



## DOWEX\* Ion Exchange Resins

### Avocet Mining Strikes Gold with Dow's Developmental Gold-Selective Resin

#### Site Information

##### **Location:**

Malaysia

##### **Purpose:**

- Enable processing of carbonaceous ore
- Improve gold recovery

##### **Time in Operation:**

Over 4 years

##### **Performance:**

- Successfully processing carbonaceous ore
- 20% improvement in gold recovery



*Avocet Mining's Penjom gold mine uses a Dow developmental gold-selective resin to boost gold recovery from carbonaceous ore. (Photo courtesy of Avocet Mining)*

#### Introduction

Avocet's Penjom gold mine is located in the province of Pahang in the center of Peninsular Malaysia. Penjom commenced production in December 1996 as an open pit mine with a mill capacity of about 500,000 tons/year. As Malaysia's largest gold producer, the mine produces approximately 100,000 ounces of gold per year. Penjom's conventional processing facilities initially recovered free gold and gold contained in relatively low grade oxidized ores at recovery rates in excess of 90%. However, once mining began of the higher grade carbonaceous ores that constitute the bulk of the ore reserves, recovery rates dropped to the mid-60% range.

Avocet worked with Mintek, a company based in Johannesburg, South Africa, to develop an ion exchange process to bring recovery rates back up to acceptable levels. Mintek is one of the world's leading technology providers specializing in mineral processing, extractive metallurgy, and related fields. Dow licensed technology from Mintek to develop resin XZ-91419.00, which was ultimately deemed by Avocet as the resin of choice for the new process.

Dow  
Developmental  
Resin XZ-91419.00

The Dow Chemical Company has decades of mineral processing experience with ion exchange resins and a keen focus on mining and hydrometallurgical applications. As part of the company's development efforts for new methods for primary metal separations, Dow licensed technology from Mintek to develop and manufacture XZ-91419.00 resin. This resin is uniquely designed for the rigorous conditions of resin-in-leach and resin-in-pulp mineral processing. The beads are large and resilient, better ensuring separation from ore pulp and longer life.

Penjom Process

The processing facilities at Penjom underwent significant modifications in order to address the challenges of gold recovery from carbonaceous ore. The primary/gravity circuit was significantly bolstered, and a resin-in-leach (R.I.L.) gold recovery process was implemented in place of the existing carbon-in-leach (C.I.L.) process. Figure 1 is a diagram of the entire mining process.

Figure 1. The Penjom goldmining process.

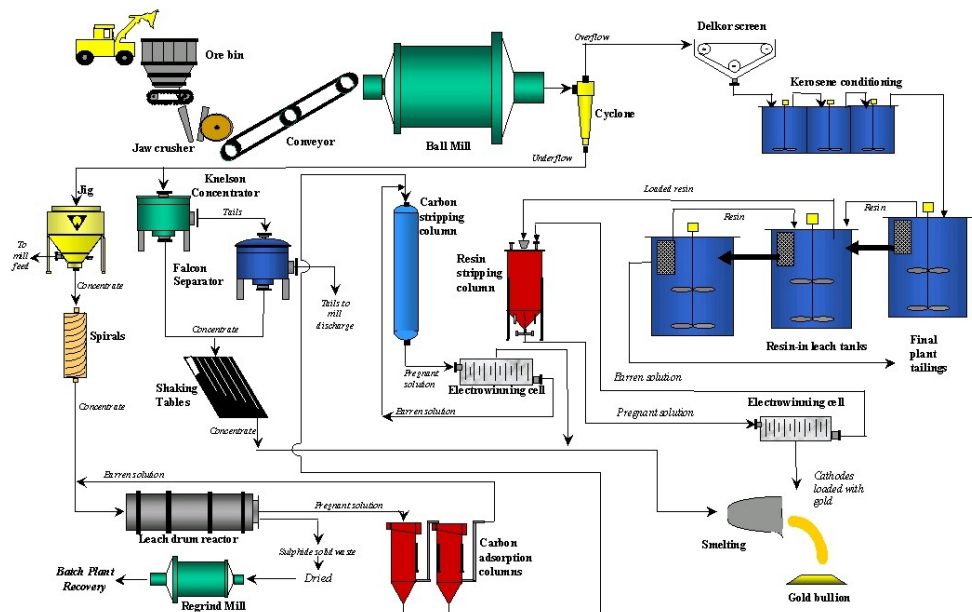


Figure1 courtesy of Avocet Mining

Process  
Performance

Of the ion exchange resins evaluated, Dow's XZ 91419.00 developmental gold-selective resin was the most economical to operate and was ultimately selected by Avocet as the resin of choice. When used properly, this resin is highly selective for gold from cyanidation leach solutions and is economically regenerated using acidic thiourea solution. For maximum performance in R.I.L. systems processing carbonaceous ores, the resin can be used in combination with "blanking agents," which blind-off the carbonaceous preg-robbars but do not interfere with resin/gold interaction.

Since commissioning the R.I.L. process in mid-1999, Avocet's recovery rates consistently run close to 85%, a nearly 20% improvement over recovery rates using activated carbon. Based on these results, Avocet is now installing Dow's XZ 91419.00 developmental gold-selective resin in a new facility in the Pacific Rim.

## Conclusions

Penjom is the first processing plant outside the former Soviet Union successfully using R.I.L. technology for primary recovery of gold in carbonaceous ores. The proprietary Penjom process using Dow's XZ 91419.00 gold-selective resin has been running successfully for over 4 years at 85% recovery.

### **DOWEX Ion Exchange Resins** For more information about DOWEX resins, call the Dow Liquid Separations business:

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Notice: Oxidizing agents such as nitric acid attack organic ion exchange resins under certain conditions. This could lead to anything from slight resin degradation to a violent exothermic reaction (explosion). Before using strong oxidizing agents, consult sources knowledgeable in handling such materials.

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