A Thread of Time- A History of IP

The first recorded observation of IP phenomena was by Conrad Schlumberger in 1911. While Schlumberger continued experimenting with the technique for primarily oil exploration in Russia in the 1920s and others appear to have built upon Schlumberger's work in the 1930s, the global impact of Schlumberger's discovery was limited. In the 1940s, the US Navy undertook a program to investigate the application of IP to the detection of marine mines of the variety used as an anti-personnel weapon by the Axis military as a first line of defense to protect shore fronts against marine assaults by the Allied forces. A functional detector was developed which frog men could use to survey the beach line but the largescale invasions that were envisioned for the Pacific front never occurred.

Several years after the war ended, interest in the IP technique expanded on both the academic and applied/commercial front. By the end of the decade, Newmont Mining had an IP system built and field tested at several locations in the US. In late 1940s, Anaconda under the leadership of Ed McAlister who had been directly involved in the original Navy project, started a in-house IP development project to both extend the depth of investigation that could be achieved with IP and separate the response of pyrite from chalcopyrite. While some technique success regards the later problem, the technique was felt to be impractical as a standard field procedure. This remained a Holy Grail for IP for decades, with the only conclusive outcome known to the author was work done by James Klein at the University of Utah in the mid-late 1970s. His studies showed that is sufficiently high current densities were used, measurable differences between different mineral species could be obtained. The current densities required however, were only achievable in special conditions such as borehole logging. In normal field settings, it appears that some information about the size of polarizable grains could be recovered. In some situations this information could be of value in separating mineralogy.

The primary target for both Newmont and Anaconda was to locate porphyry copper deposits. Both companies had self-imposed confidentiality around their work, although Newmont did publish a summary of their general R&D program that ran from the late 1940s to 1958 (Wait 1959). Anaconda seems not to have either published any results of their work nor given professional talks until 1979 (Halverson et al. 1979). While Newmont published a few papers on their work, what neither group revealed was any idea as to the success of their geophysical efforts. Newmont did publish a extensive IP survey over the Cuajone (Peru) deposit (Wait 1959) but there was not discussion about the IP survey providing a proxy for alteration zones associated with the porphyry intrusive. Anecdotal evidence from the 1960s indicates that the industry as a whole whether through geological or geophysical means, both understood alteration zoning for porphyry deposits and that IP could be used to map these zones remotely. The publishing of the Lowell and Gilbert paper in 1970 (Lowell and Gilbert 1970) formally defined the commonly recognized alternation zonation of porphyry deposits in a geological context but the geophysical component of the story was not defined until 1976 by Pelton and Smith (1976) in a paper which outlined the use of IP to map porphyry deposits in the Philippines.

In the 1960s and '70s, IP was applied to a number of deposit types and styles around the globe. A number of equipment suppliers appeared as well as service groups who would provide contract services. R&D work by companies decreased, although Anaconda continued with researching how to reduce the effects of EM coupling in the data as well as improved the efficiency of data recording. In 1977, ARCO purchased Anaconda and the geophysical group's focus shifted from applying IP to minerals and more to oil and gas. In the late 1970s, Anaconda began applying technology designed for seismic acquisition to their IP technology. This work continued until 1986, when ARCO divested themselves of their mineral assets and work in electrical methods ceased.

In the mid-1990s, interest grew in how to acquire larger amounts of high-quality data that could in turn be modeled with recently developed 3D inversion software. Interest in building a next generation system arose in Australia and a group at Mt Isa Mines Ltd. (MIM) recruited several former Anaconda staff who had been key players in the Anaconda technology developed in the 1970s-80s. This work ended up drawing in a Canadian service company Quantec Ltd. who had considerable expertise in ground geophysics and IP surveying. In this development, personal who had originally worked for Anaconda were instrumental in helping to guide the development. In a relationship which ended up being challenging for both parties, two new technologies emerged; MIMDAS for MIM and Titan for Quantec.

In the early 2010s, the technology to carry out full 3D acquisition first appeared and now a decade later, 3D acquisition has become a main stream commercial service.

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