Why should I choose Asahi?
When comparing competitive systems it is important to recognize the higher quality of Asahi/America’s piping systems. Many competitors do not utilize high purity raw materials or follow stringent high purity manufacturing practices to the same level as Asahi/America. In addition, inferior fusion and joining methods are used which may jeopardize system purity and integrity.

Material and Piping System Selection
There are several factors to consider when choosing the best material and piping product. The first step is to define your system and the water quality.

What are the water quality specifications?
Stringent water quality specifications would indicate a need to choose Purad™ UHP PVDF piping system as this will provide the lowest level of leachouts. Less stringent requirements allow consideration to utilize the cost savings offered by PolyPure™ or PP-Pure™.

What are the end products and how will water quality impact them?
Will this water system be utilized in the manufacturing of high value products such as micro-electronics or pharmaceuticals? If manufacturing down time and product yield are critical and costly, then Purad™ UHP PVDF is the best choice.

What is the system’s capital budget?
PVDF piping systems are 5-10 times the cost of a comparative PP system. While PVDF offers unparalleled purity, when budget concerns are the primary consideration, PolyPure™ and PP-Pure™ offer less stringent purity performance at reduced prices.

What is the system size range?
PolyPure™ natural PP is only commercially offered up to 110mm (4”). For customers who are interested in the cost savings of PP but have large diameter line sizes, PP-Pure™ is an excellent choice.

Overview
The following information is intended to provide an overview for designing a high purity piping system. Please consult our Engineering Design Guide for complete technical information.

High Purity Design and Installation

Design Considerations
Proper system design is critical for well functioning high purity piping systems. The system layout, material selection and component specifications can have significant impacts on initial cost of ownership, system startup time, system operation, water quality and operating costs.

Diaphragm Valves
T-342 Diaphragm valves are the ideal choice for valves in a high purity water system as the valve design eliminates entrapment areas for bacteria to grow.

For branches and laterals, our T-343 Zero Dead Leg diaphragm valves (ZDL’s) eliminate dead space where bacteria can grow.

Sampling Valves
Asahi offers three types of sampling valves. Our Dymatrix NVM features an integrated diaphragm around the needle for the highest level of purity. Our EM-Technik needle valve is a popular and cost effective choice. Additional details can be found on page 8.

Instrument Fittings
Instrument fittings also reduce dead space and are the best way to attach gauges, sampling valves and instruments to the system. The large center shoulder provides an area to place a threaded tap or welded connection.
Asahi can custom make instrument fittings to any specification. Our exclusive IR Lateral Fusion process allows us to weld to the branch of the instrument fittings with a clean and reliable IR weld.

**UV Lights**
UV lights are commonly used to kill bacteria in high purity water systems. Light Traps are a fitting assembly with two elbows in an “S” shape, which blocks the UV light from travelling into the system. Light Traps should be used to prevent damage to plastic piping components, as not all plastics are resistant to UV. PVDF is resistant to wavelengths above 250 nm, but high energy 185 nm will attack PVDF. Polypropylene (PP) is not resistant to UV light at all. Light Traps constructed of PVDF (for wavelengths above 250 nm only) or stainless steel should always be used.

**Pressure and Flow Regulation**
Proper system pressure regulation and flow rate is required to make sure all points of use receive adequate flow supply. In addition, flow rate is important to high purity water systems as it can effect the growth and spread of bacteria in a system. Additional information can be found on page 9.

**Hot Systems and Thermal Expansion**
Some high purity water systems are designed to be run at high temperatures (60 - 80°C) in order to control bacteria growth. PVDF is suitable for these elevated temperatures and our Purad™ UHP Piping system is an excellent choice for your Hot UPW system. Proper design of thermal expansion loops with restraint fittings should be implemented. Technical details can be found in our Engineering Design Guide and we offer an Excel based calculator.

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**Welding Methods**

There are a wide variety of welding methods available for high purity plastic piping systems. Choosing the right welding method can have a significant impact on your water quality and piping installation. Asahi/America offers the latest technology of welding equipment in all these methods and supports them with operator training, field service and factory service.

**IR Fusion**
Asahi/America strongly recommends the use of IR fusion for all high purity water systems whenever possible due to its cleanliness and reliability.

IR fusion is a form of butt fusion where the piping components do not contact the heating plate. This eliminates contamination from the heating element into the weld zone, which occurs in contact butt and socket fusion. The interior welds on IR fusion are significantly smaller than contact butt and socket fusion, which reduces the chances for bacteria growth.

Asahi/America’s cutting edge SP series of IR fusion equipment is fully automated and provides Force Control welding technology. When utilizing IR fusion with our equipment, you receive unmatched reliability and repeatability of the weld process. This reduces operator error, prevents cold welds and makes QC/QA inspection easier. Additional information can be found on pages 6 & 7.
High Purity Design and Installation

Beadless Fusion
Beadless fusion utilizes a clamp over heating element on the exterior of the pipe and a balloon on the interior to eliminate the interior weld bead. Beadless fusion is utilized for critical high purity water systems where interior weld beads are avoided for stringent bacteria concerns. Common applications include high end pharmaceutical water systems.

HPF Electrofusion
HPF Electrofusion utilizes an electrofusion coupling over the piping components to weld the material. The coupling is connected by electrical cables to the welding machine. Copper coils are molded into the middle of the fitting and as electrical current flows through them, the material is heated and fused. An optional balloon may be inserted to reduce the weld bead and crevices. This is a unique system offered by Asahi/America for PVDF only.

Beadless Fusion should only be selected when necessary for the water system, as it will significantly impact installation and fabrication costs. Beadless fusion has much longer weld times than IR fusion. The special weld heads on Beadless fusion prevent tight weld dimensions of fittings during fabrication.

Butt Fusion & Socket Fusion
In traditional (contact) butt fusion the material is in contact with the heating plate. The weld bead in butt fusion is larger than that of IR fusion. The weld bead in socket fusion is the largest of any of these methods, and the heater socket bushings contact the most surface area.

Asahi/America strongly recommends the use of IR fusion for all high purity water systems whenever possible due to its cleanliness and reliability. In some cases it may be advantageous to allow the use of contact butt or socket fusion.

Small Polypropylene piping systems can be very cost effective. The higher cost of IR fusion equipment can sometimes outweigh the cost of the piping material. Many mechanical contractors already own contact butt fusion or socket fusion equipment. In addition, socket fusion welds can be fabricated more quickly than IR or butt fusion which may save on installation costs.

IR fusion equipment is most easily done on a bench top. If the system installation requires numerous field tie ins or plenum welds, butt and socket fusion may be advantageous.

Socket Weld

Butt Weld

IR Weld

Beadless Weld

HPF Weld

HPF is an excellent means of tying in, repairing or working in tight quarters of your PVDF system. The connection cables are 16 ft. long and allow for easy access to plenum space. Asahi/America and others do offer field repair models of IR tool models and remote weld heads. However, these are not as easy to use as they may seem or be advertised. Many satisfied customers utilize HPF fusion for their intricate welding needs.