North American Oil & Gas PIPELINES

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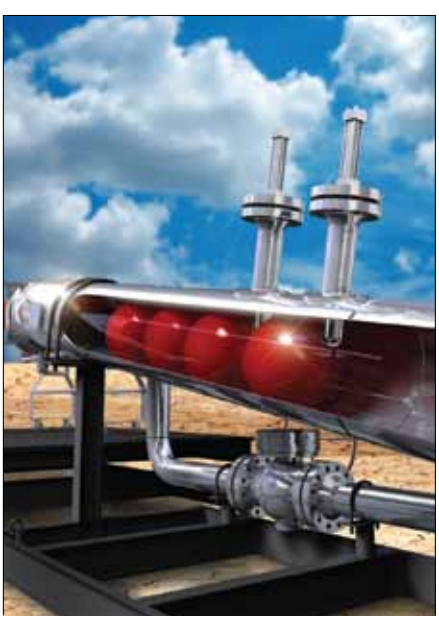
Generation to Generation

Gabe's CONSTRUCTION

GABE'S CONSTRUCTION CELEBRATES 70 YEARS IN BUSINESS



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ON THE COVER: Since its founding in 1942 by Jacob Gabrielse, Gabe's Construction has flourished as a prime contractor for pipeline installation and other utility related projects.

Fused Armor is introducing a new technology that could prevent pipeline ruptures, such as the one shown here.

Adding Some Armor

Could a New Technology Stop Pipeline Spills?

By Gary Wilson and Robert Hansen

How is it possible to stop pipeline spills? A company in the state of Washington may have an answer in the form of a new pipeline protection material that provides a longer life-cycle than traditional methods.

Fused Armor Inc. has developed a breakthrough that could change the way that companies deal with traditional corrosion and erosion problems. The new approach involves cladding the external and internal walls of the pipelines with a patented water-based silicon protective process. This will permanently seal the metal substrate from corrosion and will prevent erosion from damaging the inner wall of the pipeline.

The inventor of the Fused Armor fusion process spent two years as a distributor for a national industrial coatings manufacturer. The limitation of using epoxy and urethane coatings to protect metal for a long-term basis was not possible. The seed was planted to provide a new long-term protection system for metal substrates.

The development of Fused Armor involved a substantial collaborative effort and numerous improvements bringing forth its current formulas designed for the caustic and corrosive environmental conditions of the petroleum industry. In meeting this protection, Fused Armor also offers a high degree of lubricity to allow crude oil and natural gas to flow through a pipeline freely by greatly reducing static tension of liquids and gases flowing through the pipe.

Flow of crude oil and natural gas on the inner wall of pipeline on the bare metal creates static tension, which creates friction allowing for buildup of crude oil waxes that reduce or block the flow of crude oil. Crystalline webs called calthrate (buildup of methane hydrate webs) reduces or stops the flow of natural gas through a pipeline. This may cause undue pressure on the pipe causing it to weaken and break. The interior wall of the pipe is further protected from erosion by sand and other abrasive objects contained in crude oil. Protection of both inner and outer walls of pipelines is of primary importance to pipeline operators.

When buried, the outer wall of a Fused Armor-cladded pipeline is protected from attack by natural alkaline and acids of the soil. Further, the operational effectiveness of the metal substrate can be extended indefinitely without corrosion affecting

the outer wall. This inorganic formula is not affected by the moisture or any caustic or corrosive effects contained in the soil. Above ground the Fused armor protection system is unaffected by ultraviolet rays. It will not break down due to ultraviolet ray exposure as do many industrial coatings. Atmospheric weather conditions will not reach the metal due to the impervious shield of Fused Armor.

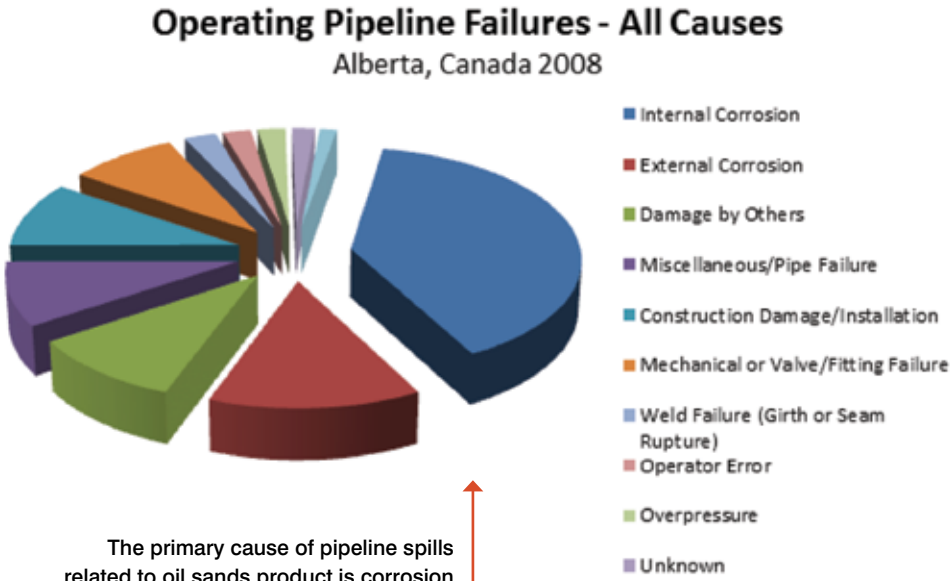
The cladding actually changes the properties of carbon steel creating new "Super-Steel." A Super-Steel shield is created when Fused Armor claddings are applied to a carbon steel substrate changing most, if not all, of the properties of the regular steel into Super-Steel by making it harder and stronger than chemical resistant stainless steel alloys and 32 other acid resistant metals.

Super-Steel Testing:

- Electrical resistance (40,000 volts, the max output of the testing device);
- Excellent electrical conductivity when grounded;
- Chemical and acid resistance (six-hour boiling sulfuric acid testing vs. 32 different metal alloys and metals);
- Flexural strength (180-degree bend with no cracks on a 1-in. radius);
- ASTM A370-06 testing for yield strength, ultimate load, stress testing and percentage of elongation, which demonstrate a substantial increase of yield load, yield strength, ultimate load and the ultimate stress of steel pipe;
- Ultraviolet resistance;
- Radioactivity resistance;
- Corrosion, acid and bio-fouling resistance;
- Impact resistance with testing demonstrating strength beyond most metals;
- Superior performance in temperature extremes ranging from minus-325 F to more than 1,500 F;
- Compression strength at 24,000 psi (keeps the metal substrate in a constant state of compression); and
- Welding friendly (in some cases, it will fold over weld bead when cooling down without touch up).

This new inorganic water-based silicon material is harder than the metal it's protecting. The surface of the metal substrate (carbon steel) must be permanently damaged before the hard protective shield will fail. This durable protective shield gives a long-term solution to the short-term protection presently being offered by some other industrial protective coating systems.

There has been much discussion within government and industry concerning the new pipelines that are needed to deliver products from the Canadian oil sands (diluted bitumen) to refineries. Reports since TransCanada's Keystone pipeline opened in 2010 indicate that there have been 11 spills/leaks in less than one year. Blame for the spills is commonly linked to the thicker,



The primary cause of pipeline spills related to oil sands product is corrosion to the inner wall of the pipe (39 percent of all spills) and external corrosion of the outer wall (13 percent of all spills), according to data from the Canadian Association of Pipeline Producers ("Mitigation of External Corrosion on Buried Pipeline Systems," June 2009).

more abrasive oil sands product (dilbit) which results in corrosion/erosion to the inner pipeline walls. A dilemma is caused in balancing the potential of the abundant oil sands oil resource, and the corrosive harshness placed on the delivery infrastructure used by bringing this valuable resource over 1,800 miles to refineries in the United States. It is easy to point out the shortcomings of the pipeline system when it is corroding and failing at multiple points along critical travel routes.

This new protective system offers the opportunity to introduce a safer and more dependable delivery system by offering operators a compelling option. A delivery system that can be self-sustaining with little maintenance needed (offering significant reductions of maintenance budgets) teamed with the opportunity for minimal delivery downtime (by maintaining an intact, unrestricted product flow) is extremely attractive. This translates into higher profitability. Having such asset protection could allow a pipeline operation to run consistently for more than 30 years without the fear of spills or leaks caused by corrosion, helping to eliminate associated downtime, cleanup costs and fines from the U.S. Environmental Protection Agency. As for environmental concerns, this type of long-term protection provides an opportunity for pipelines to remain buried without worries of leaks or spills damaging natural resources and wildlife. To top all those considerations, Fused Armor is strictly water-based. It is environmentally friendly throughout its entire product life-cycle.

Fused Armor offers tangible and quantifiable returns for major gathering and trunk line operations. By cladding the inner and outer walls of the pipeline, the pipe would be protected for many years without wear. Cathodic protection can be kept at a minimum or eliminated. The high lubricity of the protection system would call for periodic flushing of the line with surfactants to clean out the inner wall, without the need to physically scrape down buildup of corrosion, carbonate or crystalline particles. The cessation of product flow while using a pig to clean the walls of a pipeline can easily represent lost revenue of up to $50,000 an hour for each hour of downtime or millions of total dollars per day.

Using Fused Armor to protect the inner wall of the pipeline protects carbon steel from exposure to the caustic effects of the dilbit crude and erosive quartz contained in the flows. The combination of lubricity and hardness of Fused Armor (demonstrated in third-party testing) proves a valuable feature for using the Fused Armor's long-term protection system. A delivery system that can be self-sustaining with little maintenance needed, offering significant reductions to maintenance budgets, teamed with the opportunity for minimal delivery downtime by maintaining an intact, unrestricted product flow translates into increased profitability.

Reduction of maintenance costs are another advantage of using Fused Armor claddings:

1. **Elimination of re-coating** pipelines (ultraviolet ray protected for over 50 years).
2. **Elimination of insulation tape** (45 percent insulation value of the coating and corrosion caused corrosion to pipe due to moisture accumulation between the wrap and the pipe).
3. **Reduction of cleaning pigs** by coating the pipeline internally (increasing the lubricity internally and reducing friction on the inner wall of the pipe).
4. **Elimination of expensive** corrosion resistant chemicals to flush through the pipelines.
5. **Improved cathodic protection** by grounding the treated pipe and using electrical conduction to place sensors on the pipes wall.
6. **Reduced or elimination of the need to install cathodic protection** (chemical/electrical resistance of the cladding) using anodes or electrical devices.
7. Metal detection pigs can still be run on a **reduced schedule** (every five to 10 years).

The pipelines in the United States are at a crossroads due to their age and state of disrepair. Many need to be repaired, replaced or rebuilt. If a long-term protective coating would have been available when they were first built they would have not been weakened by corrosion. However, the solution for the extended life of both subsea and land based pipelines is now available to the pipelines operators. The Super-Steel system offers

Application to inner and outer wall | Dried and dewatered | Fused Super-Steel product

a solution for extending the life of their pipelines. To top all those considerations, Fused Armor is a strictly water-based, inorganic protective system.

After considerable research and development, Fused Armor is just now entering into applications for licensing for this protective system. The company understands the tremendous game-changing nature of this undertaking and is prepared to meet the challenges.

This all adds up to longer operating life, eliminated or reduced downtime, ongoing reduction in annual operating costs, competitive capital costs, cleaner environment and diminished exposure to regulatory fines. This is the greatest value for a disruptive technology and potential game changer.

Gary Wilson, vice president, and Robert Hansen, president, are founding owners of Fused Armor. Contact them via *www.fusedarmor.com*.

The Fused Armor cladding actually changes the properties of carbon steel creating new "Super-Steel" that improves durability.