platts
The McGraw-Hill Companies
POWER
BUSINESS AND TECHNOLOGY FOR THE GLOBAL GENERATION INDUSTRY

FOCUS ON O&M

MECHANICAL

S-Flex buries the (dog) bone

It's the age-old scenario—a nagging problem no one has been able to solve for years. Such is the case for the dogbone belt used at the turbine-to-condenser expansion joint in power plants all over the world. The belt consists of a flat piece of rubber and fabric with a knob at each end, giving it the look of a dog's bone.

"They just never fit right," says Bob Hahn, senior VP and GM of condenser services for The Atlantic Group, Norfolk, Va. As a field service engineer for Ingersoll-Rand and Ecolaire Condenser, Hahn spent years designing condensers and repairing and replacing their dogbone expansion joints. Almost without exception, he found that the clamping bars holding dogbone expansion belts in place were misaligned. Solving this problem became Hahn's mission.

The result of Hahn's years of effort is the S-Flex II (Figure 3). His patented design is such an effective solution that most major condenser manufacturers now include the device with the hardware and tools they sell for installing or replacing rubber "U" and stainless steel bellows expansion joints.

Two features of the S-Flex II make it useful: its shape and its flexibility. When attached to a clamping bar by a belt, the device can be compressed or expanded to compensate for a misalignment of as much as 1.25 in. Over the course of developing the S-Flex II, Hahn made another improvement. Data from accelerated life testing indicated that most failures of traditional dogbones were the result of their rubber separating from their fabric. So Hahn eschewed dogbones' traditional six-ply fabric and rope configuration in favor of a three-ply fabric, but he skim-coated each ply with neoprene. This change improved both the strength of the fabric plies and their adhesion to rubber.

It soon became clear that traditional dogbones' lack of flexibility was the main reason they never seemed to fit right. Their rigidity transferred a tremendous amount of pressure to the clamping bars during operation as the condenser and turbine moved. The S-Flex II's flexibility also allows the belt to "squirm." This reduces the load on the turbine and clamping bars by as much as 85% and eliminates air in-leakage if the device is installed properly. What's more, the shape of the S-Flex II serves to extend expansion joint life by allowing movement in two directions during the contractions and expansions of normal plant cycling. Together, the S-Flex II's flexibility and shape extend its life as well. During testing, engineers determined that the longevity of an S-Flex II is twice that of a traditional, flat-belt expansion joint system.

The typical lifespan of expansion joints is 8 to 12 years. Hahn explains that an installation will take three to six days per belt and that the average length of the S-Flex II is about 90 ft. "If you're not scheduling regular replacement of your rubber expansion joints, you should inspect them routinely during scheduled outages," he advises. "There are ways to check whether your expansion joint is degrading. A simple and quick one is to use a durometer to test the joint's rubber; as rubber ages, it becomes hard and brittle." Another, more obvious way is to look for signs of cracking. Like weather cracks on a car tire, cracks in an expansion joint indicate a potential problem—especially if the joint seal is compromised.

3. S-Flex II

S-Flex II clamping bars being installed (left) during replacement of a stainless steel bellows expansion joint. Spacer bars ensure proper distance between bars during welding and are removed once welding is complete. S-Flex expansion joint installation (middle), showing steam shields for directing steam away from the belt being installed. An S-Flex II belt being prepared for vulcanization (right) by technician Craig Northcraft, to join its ends into a loop. Courtesy: The Atlantic Group