A Safety Testing and Research Centre

What Drives Non Destructive Wire Rope Examination

By Ray Johns, Senior Technical Officer, NDT Specialist

In an industrial setting wherever people or equipment need to be moved up, down or along via lifts, cranes, hoists, winches, building maintenance units, skyways, cable belt conveyors, escalators, moving footways or mine conveyances, you will find wire ropes. They are often invisible and taken for granted but their safe functioning is critical. With advances in technology, non-destructive testing equipment (NDT), a part of our non-destructive wire rope examination (NDE) function, is now available to undertake testing of these ropes at speeds in excess of 3 m/s wherever they are located. For the past two decades TestSafe has been at the forefront of research and development of this type of rope testing equipment and routinely carries out both laboratory and field-testing. Complimentary to our examination process is the performance of destructive wire rope testing (DT) which is also carried out by TestSafe's laboratory.

This accident and incident prevention activity is of fundamental importance to many industries. To date we have inspected ropes notably in and at coal mines, metalliferous mines, buildings, Taronga zoo, Australia's Wonderland, Warragamba and Oakey Creek dam sluice gates, Warragamba dam wall construction flying fox, ski fields, overland conveyors and nuclear reactor cranes. Knowledge gained from our fieldwork has proven useful in providing significant input in the development of NDE Guidelines in co-operation with the Department of Mineral Resources New South Wales and NDE Standards with Standards Australia. TestSafe's testing activities in this area are accredited by NATA and its quality management system is certified to ISO 9001 by NCS International.

Typical Mine Drift Rope during examination.

Three **prime drivers** apply to the function of non-destructive wire rope testing:-

- Prevention of accident or incident that may occur as a result of rope failure.
- Extending rope life by defining the cause and effect of external influences on the properties of the rope.
- Progressively predicting the life of the rope within a reasonable order of accuracy.

Many interesting events, where these drivers have been applied, are regularly encountered whilst carrying out the non-destructive wire rope testing function on behalf of TestSafe. Typical of these was an event that took place at a Southern New South Wales Coalfield's mine. It was a normal day at the office. All seemed straightforward with the mine staff ready and waiting. As the rope was relatively new and been in service for approximately 2 1/2 years no defects were anticipated in the rope's structure.

After having covered the preliminary activities to gain mine entry, the test equipment was mounted to the rope and the conveyance driver dutifully followed instructions to take the Dolly Car to the drift bottom. The reading from the test equipment, as expected, continually indicated that the rope was in excellent condition with no faults or defects apparent. Then it happened. About half way down the rope the local fault trace went berserk with an equally erratic response emanating from the loss of metallic trace. Immediately I communicated with the Dolly Car driver with the request that he slowly bring the winder to a standstill, disembark from the conveyance and walk out the drift. The Engineer-in charge was notified.

From L to R: Michael Kovacs, TestSafe's Technical Assistant, Ray Booth, Mine Fitter, Ray Johns, TestSafe's NDT Specialist, getting ready for a typical day on the job.

An analysis of the test chart indicated that severe corrosion and/or wear existed over a four to five metre length of the rope which, when assessed in conjunction with the measured loss of metallic area, allowed a conclusion that the rope had a potential loss in excess of fifty five percent of its' original strength. A thorough visual inspection of the rope surface showed no difference between the area of concern and the remainder of the rope. Naturally the Mine Engineer questioned the results that were being obtained and requested an explanation as to how a rope could deteriorate to the extent that it had over such a short period of time. With the winder now being operated from the winder house, the rope was passed through the test equipment several times with no change to the result. I concluded that the section of damaged rope had been constantly contaminated with mine water, over a prolonged period of time, when the Dolly Car was in the parked position at pit bottom. To ensure that this conclusion was valid, the rope was marked with paint, and the Dolly Car was slowly wound to pit bottom as we followed the rope's marked section down the drift. As the Dolly Car parked it became obvious that a stream of water flowed from the roof, striking the rope on the marked section.

Mine Winder Rope following destructive rope testing

The results of the test were accepted immediately by the mine personnel and plans were made to immediately discard the rope and replace it with a spare from the mine's store. The mine management however, retained sufficient doubt so as to request that we return to the mine the following day, pick up the questionable section of rope that was to be cut from the body of the rope upon removal from the mine and return it to TestSafe for tensile testing. The colliery's Engineer rang the next day to apologised that he was unable to give us the sample as, during the extraction of the rope from the drift, the rope had broken **"right in the middle of the painted marking"**.

Regular events such as this one leaves me with the satisfaction that we had accomplished an important task by preventing an accident or incident involving such ropes and, at the same time, given a solution to the client to prevent a recurrence of the event and to prolong future rope life. Unfortunately, in this instance, we were unable to follow the progressive rate of deterioration of the rope through to discard due to factors such as its' relatively short life, the limited number of tests and the rapid rate of localised deterioration. Nevertheless, given the outcome, and as the Dolly Car driver stated "two out of three ain't bad".