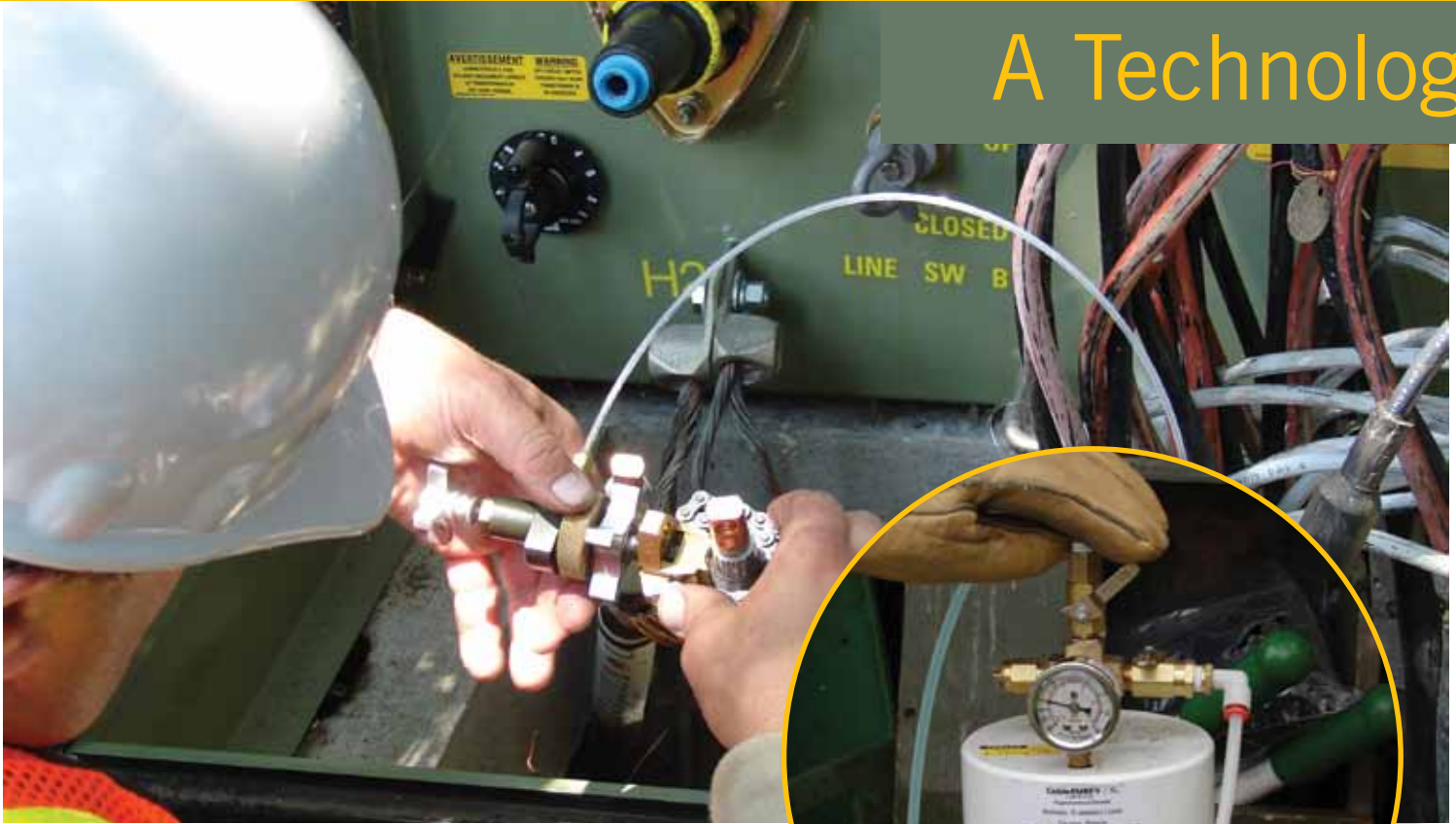


Silicone Injection at Lond

A Technology



A new high pressure technology known as the "un-sustained" process can also be used in silicon injection. (Photo courtesy of London Hydro)

Customer satisfaction is significantly influenced by reliability of supply. Improving reliability is a major focus at London Hydro and is a prime driver of the annual capital refurbishment program. One element affecting system reliability is failures in aged medium voltage XLPE cables used in residential subdivisions. Condition assessments were completed in 2000 and again in 2010 to determine the age profiles of the underground systems, to assess options for rehabilitation and to create plans for rehabilitation work. One of the options selected to address this problem was silicone injection. This option has proven to be very successful and is now considered to be the solution of choice for all XLPE cable rehabilitation projects at London Hydro.

London Hydro first experimented with silicone injection technology in 2002-2003. Eight kilometres of medium voltage cable was injected in a mid-sized residential subdivision that had experienced numerous cable failures over several years. The injection was completed with minimal power interruptions. More importantly there was negligible disruption to the customer's property. Over the next several years, the effectiveness of the pilot was evaluated and during the evaluation period, London Hydro reverted to

The sustained low pressure injection method can be used for silicon injection of cables. (Photo courtesy of London Hydro)

its traditional rehabilitation methodology comprised of directional boring and selective replacement schemes.

In 2010, London Hydro's Asset Sustainment Plan identified that the traditional methods employed for cable rehabilitation were not keeping pace with the aging demographics identified in the condition assessments. Based on the rate of depreciation and cable life expectancy, London Hydro identified the need to rehabilitate 50 km of cable per year. In order to accomplish this rate of rehabilitation, silicone injection was considered to be the most viable option. An in-house methodology was used to prioritize underperforming areas to help with the annual selection of subdivisions requiring rehabilitation.

for Aging Underground Infrastructure

There are two similar technologies used for silicon injection of cables. There is the sustained low pressure injection method and there is a new high pressure technology known as the "un-sustained" process. The sustained method requires a short outage to install a special elbow that allows silicone to be injected. The sustained method requires a silicone soaking period in the order of thirty to sixty days. Several visits take place during this period to monitor the process. The un-sustained method requires a longer outage since the injection process takes place while the cable is de-energized. However, the entire process is completed during the outage. Depending on the vendor and the technology being used, warranties are being offered for an expected cable life extension from 20 to 40 years.

The principles are the same for both processes. Each technology is based on the injection of a silicone based fluid in between the conductor strands. The silicone molecules are small enough that under pressure they migrate

through the insulation. As the silicone molecules come into contact with moisture in the insulation they grow in size thereby impeding its travel through the insulation. The silicone fills in any manufacturing voids or water trees that have formed over time, restoring the cable to almost new status with very little customer impact.

Manufacturers have demonstrated that the chemicals used in both processes give the desired life extension with no safety compromise. Underground cable rejuvenation has been used for decades, particularly the use of silicone injection in medium voltage cable insulation, such as XLPE. London Hydro's experience has shown that silicone injection has extended the reliable life of medium voltage XLPE underground cable. Ultimately the improvement in the condition of London Hydro's underground assets through silicone injection will result in improved system reliability and customer satisfaction. ■