Flow through heaters based on Thick Film Heating Technology

by Mark Wessels, Ferro Techniek B.V.

Introduction Ferro Techniek

Founded in 1932 Ferro Techniek BV has turned from a classic enameling company into a well established partner in business. Nowadays Ferro Techniek employ 130 people; 60 employees work for Ferro Electronics Kft. in Budapest, Hungary and 70 people are staffed at the headquarters in Gaanderen, the Netherlands. Next to this Ferro Techniek has a production department in Poland and a sales office in Wuxi, China.

One of the core competences of Ferro Techniek is the design and manufacturing of Thick Film Heaters. Basically electrical tracks are printed on an enameled substrate and fired subsequently. The technology offers a lot of benefits compared to conventional heating elements:

- Fast heating – low thermal mass and high power
- Full protection against overheating
- Design freedom
- High mechanical strength

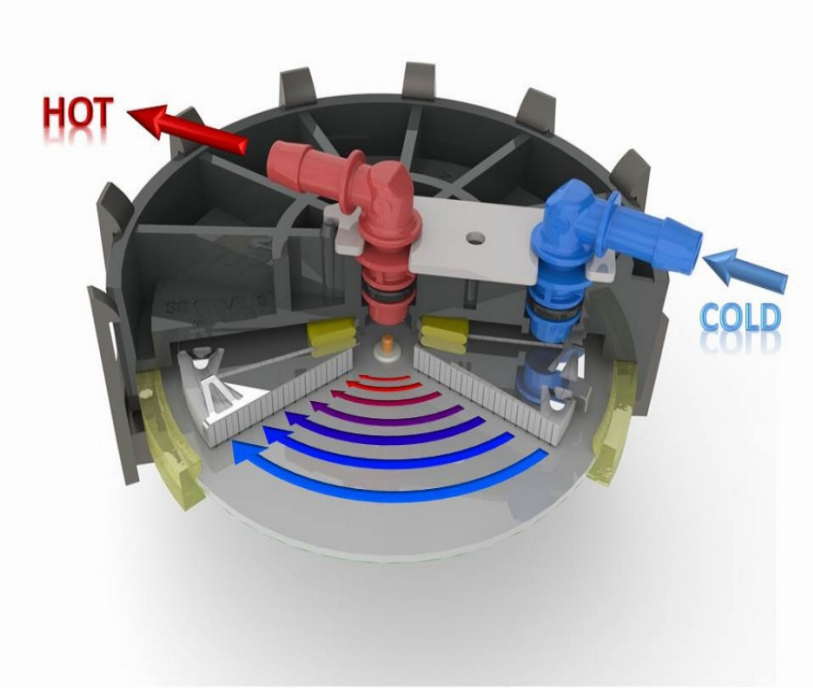
Ferro Techniek has grown to being a world class leader in thick film heating technology over the last years.

Flow Through Heaters

The market situation drives us to creating more added value and rather supply (sub)assemblies instead of simple components. To follow up on these trends R&D of Ferro Techniek have developed so called flow through heaters (FTH) for instant heating of water. FTH are a spin-off of thick film heaters, as “the heart” of the FTH assembly is the thick film heating element. Next to the heating elements the modules consist of sensors, connectors, compression seals and a housing. All components in contact with water are corrosion resistant for a long and durable life. It’s possible to heat up water very quickly by directing the water through a stainless steel spiral along the heating element. The water that is pumped through the spiral is very turbulent because of its high speed (1.5 meters per second!). This high speed enables the water to heat up very quickly up to 95°C without overshoot / boiling / steaming. The construction of our Flow Through Heaters is very compact. The small 80mm diameter thick film heating element transfers a stunning 1800Watt of power into the water.

FTH mk1.5

The first FTH products Ferro Techniek developed is a low pressure flow through heater called FTH mk1.5. This product can handle an operating pressure of max. 2.5 bar.



Benefits for hot beverage preparation:

- Instant hot water
- No standby mode required
- Energy saving
- Settable temperature for each cup
- Always freshly heated water
- Integrated electronic volume measurement
- Compact design
- Aluminum free

Applications:

- Kitchen appliances (hot water, coffee, tea, chocolate)
- Hot drink vending machines
- Hot water dispensers
- Professional applications

FTH mk2

Currently Ferro Techniek are developing a high pressure type of flow through heater. We call the product FTH mk2. The principle is again based on a thick film heating element; Water is running at high speed through a channel that has been brazed onto the thick film heating element . The production technologies required for the FTH mk2 however are quite different compared to the FTH mk1.5. The bottom and the top part of the FTH mk2 are brazed at a temperature of 1100°C. After the brazing the enamel and thick film are applied. The normal operating pressure of the FTH mk2.0 will up to 20 bar, making it very much suitable for use in espresso coffee makers.

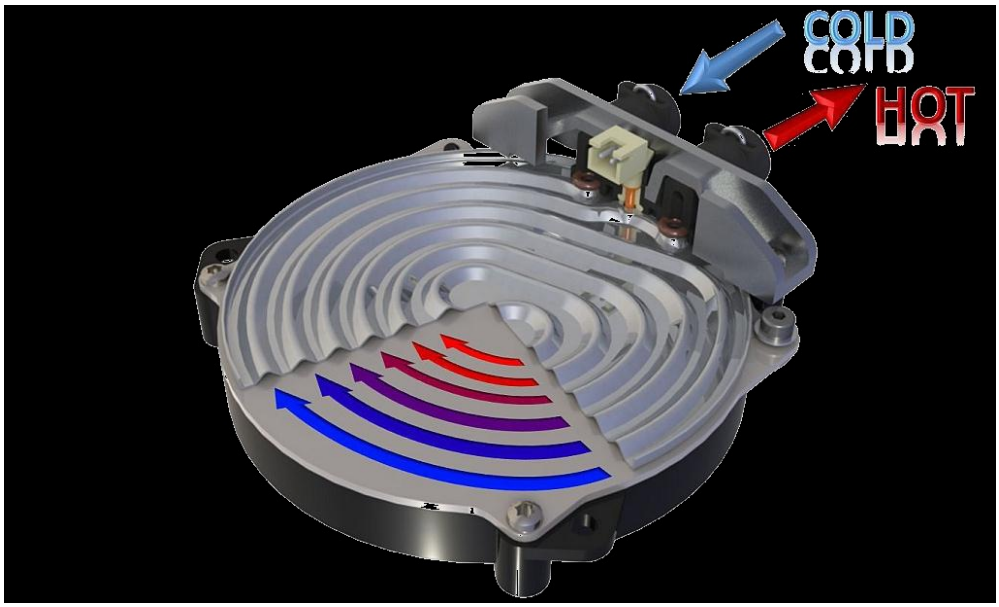
Further benefits:

- Less thermal mass and less water contents than mk1.5 (faster and even more energy efficient)
- High pressure- resistant (20bar), suitable for espresso coffee making
- Built more compact than mk1.5, generating design freedom
- Temperature sensor is faster (accurately adjustable, faster at required temperature)
- Lower cost compared to FTH mk1.5

TNO, a leading Dutch institute for scientific advice and research, has recently performed a Life Cycle Analysis (LCA). FTH mk2 has been tested and compared to a mini boiler and an espresso machine - thermo block. FTH mk2 showed extremely good results as to energy consumption and the environmental impact during production.

Status development mk2.0

Ferro Technieks' R&D department currently is in the process of ordering the various components to enable testing of total FTH mk2 construction. The goal is to finalize the development in Q2 of 2012. Production release will follow immediately afterwards. FTH mk2 market introduction will likely be very fast as two key players in the coffee market are developing their FTH mk2 applications in parallel with our FTH development.



Ferro Techniek are convinced that both the FTH mk1.5 and the FTH mk2 are innovative products creating a sustainable solution for heating water in electrical appliances.