

The “ENVIRO method” for lubricating plunger and sleeve of high pressure die-casting machines (Pending for patent)

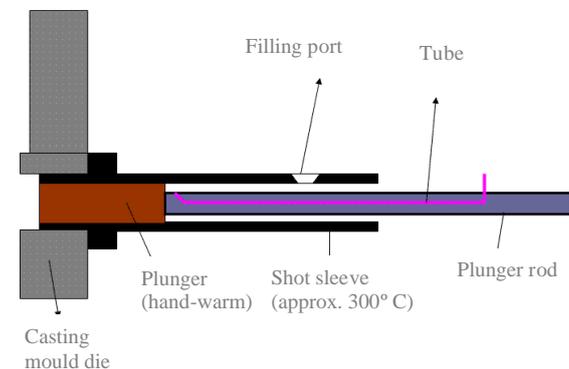
Tribo-Chemie has invented an innovative process for improved lubrication of plunger and shot sleeve.

This technical innovation offers the following advantages:

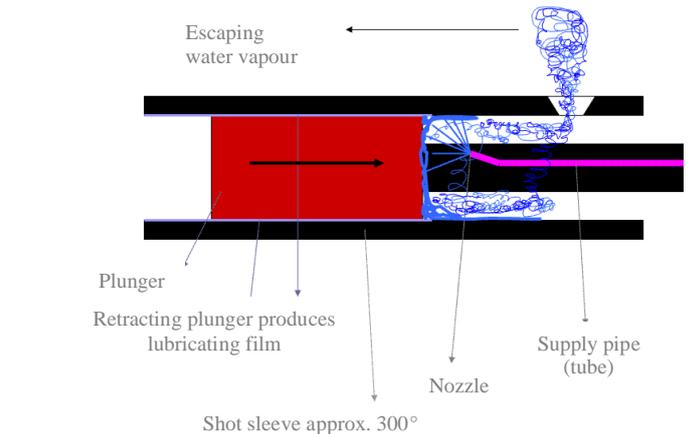
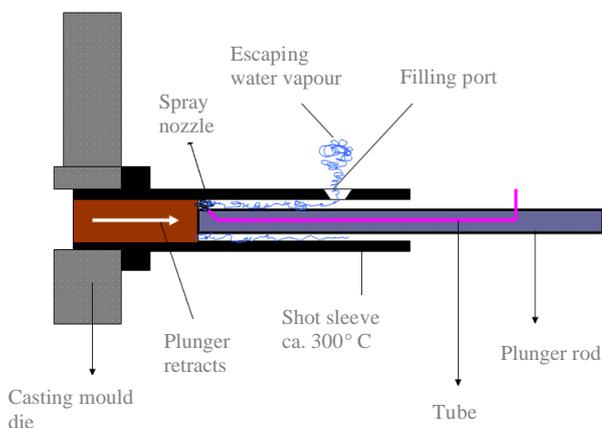
- The process is elementary for the manufacture of porous-free castings
- Inclusions of hydrocarbons inside the casting metal are virtually eliminated
- Reduced emission of smoke, no flammable vapours
- Easy and reliable technology and application
- Clean to use
- Effective and even lubricating film with high temperature resistance formed inside the shot sleeve and on plunger
- Prevention of steel erosion in the shot sleeve

Description of the process

The aqueous plunger lubricant **Enviro 781** is pumped through a fine tube which is inserted inside a machined groove in the plunger rod.



As the plunger slowly begins to retract, the plunger and the shot sleeve are flooded with a small amount of **Enviro 781**. Towards the end of the stroke the tube is air-blasted free. This is important to prevent sustained blocking of the narrow pipe.

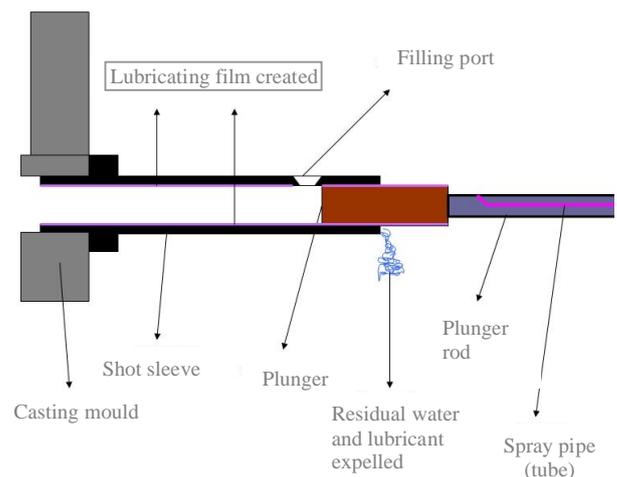


At this point, certainly in the case of large machines, the temperature inside the sleeve is around 300° C. The temperature at the bottom is likely to be higher than at the top, unless the chamber is temperature-equalised by means of a heating system.

As a result of the high temperatures, the water contained in **Enviro 781** evaporates instantly and escapes through the sleeve opening.

During the reverse movement of the plunger the lubricant is evenly distributed inside the sleeve, the plunger is also coated. The heat has the effect of producing a thermally induced lubricating film.

Any residual water or lubricant is expelled at the rear of the sleeve.

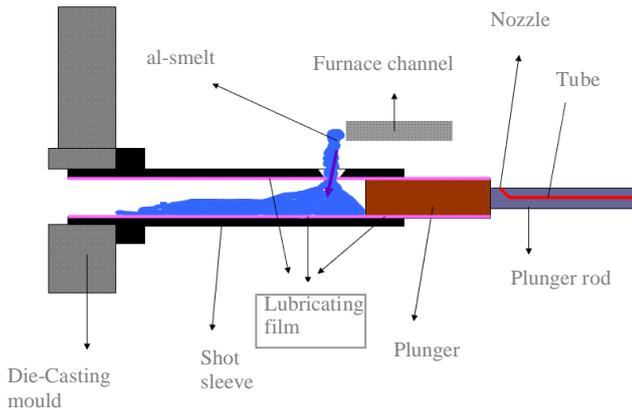


When the smelt is poured in, no residual water, hydrocarbons or vapours thereof are left inside the sleeve. This means that no organic gases can enter the casting. This is an important precondition to manufacturing porous-free castings.

Comparison with performance of dry lubricant (beads) process

Short description of the process

Towards the end of the casting cycle, the plunger is retracted hydraulically until a section protrudes at the rear of the sleeve. Then a precisely dosed quantity of lubricant beads is introduced through the upper opening into the hot sleeve. During the strong evaporation of gases – sometimes ignition takes place - the holding furnace pumps a specific amount of liquid metal into the sleeve through the filling port and immediately thereafter the plunger moves forward and presses the metal into the closed die.



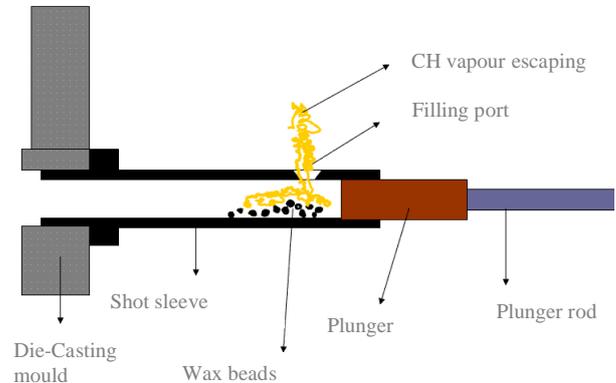
The water in **Enviro 781** is merely a carrier to enabling the lubricant to be applied.

Enviro 781

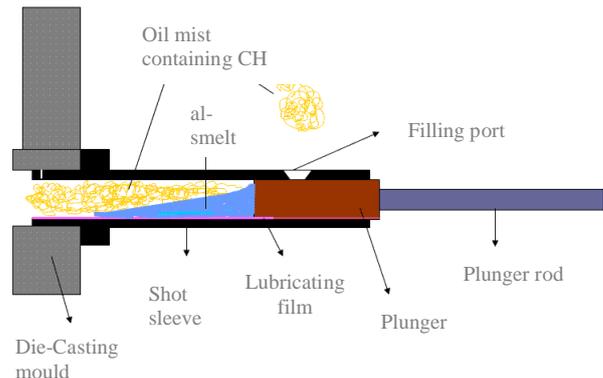
Enviro 781 is a ready-to-use plunger lubricant with a water content of approx. 60 %. This product was developed specifically for use with the ENVIRO process. It functions failure-free and guarantees long life of plunger and sleeve.

Four specific properties of **Enviro 781** should be noted:

- 1) The product contains no waxes or solid lubricants, thereby ensuring that the fine conduits do not become blocked.
- 2) It is based exclusively on modified, regenerative raw materials. Emission values from thermal by-products are therefore extremely low. Marking is not mandatory as the product is environmentally friendly.
- 3) The product contains a high percentage of dissolved inorganic substances resistant to temperatures exceeding 800° C. A thin lubricant film forms inside the sleeve and effectively protects the surface against erosion.
- 4) **Enviro 781** consists of a fine emulsion that can be further diluted in water.



When the lubricating granules are charged (see diagram 3), the temperature inside the sleeve is around 300° C. The wax melts instantly and immediately starts to evaporate, producing large amounts of smoke. If there is a little too much wax, it will ignite. Some of the products of combustion containing hydrocarbons escape through the filling port; others are mixed with the molten metal and the casting becomes contaminated.



1st Disadvantage: Waxes of this type are, as a rule, composed of polyethylene waxes with melting points above 110° C, or Fischer-Tropsch waxes with and without additives and/or solid lubricants. At 300° C and above such raw materials vaporize (combust). In the case of "white granules" a residue of less than 99.6 % of the original quantity of lubricant remains inside the sleeve (measured as Conradson value). With wax granules containing graphites, the amount of residue is higher.

2nd Disadvantage: The organic substances from the waxes and the residue thereof contained in the sleeve combine with the molten metal and enter the casting, where, as small gaseous particles, generate pinholes and porosity.

3rd Disadvantage: Wax granules accumulate on the bottom of the sleeve around the area where same has been dosed. The granules, or what is left after evaporation, are not evenly spread.

4th Disadvantage: Complicated and costly dispensers are required for dosage.