



CONSTRUCTION EQUIPMENT

ROBOTIC EXCAVATION SYSTEM

Multi-axis guides help keep infrastructure repair process clean & controlled.

Utility and energy industry companies have an increasing need to repair and maintain their pipelines and infrastructure. Typical repair methods are time consuming, costly, disruptive to the public, expose operators to hazardous environments, and pose the risk of damage to buried infrastructure.

ULC Technologies (part of SPX Corporation) seeks to improve the repair process with their Robotic Roadwork and Excavation System (RRES), developed in partnership with UK gas network SGN. RRES is a fully electric, all-in-one solution for underground utility maintenance.

RRES scans and models the underground pipes and other assets. It then cuts a core out of the ground surface in any desired shape. After deploying its excavation head, the robot uses supersonic air nozzles to agitate the soil and innovative vacuum technology to excavate. The robot can then perform repairs on the utilities before returning the soil and core.



MULTI-AXIS



DEBRIS RESISTANT



SMOOTH MOTION



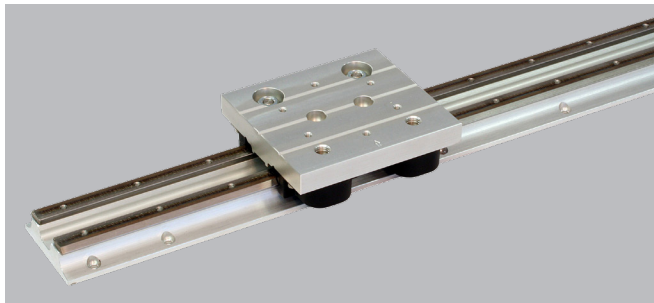
COMPACT

CHALLENGE

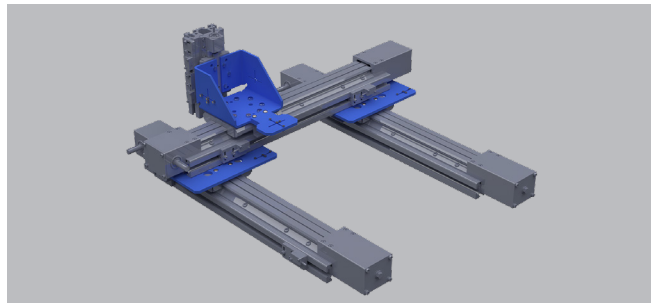
DEBRIS-TOLERANT MULTI-AXIS MOTION FOR LOW PROFILE ENCLOSURE SYSTEM

The RRES aims to reduce the exposure of contaminants to operators and the disruption to public spaces. This includes controlling debris produced by excavation. To maximize the benefit of their patented vacuum technology, ULC Technologies required an enclosure system that only allowed debris to exit through the excavation head while providing sufficient range of motion to the head.

The team designed an enclosure for the dig site that included a top plate with a hole large enough for the excavation head. The plate and a series of bellows connected to it would close off the dig site. As the robot positioned and angled the excavation head, it would push the center plate in a plane parallel to the ground surface.



Undriven and unmounted LoPro® system using DualVee Motion Technology®.



LoPro® Gantry Kits make it easier than ever to spec and install a multi-axis system by including connection elements, hardware, and mounting points for cable carriers.

The plate and bellows required a multi-axis guide system that would run smoothly and be extremely tolerant of dirt and debris. The durability is critical to minimizing resistance and undesired forces on the moving elements. Also, the system needed to be lightweight and low profile to be easily transported to and from the repair site.

SOLUTION

DURABLE AND DEBRIS-RESISTANT LOPRO® LINEAR SYSTEMS

Bishop-Wisecarver's motion system experts assessed ULC Technologies' goals and challenges for this project, and provided local technical support tailored to their specific needs. The design team decided on undriven LoPro® linear actuators for the enclosure's multi-axis motion system. Though LoPro® actuators can be supplied with belt, chain, lead screw, or ball screw drives, their durable and smooth-running motion can be used as guides without any drive system when motion is manual or driven by other elements.

Four LoPros are used per enclosure, two for the X axis and two for the Y axis; each guide is fitted with two wheel plate assemblies. LoPro® relies on DualVee Motion Technology®, an extremely durable guide wheel system that uses angled vee wheels to wipe debris off of the track as the system runs. The system is debris tolerant enough to run without wheel covers.

While some applications are best used with the self-supporting T-slot aluminum or steel beam options in the LoPro line of products, ULC Technologies selected the "unmounted" configuration to easily install onto their existing frame.

CHALLENGE SOLVED

RELIABLY SMOOTH MOTION IN A LOW PROFILE

LoPro's debris resistance properties excel in the harsh and extreme environment of construction sites and other field work. The self-cleaning action of the vee guides ensure that dirt and debris are no obstacle to smooth and reliable motion of the enclosure plate.

True to its namesake, the LoPro® system provided a low profile solution. The multi-axis system was sufficiently compact and lightweight, allowing it to be easily transported alongside the RRES robot.

QUANTIFIABLE RESULTS

GETTING THE JOB DONE, NO MAINTENANCE REQUIRED

Despite global shipping slowdowns, Bishop-Wisecarver was able to supply all the systems required with a 2 week lead time. In one year of rigorous field testing and operation, the LoPro® systems have displayed no performance issues, running smoothly and requiring no maintenance.

The success of this project helps ULC Technologies address the critical needs of global utility and construction companies. The platform can increase safety and reduce disruption when it comes to excavation, benefitting both workers and the public.