

12.6 Pipeline pigging

Pipeline pigging was developed in the United States to clear the debris in crude oil pipelines. They are now widely used to clear pipelines carrying chocolate. The term “pig” comes from when the device was first used to clear a pipe carrying a product with poor lubrication properties. The lack of a lubricant caused the projectile to squeal like a pig.

A pig acts like a free-moving piston inside the pipeline, sealing against the inside wall with a number of elements, and is propelled along the pipe by either compressed air or by other product. The compressed air used should be filtered to meet all hygiene requirements. The pig pushes any residual product from the pipe and via an open valve into a receiving tank. This technique allows a single pipe to be used to sequentially carry many batches of products with fast change-over times and without the lengthy process of disassembling the pipeline for cleaning. A diagram illustrating a pigging system is shown in Figure 12.9.

The pig should be manufactured from the correct grade of food compatible plastic such as polyurethane or neoprene; any swelling or change in colour of the pig could be caused by the absorption of fat or the leaching out of plasticisers into the chocolate.

Pigs generally need specially designed launching and receiving vessels and valves to introduce them into the pipe work. The pipeline should be designed in such a way as to not have any obstructions that may impede the movement of

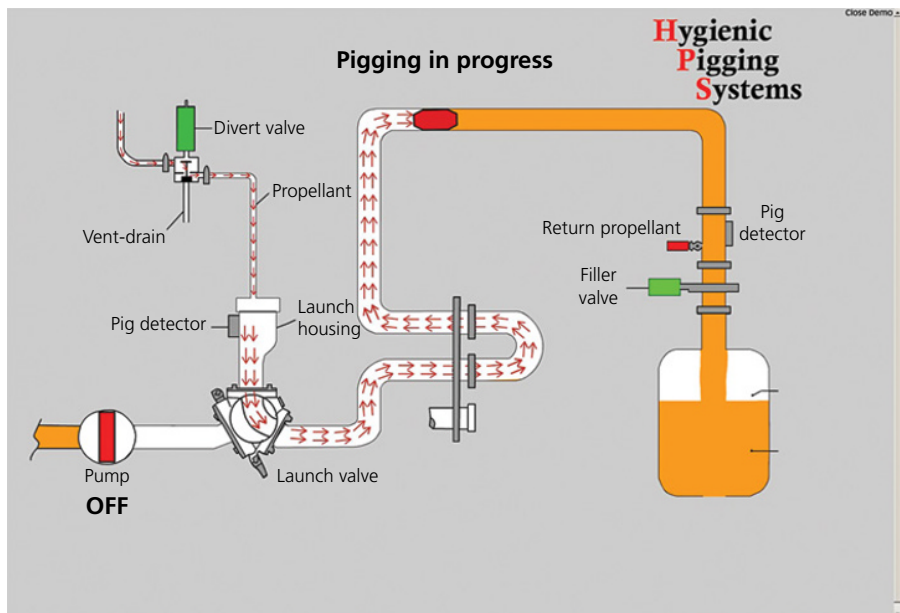


Figure 12.9 Diagram of pigging system.

the pig along the pipeline. All “T” junctions and “Y” type fittings may have to have rails or bars welded across the openings to guide the pig past them. All in-line valves must be of the full port design with a 100% pipe size opening.

12.7 Storage of liquid chocolate

Liquid milk chocolate should be stored at 40–45 °C (103–110 °F) and white chocolate from 38–40 °C (100–103 °F). In all cases however, care should be taken to ensure that the temperature of the chocolate is uniform throughout. Hot or cold areas can give rise to several problems and it is for this reason that the storage tank is constructed with a water-heated jacket. As in pipelines temperature control is important. At low temperatures the chocolate becomes viscous, making it difficult to stir and pump. There is also the possibility that if the chocolate becomes too viscous the stirring mechanism may be damaged.

The liquid chocolate in any tank or vessel requires agitation and a slow-moving low shear stirrer must be mounted on to the top of the vessel. Failure to do so results in fat separation from the chocolate. In extreme cases the sediment can cause damage to the pump and will prevent the flow of chocolate out of the tank. The rotational speed of the tank stirrer depends upon the diameter of the tank and the quantity of chocolate being stored. Recipes and manufacturing process also play an important part: some chocolates become thinner while others thicken. If the stirrer speed is insufficient a puddle of fat will appear on top of the chocolate.

The above recommendations also apply to the bulk transportation of chocolate in road tankers. These are sometimes heated or have localised heaters, resulting in hot spots.

Chocolate that is shaken in unstirred tanks during transportation is also more likely to separate and have a fat layer on top. Some further mixing may therefore be required at the receiving factory.

The equilibrium relative humidity of most chocolate at 40 °C (103 °F) is about 30%. This means that, if the relative humidity in the area where the chocolate is being stored is above 30%, the chocolate will pick up moisture and this will increase the viscosity of the chocolate. Many tanks, especially those with built-in sieves are open to the atmosphere, therefore it is important to control the humidity of the room where the storage tank is sited, to avoid moisture pick-up. It is recommended that liquid chocolate should have the minimum storage time possible.

Tanks manufactured from mild or stainless steel are used for the storage of chocolate and these can be constructed with a double skin jacket, a dimple jacket or a half-pipe jacket (see Figure 12.10). The tank should be insulated to conserve energy and to eliminate any cold spots. The water jacket of the tank, together with any associated jacketed pipe work, should be periodically examined for corrosion.