

APPLICATION NOTE

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Title: Temperature monitoring in wastewater purification system

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Summary:

Microwave technology is increasingly used as heating method in different decontamination and remediation processes, like wastewater purification, to improve efficiency. In some applications, temperature monitoring is necessary to control and optimize microwave heating. FISO Technologies fiber optic temperature gages, with their complete immunity to electromagnetic interferences (EMI), resistance to corrosive environments, reliability and high accuracy, are ideal for temperature monitoring in a microwave field.

Text:

Microwave technology is an attractive alternative to conventional heating methods because of its efficiency and energy conservation properties. The process can be faster for drying, curing, concentrating, product heating, and waste management. Wastewater purification is one of the applications that increasingly make use of microwave energy because of its many advantages.

Microwave heating is an in situ process that uses electromagnetic energy to heat water and enhance purification process. The advantage of microwaves over other heating methods is its ability to deliver heat directly to the molecular level of targeted water and contaminants, rather than indirectly through steam or hot air. Therefore, microwave regeneration systems use considerably less energy and take less time than conventional methods. In addition, because the regeneration cycle is much shorter, less adsorbent is required to keep the system operating continuously.

In order to automate the purification process, continuous temperature monitoring is necessary. This allows the optimizing and controlling of the field distribution of the microwaves. Because of their sensitivity to electromagnetic interference (EMI), conventional temperature sensors, such as thermocouples, are not suitable for use close to a microwave field. **The FISO Technologies Inc. fiber optic temperature gages**, entirely made of dielectric materials, are ideal for direct and reliable temperature measurement in an intense microwave environment. While they are immune to EMI, the fiber optic gages are also robust, flexible, and chemically resistant. Therefore, they can be easily installed in a hostile environment.

An American manufacturer of air and water purification systems uses FISO Technologies instruments to monitor temperature in a hydrocarbon remediation application (figure 1) with microwave heating. Wastewater flows into a chamber – a pile of catalyst pellets absorb hydrocarbons mixed in with the waste – the water is pumped away and a partial vacuum (70 kPa) is obtained. The pellets are then heated to 180 °C in a microwave field and the hydrocarbons are fractionally distilled from the vapours pumped out of the system. During this operation, temperature is monitored in 4 points that are 4 to 8 inches into the pile of catalyst pellets. Organic solvents including fluorine may be present.

The temperature monitoring system set up is presented in figure 2. Swage locks with rubber o'rings are used to secure each gage when it is in place. Position of brackets and cable gage lengths are selected in order to allow each gage to reach associated thermowell. If a thermowell is located too far away, then the gage can be pulled out of its actual thermowell, disconnected from the mating and reconnected to another nearby mating bracket. After reconnection, the gage is inserted into the new thermowell, and secured in place. Finally, a cable is reconnected to the other side of the bracket and directed to the control room.

With FISO fiber optic temperature gages, this manufacturer has been able to introduce reliable and accurate temperature monitoring features in its water purification systems.

Graphs:

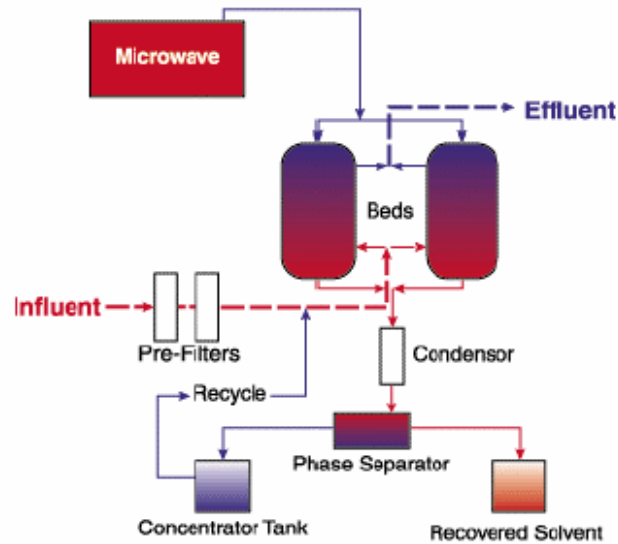


Figure 1: Water purification diagram

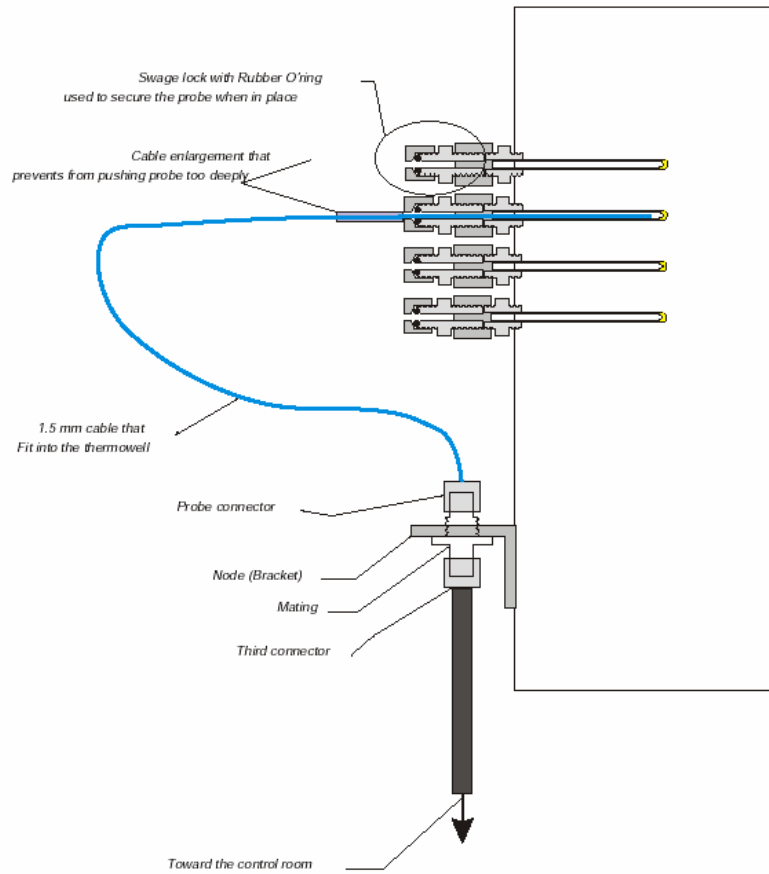


Figure 2: Fiber optic temperature monitoring system

Equipment used:

- 8 FOT-L fiber optic temperature gages
- 8-channels UMI signal conditioner (up to 32 channels available)