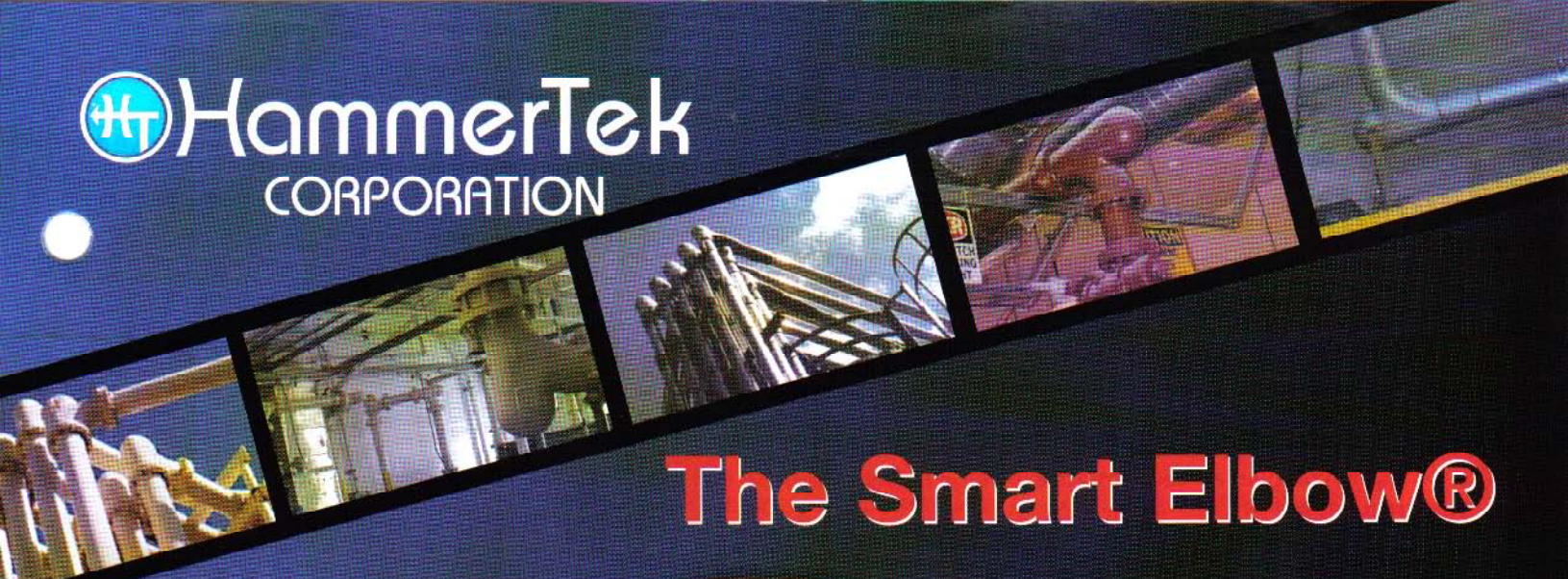
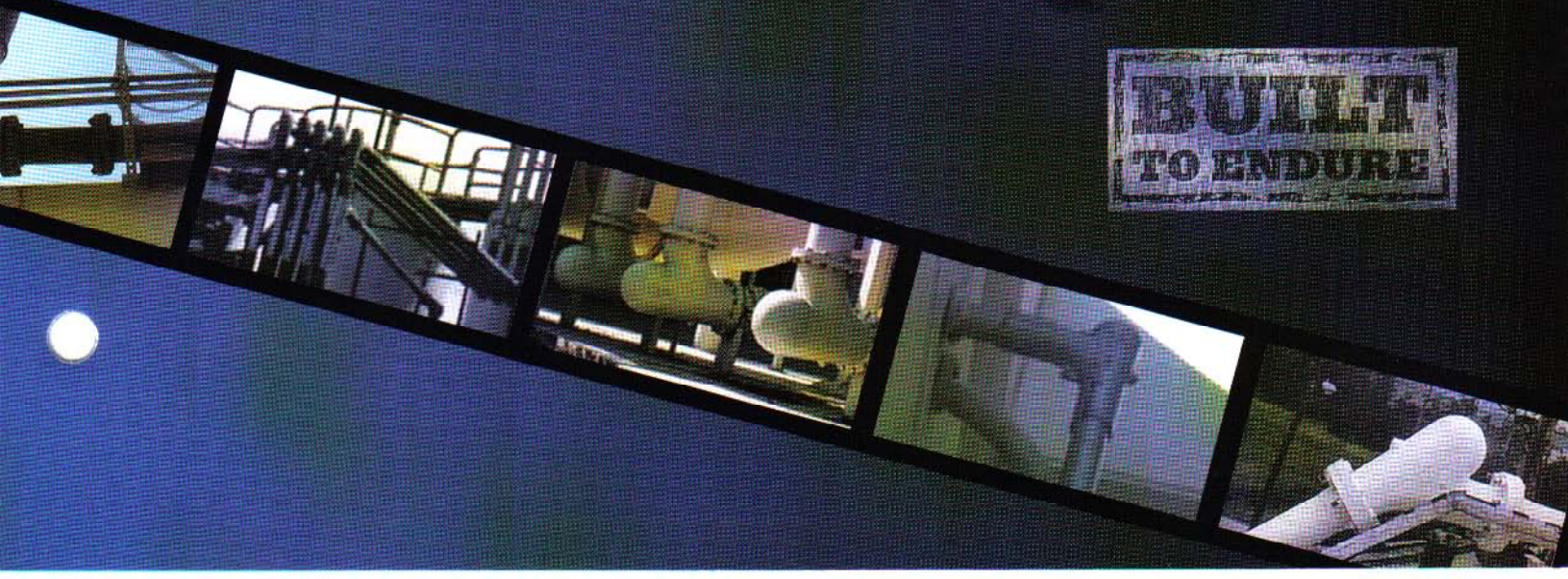
HammerTek
CORPORATION

The Smart Elbow®





The Smart Elbow® from HammerTek Corporation provides long-wearing protection from elbow failure in pneumatic and hydraulic conveying systems.

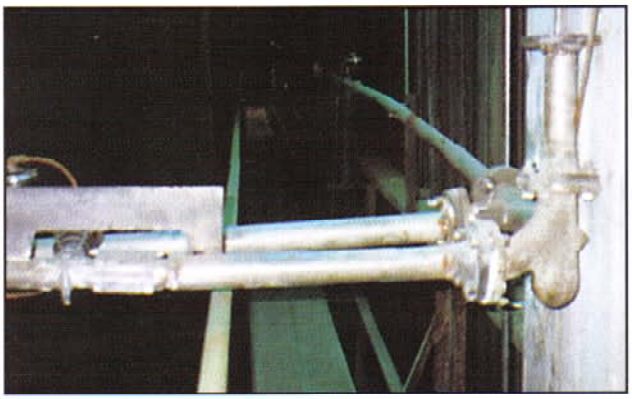
Power generation

The Smart Elbow® protects against wear and leakage in pneumatic applications better than any other elbow type. Its tremendous long-wearing properties eliminate repair costs in terms of materials and labor, as well as costs relating to compliance with any EPA cleanup/material disposal regulations.

The Smart Elbow® can also prevent excessive emissions penalties at combustion-based power generation plants. It safeguards emissions control systems which contain pneumatic conveying components because it removes the threat of elbow wear and subsequent system failure.

CASE PROBLEM: The sulfur emissions reduction system at a large east coast coal-fired powerplant was experiencing frequent shut-downs due to leaks in stainless steel standard elbows. Elbows were wearing out approximately every four months in the pressure relief/vent lines of the MgO transfer system. When leaks occurred, the system was shut down for repair, jeopardizing the scrubbing system's ability to maintain sulfur dioxide emissions below mandated levels. In addition to downtime, maintenance hours and repair materials, paper work also had to be filed and cleanup handled in accordance with EPA regulations.
SMART SOLUTION: Six 3-inch carbon steel HammerTek Smart Elbows® were installed in the MgO vent/return line, and have operated without a single problem for over a year and a half.

Environmental



The Smart Elbow® protects both the workplace and the environment in several ways. First, it protects against leaks by virtue of its unique wear-resistant design. Second, it reduces conveying system noise.

TEST RESULTS: In a study conducted by a major plastics manufacturer, polypropylene pellets were conveyed in a test pneumatic conveying system using a 2-inch line. The Smart Elbow® was substantially quieter than a comparable long radius sweep elbow at the same velocity, loading and conveying rate. The significant decibel reduction was attributed to the Smart Elbow® design, which effects the change in material flow direction by deflection of particles through the elbow, not by impact with the elbow walls.

CASE PROBLEM: At a fructose manufacturing plant, a purifying carbon slurry was wearing through long radius sweep elbows every one to three months. Elbow patching and replacement, added to production downtime, material loss, and cleanup made the wear problem very expensive. When leaks occurred, product was lost, spilled carbon granules and damaged filter tank insulation had to be disposed of in an environmentally acceptable fashion and then replaced with new materials.
SMART SOLUTION: The sweeps were replaced with Smart Elbows® in 1982. Not one has required replacement since their installation.

CASE PROBLEM: At a trash-to-energy facility with three incinerator units, stainless steel sweeps were wearing out every three months in a dense phase pneumatic conveying line, a component in the lime-injection system which reduces sulfur emissions. If the failure lasted more than a few hours, the EPA mandated total incinerator unit shutdown, resulting in downtime expenses of $40,000 per day.
SMART SOLUTION: The Smart Elbow® installed in 1992 are still in operation, and more are being installed in a new higher capacity lime-injection system.

Water/Wastewater Treatment

The Smart Elbow® is the world's only patented flow controlled elbow. Its unique de-sign reduces water hammer and provides smoother, surge-free flow in hydraulic lines. Due to the improved flow characteristics of the Smart Elbow®, abrasive slurries can be conveyed without elbow wear-through and leakage.

CASE PROBLEM: A Mideastern U.S. wastewater treatment facility was having problems with the system conveying fly ash slurry to the settling pond. Fly ash is the remaining dust and fines from the furnace after the fuel has been burned. The fly ash is mixed with water and conveyed (approximately 15% solids) to the settling pond where it is then gathered in a more solid state for removal. The conveying system was using long radius elbows which, dependent upon the production, were subject to erosion from the fly ash and the velocity of the slurry. Monetarily and environmentally, the sewage treatment plant could not afford unscheduled shutdowns for repair/replacement.
SMART SOLUTION: The Smart Elbow® was the choice to replace two long radius elbows. They were so satisfied with the results that an additional two elbows were replaced with Smart Elbows® and they are now considering replacing most of the system elbows at their next scheduled maintenance shutdown. Also, they have passed the information of their experience with Smart Elbows® onto their engineering group to solve similar problems at other plants.

Processing Industries

The Smart Elbow® offers an intelligent solution to a wide range of common conveying problems. Processing industries report it saves space, reduces cost and eliminates time-consuming repairs.

GRAIN / BREWING: A Southwestern U.S. brewery needed to upgrade a pneumatic grain conveying system linking rail car delivery and 95' high storage silos. A faulty diverter house at the top of the silos was being replaced by twelve 6-inch lines, with elbows at top and bottom. Based on calculations designed to achieve both minimal grain hull damage and system pressure drop, specifications called for 4' radius sweep elbows, which would never fit the severely limited space.
SMART SOLUTION: Twenty-four Smart Elbows® were installed. They fit the desk-sized area and also protected the grain hulls from impact damage. The project came in $30,000 under budget.

PLASTICS: Friction due to contact with elbow walls created heat which would then melt and smear the polypropylene pellets being conveyed by a plastic manufacturer in the southern U.S., creating streamers, and eventually wearing through the elbow walls.
SMART SOLUTION: When the sweep elbows were replaced with 10-inch aluminum Smart Elbows®, streamer formation and wear-through were eliminated.

PHARMACEUTICALS: A major Northeastern pharmaceutical manufacturer experienced repeated plugging and nonstop product degradation in lines used to convey granulated magnesium hydroxide. Investigation revealed the long radius sweep elbows produced an uneven flow which caused the plugging and impact with the elbow walls caused the product degradation.
SMART SOLUTION: Installing Smart Elbows® provided the laminar, smoother flow desired and actually improved product integrity. The company estimated $50,000 savings in product loss alone.

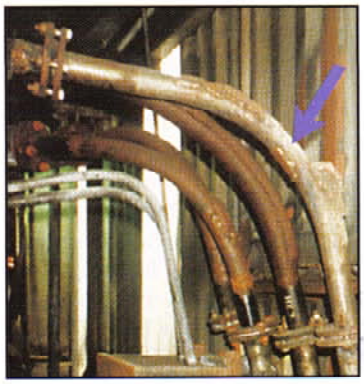
PULP & PAPER: The Canadian pulp and paper industry encountered problems when hog fuel (a by-product composed of bark and sawdust) is pneumatically conveyed. Its abrasive nature wore through one particular 12-inch wear-back sweep elbow every three months.
SMART SOLUTION: A 12-inch Smart Elbow® was installed in 1990 and continues to perform well. Since then, all the system elbows were replaced with HammerTek elbows.

Super Heavy Duty

Combining superior design with a selection of alloys, the Smart Elbow® can withstand virtually any conveying situation, especially when high technology coatings are used. Corrosives and abrasives can be conveyed safely, and will no longer cause leaks, costly downtime or the disposal problems which worn elbows inevitably create.

Smart Elbow® interiors may be coated with several materials, including carbide-type coatings on elbows of 4" and larger internal diameters, and porcelain coatings on elbows of 1 1/2" to 16" internal diameters.

CASE PROBLEM: At one facility of a major U.S. manufacturer of steel pipe, a 4-inch pneumatic system conveying weld slag from automatic welding machines was equipped with long radius sweep elbows. They wore through every four weeks.
SMART SOLUTION: HammerLast™ Series 300 Smart Elbows® internally coated with tungsten/cobalt carbide replaced the problem sweeps—and have been in operation since 1992 without a problem.



Long radius sweep elbows with patches due to wear.

Cost Analysis

The following is based on a recent Smart Elbow® installation:

WHERE IS YOUR COMPANY...**BLACK** or **RED**?

4" Pipe Size Schedule 40

	Smart Elbow® (HammerLast™ Series 300)	Long Radius Sweep (ceramic lined)
Elbow lifespan:	36 months minimum	6 months
Cost per elbow:	$ 749	$ 286
Initial cost for six elbows:	$ 4,494	$ 1,716
Elbow replacement costs for 36 months:	+ $ 0	+ $ 8,580 + Labor (5 replacements) + Lost product + Downtime/Cleanup + EPA compliance, etc.
Total elbow related costs:	$ 4,494	$10,296 and up!
HammerTek Smart Elbow® savings	$ 5,802*	

*It should be noted that maintenance labor, production downtime and cleanup expenses related to sweep elbow failures are also eliminated by use of the HammerTek Smart Elbow®. Taken in total, these costs routinely exceed the initial price.

Prices current at the time of printing.

HammerTek Corporation offers the Smart Elbow® in aluminum, cast iron, ductile, carbon steel, stainless steel 304 and 316, HammerLast™ Series 300 and 400 and HammerLoy™. These standard metallic compositions include a hardness range of 90 to 550 BHN. Special coatings that will withstand temperatures in the range of 1500° F are also available.

HammerTek CORPORATION

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The Smart Elbow® is manufactured in the U.S.A. and distributed through a worldwide network of representatives, distributors, and licensees.