The Diversity of ReCYN Technology

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History

- The ReCYN technology concept has been known for seventy years, coming out of the uranium industry in South Africa in the 1950's.
- As with most technology developments, the commercialisation stage is the hardest step.
- Signet were tasked with commercialising the Vitrokele process, a forerunner of ReCYN, in the period 1988 to 1996.
- A combination of many factors, including mixed project success and the loss of key personnel saw the technology shelved.
- A gold/silver project in Indonesia , including a cyanide recovery plant, had been put on hold due to the 1998 Asian Financial Crisis. The plant was commissioned in 2014 and re-established interest in the technology.

ReCYN Technology

- Following the success of a second cyanide recovery project in Indonesia in 2017, GreenGold was formed to commercialise the technology.
- The modified version of the technology was called the ReCYN process. There are four variants.
- **ReCYN I**, Cyanide Recovery.
- **ReCYN II**, Cyanide and Copper Recovery.
- **ReCYN III**, Cyanide and copper recovery and gold scavenging.
- **ReCYN IV**, Primary gold recovery.

ReCYN I, Cyanide Recovery.

ReCYN II, Cyanide and Copper Recovery.

ReCYN III, Cyanide and copper recovery and gold scavenging.

Naivety

- The four versions of ReCYN were meant to cover most applications. However, this was far from reality.
- Unlike carbon, the non-selective nature of the particular resin used, whilst seen as an advantage, has meant customization in most instances..
- The result has been a wide diversity of applications.

Diversity

- **Examples of the range of applications are:**

1. Circuits that require high cyanide levels, such as silver-gold ores.

Gold ores with a high soluble silver content generally require a high free cyanide concentration. The Mirah Project in Central Kalimantan had average silver levels of 100g/t. The project was made economic by using ReCYN for cyanide recovery.

2. High cyanide soluble copper gold ores.

Excessive cyanide consumption due to copper is a common problem in gold projects. Besides increasing operating costs there can be downstream problems with copper recirculating in process water. A ReCYN II circuit can turn a copper problem into an opportunity.

Diversity

3. Favourable economics to replace detox.

Detoxification of gold plant tailings to meet compliance levels can be expensive. The ReCYN process can replace destructive detox methods and give a positive economic return with cyanide recycling and copper production.

4. Reducing the build-up of cyanide-consuming metals in recycled process water.

If dissolved metals are not removed from process water they can build up and cause increased cyanide consumption, sometimes impacting gold recovery and negatively impact flotation circuits.

Diversity

5. Used in Merrill-Crowe circuits to recover and recycle cyanide and zinc.

The addition of zinc metal in an M-C circuit adds to increased cyanide and detox costs. The inclusion of a ReCYN circuit can reduce capital and operating costs. Recycling of both cyanide and zinc metal is a significant benefit and reduces detox costs.

CIP circuits are sometimes added to an M-C flowsheet to scavenge gold. A ReCYN plant can replace the carbon plant and simultaneously recover cyanide and zinc and replace the detox circuit.

Diversity (Continuing)

7. Removal of high iron and thiocyanate levels in tailings,
8. Gold scavenging from CIL circuit losses,
9. Increasing Reserves through the economic treatment of high copper gold ores,
10. The recovery of PGE cyanide complexes,
11. Lowering the carbon footprint by reducing new cyanide purchases by 50%.

Commercialisation

- GGT are now five years into the commercialisation of ReCYN Technology.
- With three operations having several years of track record and two plants under construction, ReCYN is still not considered proven technology.
- The reason is partly due to the conservative nature of the mining industry and partly due to the diversity of the technology.
- We probably have another five years to go before ReCYN is seen as a proven technology, but we are well into the process, albeit increasing the diversity!