

## Filtration in Process Cooling Water

### Introduction

Many industrial processes typically use water to remove heat generated from the process. Common applications that require process cooling water include electronics manufacturing, power plant condensate systems, and thin film manufacturing; however, virtually every manufacturing plant employs a cooling water system. The cooling water must be filtered to protect downstream process equipment from various sources of contamination. This Application Brief discusses the use of filtration systems in process cooling water systems.

### The Process

In a typical cooling water application, two process loops are used – a process water loop and a cooling water loop.

On the process water side, water is pumped to the equipment being cooled. This equipment may be a compressor, a sputtering cathode, a steam loop, etc. The process water carries away generated heat from the equipment, allowing the equipment to maintain its efficiency and operation at controlled temperatures. The hot process water is pumped to a heat exchanger, where it transfers the absorbed heat to the cooling water side. The cool process water is then pumped back to the process equipment to absorb more heat.

On the cooling water side, water is pumped from the cooling tower to the heat exchanger, where it absorbs heat from the hot process water. The hot cooling water then returns to the cooling tower, where its absorbed heat is either released through evaporation or convective heat transfer to the atmosphere. The cooling water then returns to the heat exchanger to absorb more heat from the process side.

### The Problem

There are numerous ingress points for unwanted contaminants to enter the system. External sources of contamination include make-up water added in the cooling tower section, degradation of the equipment seals, gasket materials, and improper maintenance procedures. Contamination may also be internally generated, usually from rust or scale sloughing off of piping and vessels.

Whether externally or internally generated, contamination can cause the following problems:

**Heat Exchanger Fouling** – Solids deposited on the heat exchanger surfaces can cause “hot spots” to form. These hot spots, or points where high temperatures exist, are sites where accelerated corrosion can occur. Unchecked corrosion rates can lead to early heat exchanger failure and costly repairs or replacement.

**Equipment Damage** – Poor heat transfer in the heat exchanger can lead to reduced ability of the process water to absorb heat from the process equipment. This can result in damage to, and subsequent replacement of, sensitive equipment on the process side. Contaminants can also clog piping, valves, and pumps, resulting in high equipment maintenance or replacement costs.

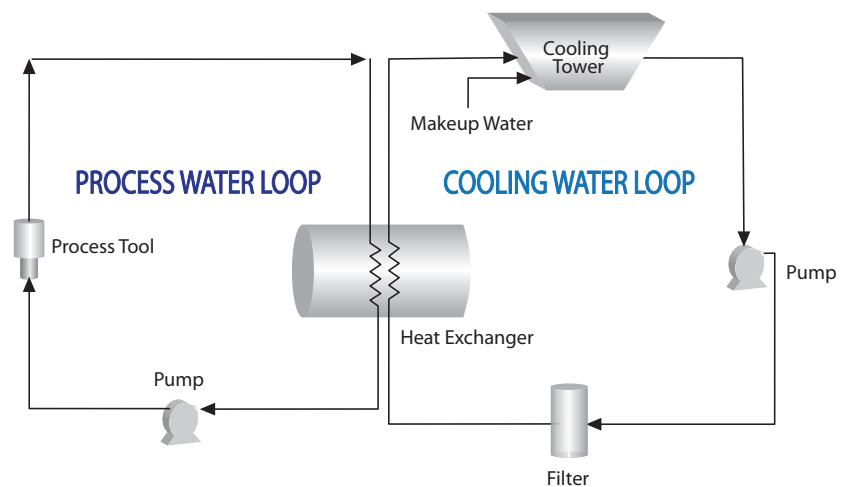


Figure 1— Typical Process Cooling Water Diagram

## The Solution

To reduce contamination problems, 3M Purification Inc. recommends the use of cartridge filtration in the cooling water loop in the 15  $\mu\text{m}$  - 25  $\mu\text{m}$  range to reduce contamination problems and equipment fouling or damage.

The 3M™ High Flow Series filter system is ideally suited to provide effective filtration at the high flow rates typical in cooling water systems. The 3M High Flow Series filter system utilizes large diameter (7") compound radial pleated cartridges in a compact housing design. High efficiency polypropylene microfiber media is used in the 3M High Flow series filter cartridges, resulting in consistent, predictable particle reduction efficiencies.

Compared to conventional 2 1/2" filter cartridges, the 3M™ High Flow Series filter system offers the following advantages:

**Higher Particle Removal Efficiencies (99.9%)** – providing for optimum protection of downstream equipment.

**High Flow Capability** – the unique construction of the 3M High Flow Series filters filter single cartridge.

**Compact Housing Design** – the high flow capability results in a smaller housing required for a given flow rate translating into reduced up-front capital expenditure requirements and footprint.

**Ease of Use** – with fewer required cartridges, filter change-outs are much easier. In addition, the 3M™ High Flow series filter system system incorporates a "twist-to-lock" cartridge seating mechanism, providing for a positive indication of proper sealing and reducing the possibility of bypass.

Figure 2 shows the benefits of the 3M High Flow series filter system vs. a conventional 2 1/2" cartridge system for a 2000 gpm flow requirement. For more information on the 3M High Flow series filter system, please request 3M Purification literature 70-0201-8710-3.

## Conclusion

Effective filtration is important to proper operation of a cooling water system. Failure to reduce suspended solid contaminants can lead to reduced plant output, equipment damage, and increased levels of equipment corrosion. Use of the 3M High Flow Series filter system is recommended to reduce these problems. The high efficiency media incorporated into the 3M High Flow series filter cartridges results in optimum protection of downstream equipment. The high flow capability, up to 500 gpm per cartridge, translates into smaller filter housings, lower capital expenditures, and reduced time and labor costs for filter change-outs.



2000 GPM System (7571 LPM)

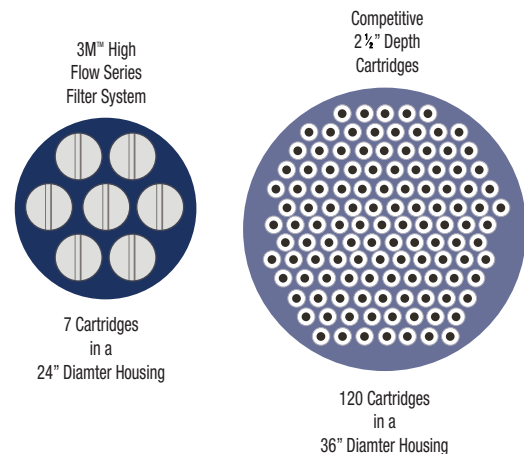


Figure 2— 3M™ High Flow Series Filter System vs. Conventional 2 1/2" Cartridge System



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