

**Government of Maharashtra**  
**Directorate of Industrial Safety and Health**

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***Circular- 6/2020***

***Subject: Guidelines for Solvent Extraction Plant***

*Introduction:*

*In the current situation of Covid-19 lockdown, the inspection of all the factories may not be possible by this directorate. Hence all such type of factories are hereby directed to follow the following safety measures in addition to the provisions of The Factories Act, 1948 and The Maharashtra Factories Rules, 1963.*

*The given guide lines are not exhaustive in nature; any additional precaution as may be necessary based on specific requirement should be adopted by the factory management for safe manufacturing operation of the factory based on the nature of manufacturing activity*

Following provisions of the Schedule XXI in respect of process of extracting oils from vegetable in solvent extraction plant of Rule 114 of the Maharashtra Factories Rules, 1963 shall be complied with.

- a. Plant shall be under and overall supervision of a qualified person who shall at least be graduate of chemical Engineering or Technology with 5 years experience.
- b. The plant shall be examined by competent person once in every 12 months and the reports of such examination shall be submitted to my office.
- c. Adequate number of portable fire extinguishers suitable for use against flammable liquid shall be provided in the plant.
- d. An automatic water spray sprinkler system on a wet-pipe or open head defuse system with sufficient supply of storage water shall be provided over the plant area throughout the building in which the plant is housed.
- e. Provisions shall be made for Automatic cutting of steam in the event of power failure and also for emergency over head water supply for leading water by gravity to condensers for at least half an hour which shall come into the play automatically with the power failure.
- f. Flameproof electric fittings shall be provided wherever inflammable Hexane are used/handled/stored.

Location and Lay-out –

- (1) No plant shall be permitted within a distance of 30 metres from any residential locality or site for public utility.
- (2) The plant shall not be put into commission unless it is certified by a Competent Person that the plant, machinery and its other equipment are designed, fabricated and erected according to the best know practices pertaining to the process and the said certificate is submitted to the Chief Inspector,at least one month before the commissioning of the plant.
- (3) 1.5 metres high continuous" wire fencing shall be provided around the plant, upto a minimum distance of 15 metres from the plants.
- (4) Boiler Houses and other buildings where open flame processes are carried on shall be located at least 30 metres away from the plant.
- (5) If godowns and buildings where preparatory processes are carried on are located at a distance of less than 30 metres from the plant, these shall be located at least 15 metres away from the plant, and 1.5 metres high continuous barrier wall of non-combustible materials shall be erected at a distance of not less than 15 metres from the plant so that it extends to at least 30 metres of vapour travel around its ends from the plant to the possible sources of ignition:

Provided that, the existing units may be exempted from any of the provisions of this paragraph on such conditions as the State Government may deem fit.

Electrical Installations –

- (1) All electrical meters, wirings and other electrical equipments installed or housed in the plant shall be of the flame-proof constructions.
- (2) All metal parts of the plant and building including various tanks and containers where solvents are stored or are present and all parts of electrical equipments not required to be energised shall be properly bounded together and connected to earth so as to avoid accidental rise in the electrical potential of such parts above the earth potential.

Prohibition relating to smoking –

Smoking or carrying any source of ignition shall be strictly prohibited within a distance of 30 metres from the plant. For this purpose 'NO SMOKING' signs shall be permanently displayed in the area of the plant.

Precautions against friction –

- (1) All the hand-tools required to be used in the plant shall be of non-sparking type.
- (2) No machinery or equipment of the plant shall be belt driven:

Provided that, the plants existing prior to the date of commencement of these rules may continue with belt drives if the belts are of anti-static type and, in the opinion of a Competent Person, a proper earthing arrangement is made.

(3) No person shall be allowed to enter and work in the plant if he is wearing clothes made of nylon or such other fibres which can generate static electrical charge, or if he is wearing footwear which is likely to cause sparks by friction.

Fire-fighting apparatus –

(1) Adequate number of portable fire extinguishers suitable for use against flammable liquid shall be provided in the plant.

(2) An automatic water spray sprinkler system on a wet-pipe or openhead defuge system with sufficient supply of storage water shall be provided over the plant area throughout the building in which the plant is housed.

(3) This requirement shall be in addition to the requirements under any other provisions of the Maharashtra Factories Rules, 1963, regarding fire fighting apparatus and water supply.

Precautions against power failure –

Provisions shall be made for automatic cutting off of steam in the event of power failure and also for emergency over-head water supply for feeding water by gravity to condensers for at least half an hour which shall come into the play automatically with the power failure.

Magnetic Separators –

Oil cake shall be fed to the extractor by conveyor through a hopper, and magnetic separator shall be provided to remove any pieces of iron during its transfer.

Venting –

(1) Tanks containing solvents shall be projected with emergency venting to relieve excessive internal pressure in the event of fire.

(2) All emergency relief vents shall terminate at least 6 metres above the ground and be so located

that vapours will be directed away from the plant.

Waste Water –

Processed waste water shall be passed through flash evaporator to remove any solvent before it is discharged into a sump which shall be located within the fenced area but shall not be closer than eight metres to such fence.

#### Ventilation –

The shed for the plant shall have adequate natural ventilation and if it is housed in building having ventilation which in the opinion of the Inspector, is inadequate, at least six air changes per hour shall be ensured by mechanical means.

#### House Keeping –

- (1) Solvent shall not be stored in an area covered by the plant except in quantities not exceeding 5 litres, which shall be stored in suitable safety cans.
- (2) Waste materials such as oily rag, other waste and absorbents used to wipe off solvents, oil and grease in the plant shall be deposited in suitable containers and removed from the premises at least once a day.
- (3) Premises where the Solvent Extraction Process is carried on and the outer area within 15 metres from it shall be kept free from any combustible materials and any spills of oils or solvent shall be cleared up immediately.

#### Examination and repairs –

- (1) (a) The Plant shall be examined by the Competent Person to determine any weakness or corrosion and wear, once in every twelve months. The Competent Person shall then furnish a report of such examination to the Inspector, with his recommendations as to whether the plant is in safe condition to work and the measures, if any, which in his opinion are necessary to be taken and the time by which such measures shall be taken, so as to ensure that the plant and equipment can be used without any danger to the workers, in the factory.
- (b) If any defects which are causing or likely to cause imminent danger to the life or safety of the workers working on such plant are found by the Competent Person, the Competent Person shall immediately submit a report to that effect to the Inspector and Chief Inspector of Factories, stating therein the measures which, in his opinion, are necessary to ensure safety to the workers. When the necessary repairs are carried out, a copy of certificate by Competent Person that the plant has been repaired to his satisfaction shall be forwarded to the Inspector.
- (2) The plant shall be purged with inert gas or steam before opening for cleaning or repairs and before introducing solvent after repairs.

#### Operating Personnel –

- (1) The plant shall be under an overall supervision of a qualified person who shall at least be a graduate of a statutory University of Chemical Engineering or Technology with specialised

knowledge of oils and fats with minimum 5 years experience in Solvent or Flammable process plants.

(2) The plant, machinery or equipment shall be in the charge of operators who have been trained and made thoroughly conversant to operate the plant so certified by the qualified person referred to Clause (1).

Employment of young persons –

No women or young persons shall be employed in the plant.

Vapour Detection –

A flame-proof and portable combustible gas indicator or any other type of gas

indicator as the Chief Inspector of Factories, may, subject to the control of the State Government, approve as safe and suitable for the purpose, shall be provided and maintained in good working order. A schedule of routine sampling of atmosphere at various location as approved by the Competent Person shall be drawn out and entered in a register maintained for the purpose.

Additional Provisions for batch-extractors –

The following further provisions shall apply to cater type extractor, namely-

(a) When the Solvent is removed from batch extractor by vacuum, vacuum gauges shall be provided and tests shall be carried out to ensure that a minimum vacuum of 650 mm. (26") mercury is obtained and maintained steadily for a minimum period of 30 minutes before the extractor is allowed to be opened for discharged of cake or for persons to enter.

(b) When, on opening the doors of a batch extractor, the extracted meal cannot be dislodged from the extractor freely, the doors shall be closed and the material reheated till the meal dislodges freely from the extractor.

(c) Where Solvent is removed by steam heating, the presence of the Solvent shall be tested at the vent provided on the top of the vessel before opening the vessel.

(d) A log-book of operations with the following particulars shall be maintained and made available on demand to the Inspector: -

(i) Vacuum gauge reading for each charge;

(ii) testing of continuity of electrical bonding and earthing system.

(iii) loss of solvent every 24 hours or loss per tonne of raw materials used.

Following preventive measures are suggested for working into tank, pit, sump, chamber and other confined spaces in any factory in which any gas, fumes, vapours or dust is likely to be present to such an extent as to involve risk to the persons working there:

- a) As far as possible an automated or mechanical system such as sludge/gear/suction pump etc shall be adopted for removal of sludge from tank, pit, chamber and other confined spaces etc. so that no person is required to enter into the pit, tank, and chamber for cleaning.
- b) Work permit system shall be followed in the factory for carrying out work in confined spaces such as pit, tank, chamber and sumps to evaluate the risk involved in the work.
- c) Standard operating procedures shall be prepared for work in Confined space to carry out the non-routine work ensuring the health, safety & welfare of the workers while they are at work in the factory.
- d) Work in tank, pit, sump, chamber and other confined space shall be carried out by trained and experienced workers only.
- e) One full time trained attendant shall always be present outside the tank, pit, sump or other confined space whenever such work is carried on.
- f) Before entering into any tank, pit, sump or other confined space, oxygen level & presence of toxic / flammable gases shall be checked with Oxygen Meter & LEL meter at least at three different levels.

The acceptable limits are:

- Oxygen reading:  $\geq 19.5\% \text{Vol.}$  to  $\leq 23.5\% \text{Vol.}$
  - Flammable gases and vapours reading :  $\leq 10\% \text{LEL}$  (lower explosive limit)
  - Toxic gases and vapours reading :  $\leq \text{PEL}$  (permissible Exposure limits)
- g) At least one person in a group working in the same vicinity of a tank, pit, sump, and other confined space shall be equipped with a portable gas detector.
  - h) Adequate provisions for continuous supply of fresh air or forced ventilation shall be provided.
  - i) A fixed ladder shall be provided at the work station to enable the workers working inside the tank, pit, sump or other confined space to egress in case of emergency.
  - j) Workers shall be provided with suitable self contained breathing apparatus such as full Body suit with positive pressure, Bubble hood with positive pressure etc.
  - k) All workers shall be required to wear a safety belt tied with a rope and free end of the rope is tied to fix structure outside/above the tank, pit, sump or other confined space to enable the attendant present outside to pull/lift the worker in case of emergency.
  - l) Workers working inside the tank, pit, sump or other confined space shall be provided with suitable personal protective equipment's such as chemical resistant hand gloves, Gum Boots, Chemical resistant aprons etc.
  - m) No portable electric light or any other electric appliance of voltage exceeding twenty-four volts shall be permitted for use inside any chamber, tank, vat, pit, pipe, flue or other confined space and if any inflammable gas, fume or dust is likely to be present in such chamber, tank, vat, pit, pipe, flue or other confined space, no lamp or light other than that of flame-proof construction shall be permitted to be used therein.
  - n) No Electric arc lamp no naked light fixed or portable, shall be used and no person shall have in his possession any match or any apparatus of any type for producing a naked light or spark and all incandescent electric lights shall be in double airtight covers.

- o) Any type of work in tank, pit, sump, chamber or other confined space shall be carried out under the close supervision of competent person.
- p) The factory shall inform to the MPCB prior to start any maintenance/cleaning/modification/alteration work related to pollution control equipment's.
- q) Provisions of Tube Settler or any other similar system after equalization stage in ETP shall be incorporated to reduce the risk of accumulation of sludge in aeration tank, further eliminating the risk of removing sludge manually.
- r) The factory shall provide Dissolved oxygen meter in the aeration tank for monitoring of Dissolved oxygen level and separate electrical energy meter for operation of ETP.
- s) The sludge lying in the aeration tank No.2 shall be removed as per the recommendation (a) to (o) as above.
- t) The factory shall dispose the removed sludge as per the consent conditions of MPCB.

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