

# Thermal Oil for the Chemical Industry: Advantages and Applications

INNERGY



Since we began manufacturing industrial boilers of thermal oil at INNERGY 50 years ago, this thermal fluid has not stopped evolving and specializing, offering users considerable advantages in its different applications, compared to other heat transfer media. These improvements not only affect the technical and operational part, but also the economic and profitability of the plant.

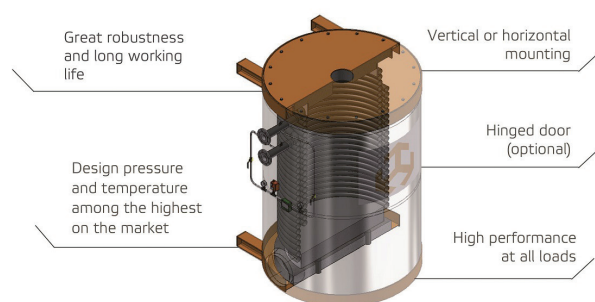
## THE THERMAL OIL PROCESS THROUGHOUT THE HEAT GENERATION SYSTEM

Industrial boilers of thermal oil allow you to take advantage of the heat generated from the use, both of biomass and conventional fuels, and transfer it to thermal oil. The flame that originates in the combustion process, and is housed in the furnace, allows you to heat the thermal oil circulating inside the coils, which not only have to be designed with adequate quality to withstand high temperatures, but also with a dimensioning that allows the optimum speed, which will guarantee a long service life, both for the industrial boiler and for the thermal oil. It is precisely the configuration of water tube coils that is the most recommended for this type of thermal oil heating process, because it is ideal to avoid excessive oil degradation, as it not only speeds up the start and stop processes but also avoids the evaporation process instantaneous, among other problems and deteriorations.

Why use thermal oil in the chemical industry? Technical and operational advantages of choosing thermal oil as thermal fluid in your heat equipment:

### TECHNICAL ADVANTAGES OF THERMAL OIL

- It allows you to work at high temperatures (Up to 400 °C in liquid phase) with minimum atmospheric pressures, which simplifies the design of the installation
  - Absence of corrosion (the fluid lubricates the installation)
  - High thermal inertia (the system retains the heat for longer)
- Long life of the equipment (More than 20 years with standard maintenance and no need for major renovations)
- Non-pressurized system
- Simple plant design
- Mixed temperatures that can be easily reached by different users in a single system.
- Simpler civil works due to low pressure operation



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### ADVANTAGES OF THERMAL OIL OPERATION

- Simple and accurate temperature control (temperature accuracy of  $\pm 1^\circ$ )
- Very low maintenance cost
- Quick start-up and stop
- Very simple operation (Does not require certified operator)
  - Does not require water or chemical treatment, maintenance of steam purges and condensate lines
  - No spillage costs (closed circuit)
  - Safer operation: less security elements required
  - Low freezing point
  - No losses due to purges, no loss of condensate

### TYPES OF THERMAL OIL AVAILABLE IN THE MARKET, GENERAL VARIETIES FOR DIFFERENT APPLICATIONS AND PROCESS CHARACTERISTICS

There is a large number of varieties of thermal oil, each of them recommended for one type of process or several, depending on certain specifications such as working temperature.

The heating system by thermal oil, whether mineral, synthetic or medicinal, allows its use applied to the specific needs of each industry or company. Whether it is the petrochemical, food, automotive, wood or any other type, it is necessary to consult the types of thermal oil to choose the one that contributes to the greater efficiency of the process.

- **Mineral Thermal Oil:** This is a simple, low priced oil, but with limited applications. It is recommended only for plants whose hours of operation year are limited, and not exceeding 250 - 260°C continuously, or 300°C at specific times, taking into account that their work prolongs at this temperature can cause a premature deterioration of the oil, reducing its lifespan.

- **Synthetic Thermal Oil:** In comparison with a mineral thermal oil, a medium type of synthetic thermal oil offers greater durability and ability to work at higher temperatures, in addition to a greater number of hours. It is also notable for the resistance offered to cracking, which translates into a longer life and, therefore, better profitability.

We can distinguish three modalities at a general level within the general typology of synthetic thermal oil:

1. Standard (290-300°C)
2. High Temperature (300-330°C)
3. Special Applications (roasting, thermal-solar...) Within this group we could also include those processes that have an operating temperature of up to 400°C.

- **Food Oil:** This type of thermal fluid operates in secondary circuit and is special for the food industry, therefore it must have the approval of special regulatory bodies (e.g. the FDA). The food oil is heated thanks to an exchanger along with an industrial boiler, either biomass or conventional.

- **Cleaning Oil:** This type of oil is used to clean the circuit oil when it is damaged and requires a change. To clean the oil, either synthetic or mineral, it is necessary to incorporate between 5% and 10% of cleaning oil, after removing the same percentage of degraded oil. The mixture left in the circuit will continue working for a certain period of time, until finally all the oil will be removed for the incorporation of the "new oil". The oil removed should be sent to a waste manager for proper treatment and recycling.

## Thermal Oil presents great versatility, which makes its application possible in different processes/industries

### Applications

• **Reactors:** Typical in the chemical and food industry, where endothermic processes find in the thermal oil an excellent heat transfer medium. Thanks to its ability to work at high temperatures, it is used in subsectors such as basic chemistry, fine chemicals, paints, resins, etc.

• **Distillation Towers:** Habitual in chemical and petrochemical plants for processes such as refining and fractioning petroleum products, oils, fats, biofuels, etc.

• **Presses:** This type of equipment is found in sectors such as wood/board, plastics and rubber, where they need a high temperature material pressing, requiring a fluid capable of working in these conditions.

• **Tank Heating:** Necessary to be able to store and handle products properly, for example bitumen, heavy fuel and waxes within the asphalt, petro-chemical and automobile industry.

As we have seen so far, the thermal oil offers advanced heat control systems, a performance and savings much greater than other heat transfer media, and also the ability to adapt to the requirements and specific needs of each industrial activity.

In order for the procedure to be as safe as possible and effective in each of the applications and industries, the following variables must be evaluated in all cases:



- The integral system of security of the facilities. Today with the integration of SCADA-type industrial software, with warning and alarm system, it is possible to have a security system which is also cost effective, which will also help to control the thermal oil effectively throughout all the processes.

- Verification of security limits during each operation.
- Check that the burner has been properly regulated to program the lowest possible emissions.
- Optimization of the control loop for optimal temperature control
- Assignment of operators and maintenance personnel rigorously trained, taking into account that finding these profiles is simpler and cheaper, because the thermal oil does not require specific training.

## Conclusions: Thermal Oil for Industrial Heat Applications

Throughout this article we have been able to verify the advantages and applications that the thermal oil presents for a great variety of industrial sectors, from the chemical and pharmaceutical industry to the automobile industry, as well as other industries such as asphalt, hotel, food, water treatment, naval, etc.

In closing, it is important to emphasize the importance of choosing the type of oil suitable for the system/application process and without only considering the costs, since in the end, the bad choice of thermal fluid can lead to a premature deterioration, not only of oil, but also of the equipment through which it circulates.

Finally, we recommend carrying out an annual analysis, as a means of guaranteeing the optimum condition of the oil, only in this way is it possible to ensure the quality of the processes and the high performance of the plant. 10