

**Problem:** The loss of power or efficiency as the result of a failed turbine crossover expansion joint is a serious problem for any power generating station. The failure of a crossover assembly generally occurs as a result of a crack in the bellows and is seen as escaping steam or moisture on the outside of the crossover piping. In many cases, the bellows is not accessible without disassembly of the crossover and weld repairs to bellows are rarely successful.

**Solution:** Refurbishment of a crossover expansion joint can put it back in service for many more years. **Senior Flexonics Pathway is the recognized industry leader in the refurbishment of turbine crossover expansion joints.**



*Wrapper Style Crossover Expansion Joint*

Turbine crossover expansion joints are generally pressure balance type expansion joints where the pressure thrust of the flow bellows is balanced by the pressure thrust of the balance bellows. By eliminating the pressure thrust loads on the turbine nozzle, only the relatively small spring forces are seen by the turbine. There are generally two main styles of crossover expansion joint construction: Wrapper Style and Open Style. The wrapper style (pictured above) utilizes a heavy cover over the bellows which also acts as the pressure restraint hardware. The cover is bolted to rings on each side of the expansion joint.



*Open Style Crossover*

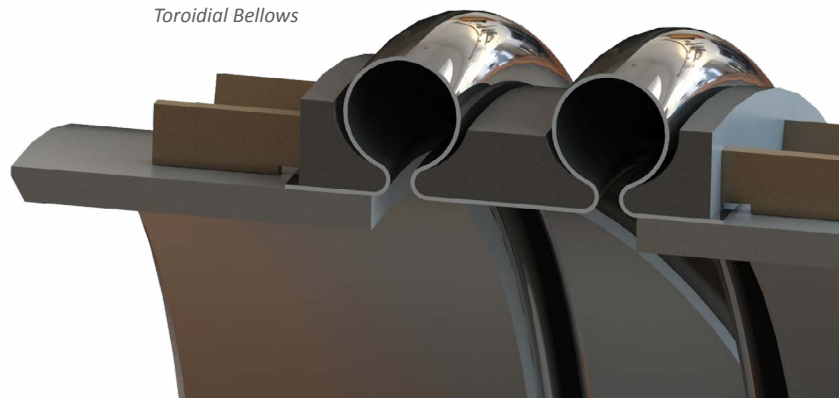
The open style crossover (pictured above) utilizes tie-rods that run the full length of the expansion joint and act as the pressure restraint hardware. Often there is a thin sheet metal cover over these bellows.



*Cross Section of a U-Shape Bellows*

There are generally two shapes of bellows used on crossover expansion joints: Toroidal and U-Shape. The toroidal bellows (pictured below) are usually found on wrapper style crossovers and are manufactured by hydroforming. The U-shape bellows (pictured left) are typically found on open style crossovers and are manufactured by mechanical forming using an expanding mandrel or other methods.

*Cross Section of a Toroidal Bellows*



The lead time for crossover refurbishments can be as little as 2-3 weeks depending on the availability of the bellows cartridges. Toroidal bellows cartridges have a typical lead time of 12-16 weeks and are ordered well in advance of the crossover being delivered to our manufacturing facility. The U-shape bellows cartridge can be done in a matter of days upon taking measurements of the actual pipe diameter.



Toroidal Bellows Cartridge

During refurbishment of the wrapper style crossover, the cover is removed by unbolting it from the rings, the existing toroidal bellows are removed and the new toroidal cartridges are installed. After installation of the toroidal cartridges, the cover is re-installed and the completed unit is hydrotested.



Disassembly of a Wrapper Crossover

During refurbishment of the open-style crossover, the bellows are removed and measurements are taken of the piping. New bellows are then manufactured and then the crossover is re-assembled and hydrotested.

Once the refurbishment of the crossover expansion joint is complete, it is shipped back to the power generating station with the full expectation of many more years of service.



New SF Pathway Crossover

Senior Flexonics Pathway is also a recognized leader in the design and manufacture of new Crossover assemblies. No matter what your Crossover needs are, our expert staff can help.

### SPACE & CAPACITY

 <p><b>BUILDING SPACE</b></p>		 <p><b>EMPLOYEES</b></p>	
 <p>120,000 FT<sup>2</sup></p>	 <p>80,000 FT<sup>2</sup></p>	 <p>140</p>	 <p>80</p>
 <p>2 SHIFTS</p>	 <p>6 DAYS/WK</p>	 <p>132,000 HRS 48,000 HRS ANNUALLY</p>	
<h3 style="text-align: center;">SHOP EQUIPMENT</h3>			
 PIPE EXPANDER	 PLATE ROLL	 PRESS BRAKE	 PLATE SHEAR
 BELLOWS FORMING	 HYDRO FORMING	 HEAT TREAT	 BLASTING



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