

EM TORCH

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The EM Torch is an electromagnetic (EM) based geophysical tool designed for finding small pods of nickel within a 20 metre search radius. This tool is the idea of Peter Williams, a geophysicist with Independence Group (IGO), who envisaged a rapidly deployable EM tool that could locate many of the small pods of nickel ore in the Longshaft Mine missed by previous mining. As the tunnels and development drives are already in place and paid for the small incremental cost of mining out small pods near such infrastructure makes the search for such pods very profitable. The trick is in finding these ore pods in an economic manner.

Massive nickel sulphide ore is a very good electrical conductor and so it is relatively easy to induce electrical currents into the ore via rapidly changing magnetic fields from a current transmitter. These electrical currents produce a secondary magnetic field that is detected by the Torch system. Luckily for IGO the ore pods are more conductive than all the other conductive bits and pieces within the mine, such as wire mesh, pipes and electrical wiring. Thus, the induced electrical currents last longer in the ore pods and can be seen as distinct conductors.

Development of the Torch system was not without tears however, as it is difficult to detect the small magnetic fields from the ore pods without resorting to enormous transmitter currents. Being able to work in an underground mine is a significant constraint as the system must have a cross-section less than 2 by 2 metres. Thus, it is hard to obtain a significant transmitter moment to excite detectable currents in pod some 20 metres distant. A compromise solution is to use a multi-turn transmitter loop with a moderate amount of current (less than 20 Amps) combined with very sensitive magnetic field sensors. A customised system incorporating these concepts was developed at Curtin University and mounted upon a wooden trailer. The use of wood was necessary as steel and other metals produce a spurious response that masks the effect of distant ore pods. In addition, the cart mounted system cannot have a vehicle within 10 metres for the same reason.

Within six months of use the Torch system has paid for itself more than ten times over, and is well on its way to delivering more than \$1-10 million dollars to IGO shareholders by year end. It is a perfect example of the judicious use of a mature technology in an innovative way.

