

ALASKAN PIPE CRAWLER

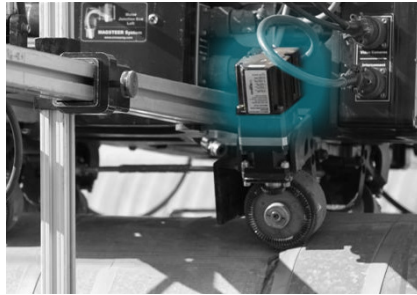
ENVISION CMOSXRAY LLC
ANCHORAGE, AK

“**Pipe crawlers**” are more than robotic gymnasts. They are robust machines moving with the utmost grace and stability, accompanied by the toughness and audacity of a mechanized lineman. Controlling the stability and guiding the machine are four SmartMotor™ servos balancing on top of frozen, elevated Alaskan pipeline while two long arms holding imaging equipment scan the bottom portion of the petroleum pipes in freezing conditions. These machines are integral to the protection of the arctic tundra.

Over 1000 miles of pipe on the North Slope of Alaska supply oil to the 800 mile Trans-Alaska Pipeline System, transporting crude oil from Prudhoe Bay in the north to the southern coast in Valdez, Alaska. Due to harsh arctic conditions and the water, sulfur, carbon dioxide, and microorganisms that are mixed with the crude oil, pipeline can lose up to 70% of its mass to corrosion (and we all know that spilling oil does to a clean

environment).

Envision CmosXray LLC, a pioneer in the gamma and digital X-ray systems, builds pipe crawlers for NDT inspection services companies to scan the pipe year-round in temperatures

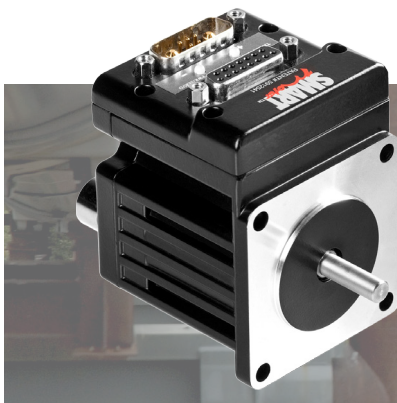
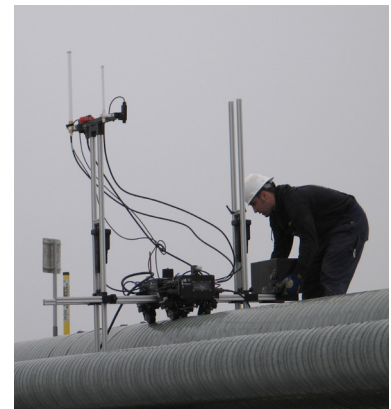


below -40F for corrosion that must be repaired to avoid a spill and environmental damage. In many areas the pipe is only accessible in the winter, prohibiting easier summer time scanning and creating harsh environment requirements for all components of the machine, including the SmartMotor.

The original pipe crawlers could only operate on a small range of pipe diameters, but the newest pipe crawlers utilize an Animatics SmartMotor on each of the four wheels. Hundreds of miles of remote pipeline range in diameter from 4 in. to 4 ft., and

the addition of the SmartMotor increased the overall flexibility of the machine so that one machine would suffice for most pipe diameters. In addition, the support structures that hold the pipelines along the ground add several layers of steel and additional obstacles to the pipe crawler’s journey, however each SmartMotor allows the wheels of the pipe crawler to nimbly maneuver over those supports while carrying a radiation source and expensive imaging equipment, all without falling from the elevated pipeline onto the frozen ground below.

Each of the SmartMotor servos utilized an external differential encoder input to create a ratio of speeds in the drive wheels in order to steer the pipe crawler automatically on



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top of the piping. The crawlers are controlled by specialized wireless communication systems that allow the crawler to be operated up to 1500 feet away from an operator taking full advantage of the integrated controls of the SmartMotor system to simplify the on-board and remote motor control system. Remote navigation is integral to the safety of the machine operator as freezing winds, icy and uneven ground and heavy equipment crawling above head-level are all valid safety concerns for pipe crawler operators.

Alaskan pipelines rise and fall with the landscape, and pipe crawlers must be able to travel the elevation changes while maintaining precise speeds for the imaging systems that rely on very accurate images for corrosion analysis. Peace of mind comes with knowing that thousands of dollars worth of imaging equipment are safely balanced and controlled with four SmartMotor servos, and even in the toughest conditions the SmartMotor dependably maintained the proper speed



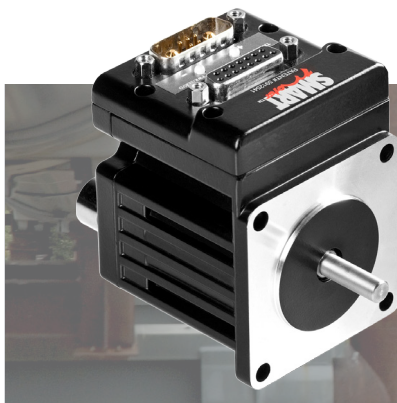
and acceleration to obtain necessary images. SmartMotor servos read inputs from an inclinometer (measuring the position of the crawler on top of the pipe) and adjust the velocity and acceleration of each wheel, allowing countless adjustments to maintain the crawler's position on top of the pipe despite obstacles, surface conditions such as snow and ice, and high winds. In addition, altering the allowable position error for the SmartMotor on each wheel calculates the perfect amount of torque to be applied to each wheel.

Flexibility and cost savings are two benefits CmosXray enjoyed by choosing the SmartMotor for its machine. By programming the SmartMotor to create a ratio of speeds in the drive wheels from an input, the pipe crawler could function on any number

of pipe diameters instead of creating new machines for different pipelines. In addition, the lower cost "platform" machine design means less engineering costs and resources when improvements to the pipe crawler are made.

Aided by the Animatics SmartMotor, pipe crawlers made by Envision CmosXray travel hundreds of miles atop the pipelines to protect the Alaskan environment against dangerously corroded pipeline. What can a SmartMotor do for you?

For more information please visit us at www.animatics.com



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