculation control valve.

4.7. Filtering system

The commonest filtration technology for high viscosity product is the self-cleaning rotary filter. Purge drum facilities should be equipped with shield protection to allow safe purge operation.

4.8. Storage facilities

For safety reasons, resin / rosin storage tanks should be blanketed with inert gas. Do not vent to atmosphere (venting gas may contain volatiles). Venting gas should be incinerated or condensed and treated. Protect your tank against overpressure with jacketed equipment. Tanks are insulated and kept at a temperature at least above 100°C to keep them free from water. Tanks are insulated and heated preferably with external coils.
Ensure no water can enter into your process in order to avoid pressure build-up by steam and foaming.
Implement proper bonding and grounding to avoid electrostatic charge build-up.
Consider the installation of circulation lines or agitation to avoid stagnation of the product if required.

Standard control instruments:

- High and low temperature alarm
- Level gauge
- Pressure transmitter
- Overfill protection.
- Sampling point only if absolutely needed for your process.
  It is recommended to install a safe drain valve for this kind of service.

A self-actuated regulator on the inert gas line, set at a pressure lower than the venting set point of the breather valve, will add the necessary nitrogen quantity to compensate for any liquid displacements out of the tank. The breather valve should be located away from contact with the rosin/resin to prevent malfunctioning due to sticking. This protective device should be checked regularly. Rosin vapours may cause blocking.

5. Road tankers / hoses

Hot rosin and resin are classified as “dangerous goods” for transportation by road and by sea.

The material “Hot rosin and resin” is known as a UN 3257 elevated temperature liquid, not otherwise specified at or above 100 degrees Celsius and below its flashpoint. ADR Class 9, hazard identification number 99.

According to chapter 4 of the ADR, the minimum required tank code is LGAV. Thus the road tanker and container will be equipped with bottom-filling and discharge openings with two closures (isolating valves). In addition, the tank is to be equipped with a venting system but no flame trap. A non-explosion-pressure proof tank is acceptable for the latter.

It is crucial that the two closures are working properly. In the event of one of the two valves (butterfly valve and bottom valve) not working properly, the number of protection layers is seriously reduced and the employee(s) will be exposed to a significant risk.

5.1. Recommendations for choice of hose

The recommended material for the loading / discharge hose is stainless steel.

The distance between the manifold of the tanker or container and the discharge / loading manifold will be as short as possible and certainly not exceed the length of one hose. If this is not possible additional jacketed fixed piping (steam or thermal oil service) should be installed.

It is recommended that before loading or unloading, the hose is supported in order to avoid additional forces acting on the hose due to its contents.

The stainless steel hose should not be jacketed unless weather circumstances are extreme (e.g. freezing) or if the loading and unloading rate is sufficient to avoid re-crystallization of the hot material.

Special attention should be given to the choice and installation of the gasket in the hose before making the connection to the manifolds. The recommended material is Viton TM.

The recommended connection is a flanged connection.

It is recommended to install an additional casing around the hose for two reasons: personal protection of employees against a hot surface and general protection in case the hose collapses;

The material of the hose and gasket must be suitable for temperatures above 200°C;

It is recommended to verify the accessibility of the butterfly valve when this valve must be closed manually in the event of the hose collapsing; if necessary and depending on your local risk assessment, have a metal rod of sufficient length ready and connected to this valve to close it in case of emergencies.

6. Instrumentation

6.1. Level measurement

Besides keeping the inventory of the stored material, the level measurement is needed for protection against overfilling of the recipient vessel. Overfilling causes spills that may lead to personnel injuries and/or environmental accidents like ground or water contamination or odours.

One or more level measurement devices are connected to close all the feeding lines to the recipient vessel when a high level is detected. A sonic or visible warning will draw attention to this situation.
Due to the sticky nature and solidifying of the material at lower than storage temperature a device with no contact to the product is preferred. Radar type level measurement is proven to be successful.
Alternative devices are weigh cells, pressure sensor, bubbler type and temperature sensors ... adapted to the specific needs.

6.2. Temperature control

Holding rosin or resins at the right temperatures is important for safety and practical reasons. Heating the material too close or above its flash-point can create a fire hazard if an ignition source is available. Too low temperatures may cause difficulties in discharging the material from the recipient.
A calibrated sensor must control the heat input to the tank. The temperature
sensor is preferably located in a turbulent zone of the tank to prevent false readings due to solidifying material on the probe.

6.3. Inerting of Vapour Space

To prevent oxidation of the rosin or resin and to prevent a fire hazard when heated at a temperature close to or beyond its flash-point, the vapour space of the vessel is filled with an inert gas.
Keep the inerting system free from rosin or resins splashes to prevent malfunctioning due to the sticky and solidifying nature of the product.

7. Loading/unloading

7.1. Loading tankers/containers

Before loading, the tanker/container should be inspected where possible. The tanker/container must be dry and always grounded.

To prevent oxidation of the rosin/resin it is recommended to inert the materials.

If the loading hose is used (loading through bottom valve), the hose should be purged. It is better to use gravity force for loading. However, if a pump is used for loading, the pressure should be 200-300 kPa. The starting and control of the loading must be done from a safe place, where there is no risk from spills or splashing.

It is recommended to isolate the loading area from unauthorised traffic and people. Relevant personal protection should be used.

Overloading of the tanker/container should be prevented and all fumes returned back to the storage vessel or treated in another system

7.2. Unloading tankers/containers

Check documents and ADR certificates (driver / container / tanker);

Check weight and verify against available capacity in storage tank; do not start the unloading if the content of the container or tanker cannot be discharged in one single operation.

Check temperature of the hot rosin / resin; request additional heating (steam / electrical) if temperature is too low.

Never allow steaming straight onto the butterfly valve in case this valve is blocked.
Remaining condensed water will be transformed into steam and may cause a pressure build- up and result in a spill.

Restrict entry to the unloading station and prevent movement of the tanker during the discharge by chocking the tanker wheels on both sides of the vehicle.

Check local emission regulations if tank lid(s) must be opened before discharge.

Best practice for emptying the container or tanker is using the pump from the receiving installation; in most cases the same pump is used to transfer the hot material in a next step to a reactor.

It is recommended to install a jacketed check valve / non return valve at the manifold of the receiving installation.

If the tank lid will remain closed during the unloading, supply nitrogen vapour pressure of 20 kPa to the top of the tanker / container to avoid implosion of the container or tanker; in this case mark the container or tanker after discharge with a label explaining that the atmosphere of the tanker contains nitrogen vapours.

Start the discharge operation beginning with the receiving installation and ending with opening the bottom valve of the tanker / container.

When the discharge operation is completed close the valves in the reverse sequence.

It is recommended to store the hose securely once it is emptied in order to protect it from weather conditions e.g. rain, snow etc.

8. Maintenance

Maintenance on hot equipment is only allowed if no other possibilities exist.
Normal maintenance should be carried out on cold equipment. Equipment has to be cleaned before the maintenance personnel start their job.

Carry out a "Job Safety Analysis". Make sure that all valves, pumps etc. are locked and tagged.
Be careful during dismantling for any residual cleaning liquids. Wear full face protection and coveralls.
Special care needs to be taken after the equipment is reassembled. Make sure that tracing etc. has been put on again and that no pressure build-up can be expected.

Work on hot equipment should be carried out with full work clothes (cotton), with extra leather apron and full face protection to cover all parts of the body.
A second person should accompany the maintenance personnel.
Work on hot equipment can only be carried out using "Hot Work Permits"

Have a programme in place to check regularly that lines are open and equipment is functioning

9. Emergency responses

9.1. First aid measures

Skin contact with hot rosin or resin:

Immediately immerse or flush the burned area with large amounts of cold water for as long as possible (at least 15 minutes) to dissipate heat (if possible take care that temperature of water is not too cold).
- Do not remove solidified material from burned skin as the damaged skin can be easily torn.
- Do not remove contaminated clothing as the damaged skin can be easily torn. Keep sterile by covering with clean cotton sheeting or gauze.
- Get prompt medical attention.

Note that removing the rosin or resin or the contaminated clothing from the burned area will damage the skin and permit infection to occur.

Eye contact with hot rosin or resin:

- Do not open eyelids if covered with rosin or resin.
- Immediately flush eyes with large amounts of water for at least 15 minutes.
- Get prompt medical attention (if possible see an ophthalmologist).

Note that the consequences are very serious if hot resin/rosin gets into eyes.
See also relevant section of Safety Data Sheet (SDS), "First Aid Measures".

9.2. Fire fighting measures

- Use water spray to cool fire-exposed surfaces and to protect personnel. Isolate "fuel" to fire.
- Use carbon dioxide, sand, foam, dry chemical, or water spray to extinguish fire.

Special fire precautions

- Respiratory and eye protection required for fire fighting personnel.
- Avoid spraying water directly into storage containers due to danger of boil over.

Hazardous combustion products

- Fumes, smokes, carbon dioxides (CO_2) and carbon monoxide (CO).

See also relevant section of Safety Data Sheet "stability and reactivity"

9.3. Accidental release measures

Spillage onto Ground

- Contain spilled liquid with sand or earth. **DO NOT** use combustible materials such as sawdust.
- Allow spilled material to cool down or solidify and scrape up with shovels into a suitable container for recycling or disposal.
- If there is a risk of a flammable atmosphere, use antistatic equipment to clean up the spill.
- If needed, consult local authorities on disposal of recovered materials and ensure conformity with local disposal regulations.

Spillage into Water

- Stop source, if possible doing so without causing a hazard. Advise authorities of possible floating substances, if material enters watercourses or sewers. Confine if possible.
- If needed, consult local authorities on disposal of any recovered material and ensure conformity with local disposal regulations

See also relevant section of Safety Data Sheet ""Stability and Reactivity"

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