

## Mining Filtration Equipment Application Briefing

### Filtration Equipment For Merrill-Crowe Gold Extraction & Recovery Operations

*Durco Filters Leach Clarification Pressure Leaf Filter Technology, Tubular Backwash Filter Technology, & Precipitate Recovery Filter Press Technology Maximizes Recovery Of Gold & Other Metallic Solids*



**Durco Filters  
Leach Clarification  
Pressure Leaf Filters**

**Durco Filters  
Tubular Backwash Filters  
For Removing Fines**



**Durco Filters  
Precipitate Recovery Filter Presses  
For Merrill-Crowe Gold Recovery**



## Mining Filtration Equipment Application Briefing

### Advances In Gold Mining Equipment & Technology

Since the 1970's, continuous advances in mining technology now allow more economical extraction of gold and other precious metals from low-grade deposits, with extremely low metal concentrations. **Durco Filters** has contributed to these technological advances, assisting the mining industry with improved process and filtration solutions.

### Extraction In Gold Mining

#### Ore Extraction

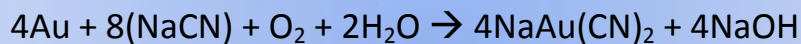
Modern mining equipment allows high-rate extraction of large quantities of gold ore. This ore is comminuted by grinding prior to further treatments which concentrate the gold-rich components.

#### Gold Extraction

Extraction of metallic gold from the comminuted ore may be broken down into 2 basic steps:

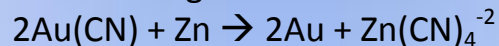
##### **Gold Leaching**

Oxygenation & Sodium Cyanide (NaCN) solution dissolve the gold from the ore:



##### **Gold Recovery**

Reaction with Zinc precipitates metallic gold from the leach solution:



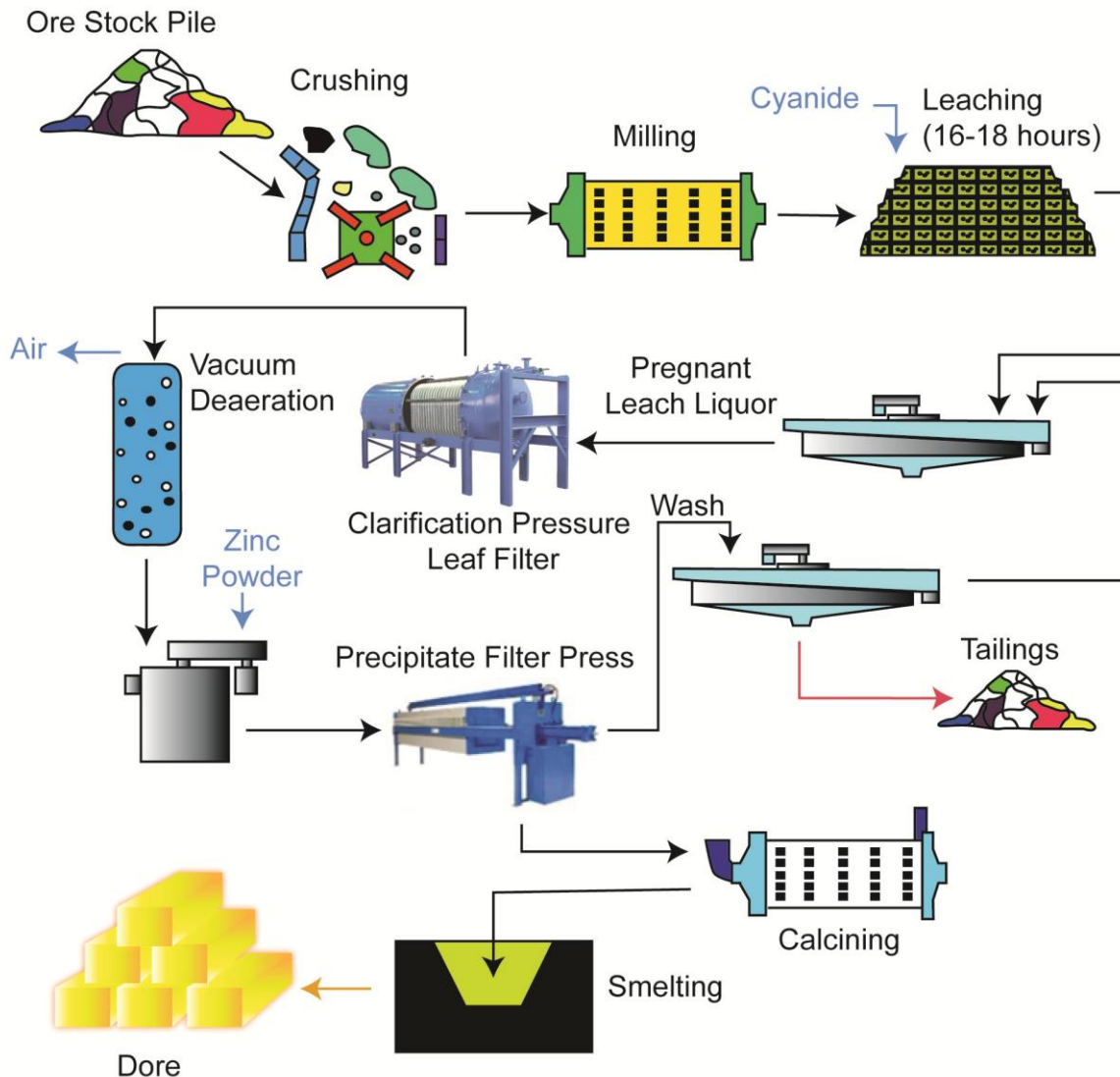
The specific operational practices used to achieve these 2 steps vary, depending upon local conditions and parameters.

**Common Practices** used in many gold mines include:

1. [Heap Leaching followed by Merrill-Crowe Recovery](#)  
or
2. [Heap Leaching plus Carbon Adsorption followed by Recovery](#)

## Mining Filtration Equipment Application Briefing

### 1. Heap Leaching followed by Merrill-Crowe Recovery



In Heap Leaching, NaCN solution is simply percolated through a heap of crushed ore in order to dissolve out the gold - which may be present at concentrations as low as 0.01oz Au per ton of ore.

Following decades of experience working with the mining industry, **Durco Filters** has developed proprietary [Leach Clarification Pressure Leaf Filter technology](#) and [Merrill-Crowe Recovery Filter Press technology](#) for gold mining. Both of these technologies utilize specialized equipment and practices that have been specifically optimized to maximize gold extraction efficiency.

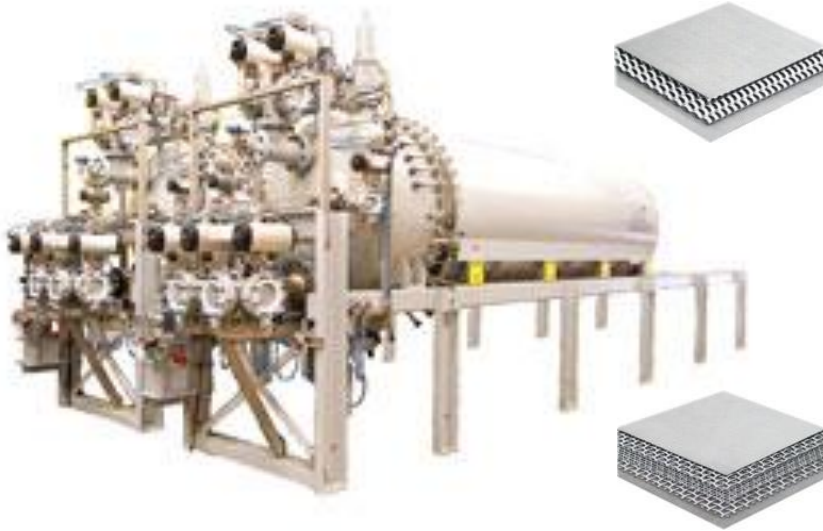
## Mining Filtration Equipment Application Briefing

### Leach Clarification Pressure Leaf Filters & Media Optimized For Gold Extraction

***Durco Filters Leach Clarification Pressure Leaf Filter Units & Filter Leaf Media have evolved over decades of specific experience with most of the major Gold Mining companies to provide Maximum Performance in Your Gold Extraction Operation***

After [Heap Leaching](#) of the gold ore, the resultant leach solution containing the dissolved gold is contaminated with fine sediment particles and other debris which must be removed during the 'Clarification' step.

**Durco Filters Leach Clarification Pressure Leaf Filters & Media** were originally developed for the mining industry. For gold mining, they have been specifically optimized to produce the clearest possible leach solution for input to the Merrill-Crowe gold precipitation and recovery process.



***Durco Filters*** Horizontal Pressure Leaf Filter Units & Media Are Specifically Optimized For Maximum Leach Clarification In Mining Operations

**Durco Filters OEM Leach Clarification Filter Media** uses woven polypropylene cloth over fine metallic mesh, with Diatomaceous Earth (DE) filter aid.

**Durco Filters Pre-Coat Technology** maximizes Your filtrate clarity by removing even extremely fine sub-micron colloidal particulates.

***For Maximum Clarification In ANY Mining Operation Insist On Durco Filters OEM Filtration Media!***

**Durco Filters** Mining Filtration Engineers can deploy laboratory testing to define the optimum filter media for your particular operation. Critical factors include the size and model of your filter unit, your process stream solids loading, your particulate size range, etc. In typical leach clarification applications, smaller filter units can utilize 3-Ply metallic mesh media (including drainage member), whereas larger units require 5-Ply media construction.

## Mining Filtration Equipment Application Briefing

### Durco Filters Model HC Leach Clarification Pressure Leaf Filter Unit

A typical example for gold mining applications is the **Durco Filters Model HC Leach Clarification Pressure Leaf Filter** with Sluicing (Wet Cake) Discharge, utilizing DE Pre-Coat over PolyPropylene-Covered 5-Ply Metal Mesh Media:



*Model HC Horizontal Leach Clarification Pressure Leaf Filters*

#### **Achieves Sub-micron Colloidal Particulate Removal**

Typical Large Installation  
~12,000gpm (45.5m<sup>3</sup>/min), with  
throughput up to 2,500gpm  
(9.5m<sup>3</sup>/min) for each filter unit

Unlimited throughput capability  
available with Multiple Pressure  
Leaf Filter Units.

Optional Full Automation &  
Frontal Piping Recommended  
Other Custom Options Available

**Continuous Operation** is typically achieved in most ore processing operations by deploying a minimum of 3 Leach Clarification Pressure Leaf Filter units. 2 Filter units run online, while the third unit is being cleaned and DE precoated for it's next filtration operation cycle.

Following clarification, in the absence of a [Carbon Adsorption Gold Concentration Step](#), the clear pregnant leach solution is now ready for input to the [Recovery Stage](#) of the gold extraction process. The ore solids that were removed from the leach solution by the Clarification Pressure Leaf Filters are currently usually sent to the tailings pile in most gold mining operations.

***Durco Filters Mining Filtration Equipment Has Evolved Through Decades Of Design & Engineering Experience With Major Companies In The Mining Sector To Provide Clearly Superior Performance In Your Gold Extraction & Recovery Operation***

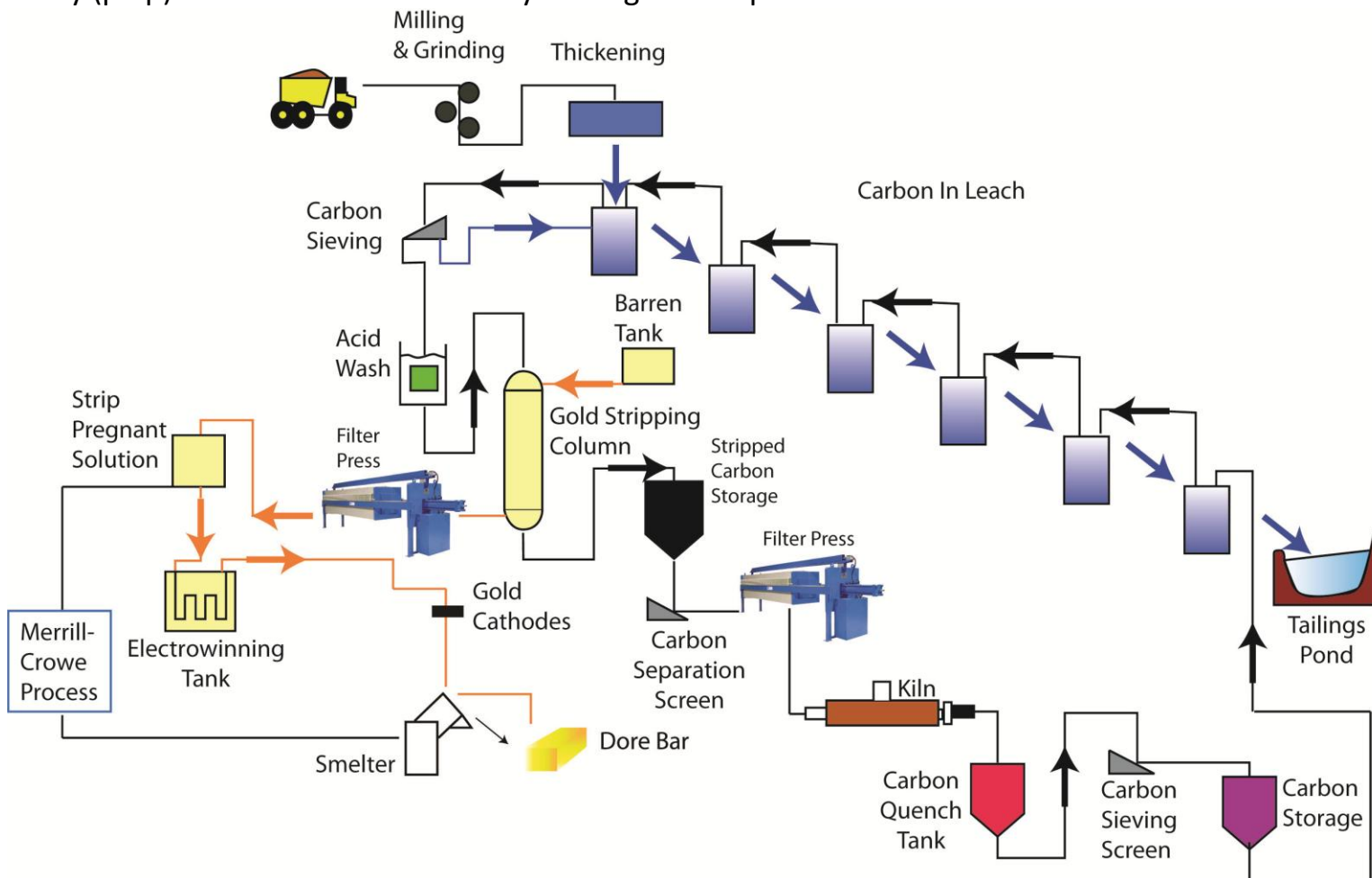
## Mining Filtration Equipment Application Briefing

### 2. Heap Leaching plus Carbon Adsorption followed by Recovery

Following the *Heap Leaching Step*, and before the *Recovery Step*, some gold extraction operations insert an intermediate **Carbon Adsorption Step** - in order to concentrate the Gold content within the leach solution.

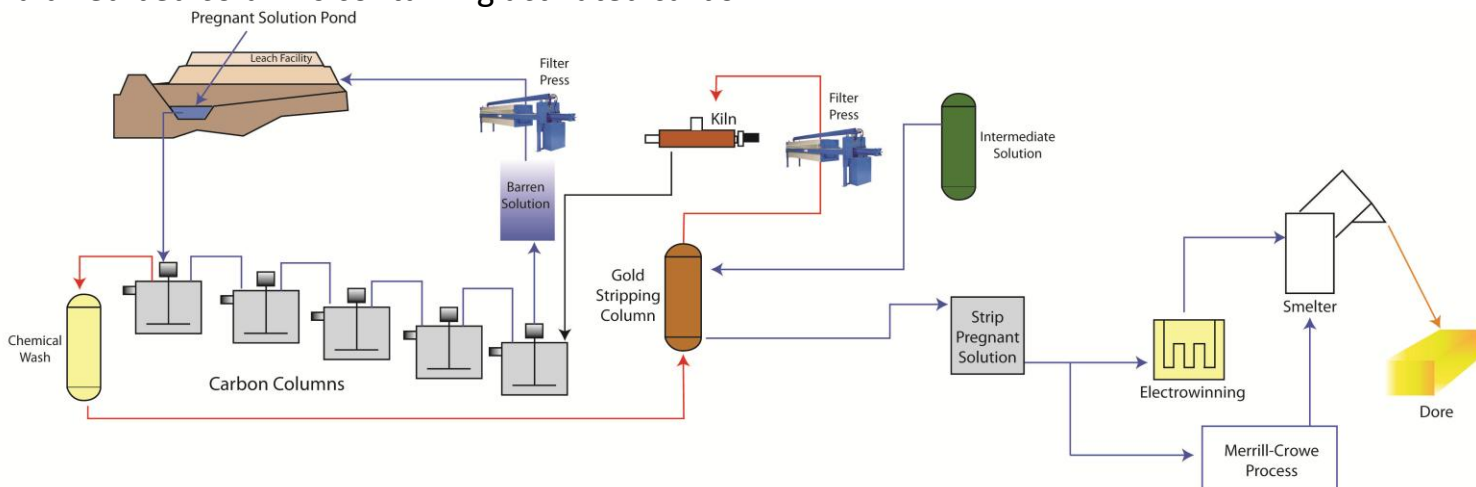
In this intermediate step, activated carbon particles are mixed into the leach slurry. The dissolved *Cyanidic Gold Complex* is then preferentially adsorbed onto the activated carbon surface. To achieve this, there are currently 3 process variations in common use:

**Carbon In Pulp (CIP) Adsorption** and **Carbon In Leach (CIL) Adsorption** - are both variations of the conventional *Heap Leaching* process in which activated carbon granules are mixed into the leach slurry (pulp) to adsorb the dissolved cyanidic gold complex onto the active carbon surface.



## Mining Filtration Equipment Application Briefing

**Carbon In Column (CIC) Adsorption** - starts with the standard heap leaching extraction process as shown in Figure 5 below. The pregnant leach solution is then pumped upwards through a series of fluidized bed columns containing activated carbon.



**In all 3 C-Adsorption Processes** the gold complex is preferentially adsorbed onto the active carbon surface. This allows concentration of the gold from the slurry.

**In all 3 C-Adsorption Processes Durco Filters Filter Press Technology** is a critical system component, required to capture carbon fines that would otherwise cause premature plugging of screens / filters:



**Durco Filters Model EP 1000**  
Sidebar Filter Press

### Durco Filters EP 1000 Sidebar Filter Press Model

**Reliable & Effective Carbon Fines Removal** For CIP, CIL, CIC

1,000gpm (3.8m<sup>3</sup>/min) Capability Filter Unit. Unlimited Throughput & Continuous Operation With Multiple Units

Custom Options Available

***Durco Filters Mining Filtration Equipment Has Evolved Through Decades Of Design & Engineering Experience With Major Companies In The Mining Sector To Provide Clearly Superior Performance In Your Gold Extraction & Recovery Operation***

## Mining Filtration Equipment Application Briefing

### Carbon Fines Removal For Recycling Leach Solution

Adsorbed gold is stripped from the carbon particles by elution with hot caustic/cyanide solution which is then pumped to the *Recovery Step*.

**Recovery** may involve either the *Merrill-Crowe Process* or alternate *Electrowinning* technique.

The recovered leach solution is usually recycled for re-use at the ore heap. However, before it is suitable for re-use, any entrained carbon fines must be removed to prevent plugging of the heap.



**Durco Filters Model TE3**  
*Continuous Tubular Filter System*

**Durco Filters TE Tubular Filter Systems** are ideally suited for this application:

**Sub-Micron Carbon Fines Removal to 0.1 micron**

Unlimited Throughput & Continuous Operation

Optional Fully Automated Backwash Operation

Optional Backwash Conservation System Available

Other Custom Options Available

[More About Durco TE Continuous Tubular Backwash Filters](#)

### Durco Filters Pilot Filtration Process & Laboratory Filter Testing Facilities

**Durco Filters** offers You a range of Test Filters, Laboratory Analysis of Your process fluids, and on-site Pilot-Scale Filter Testing to optimize Your specific mining filtration process.

**Interested? - Contact:**

**Durco Filtration Engineering**

**716-693-9381 ext.217**

[filterengineering@asmfab.com](mailto:filterengineering@asmfab.com)

## Mining Filtration Equipment Application Briefing

### Merrill-Crowe Precipitation & Recovery Of Metallic Gold

In the **Recovery Stage** of the extraction process, metallic gold and other metals will be precipitated from solution and collected using *Recovery Filtration*.

First, the leach solution is de-oxygenated, and then it is reacted with fine metallic Zinc (Zn) powder and other activation agents. Zinc has a high affinity for cyanide, and the resulting chemical reaction causes the Gold (as well as any Silver or Copper that are present) to precipitate from solution as very fine (colloidal) metallic particulates.

The gold-rich metallic particulates are then most effectively extracted from the resulting slurry by using *Precipitate Recovery Filter Press technology*.

**Durco Filters Precipitate Recovery Filter Press Units & Filter Media** have been developed following decades of experience supporting the mining industry.



**Durco Filters EP Series**  
*Recovery Filter Press Units*

In gold mining, these Recovery Filter Press units have been specifically optimized to maximize recovery of precipitated gold colloids from the Merrill-Crowe process, and they are ideal for use in other Gold Recovery processes.



**Durco Filters QP Series**  
*Recovery Filter Press Units*

### Gold Bars

The resulting gold-rich filter cake is then sent for drying, and smelting into *Dore Bars*, which are typically composed of ~90% Gold.

Generally, *Refining* of the Dore to produce *99.99% Pure Gold Bars* is performed in an external operation.

## Mining Filtration Equipment Application Briefing

### Durco Filters Merrill-Crowe Gold Recovery Filter Units

*Optimized Technology Evolved For Maximum Recovery Of Gold & Other Metallic Solids*

### Durco Filters EP 1200 & EP 1500 Sidebar Recovery Filter Press Models

Oversized stainless steel inlets, complete automation, and optional sludge/cake handling systems:



#### High-Efficiency Recovery For Most Mining Operations

**EP 1200 Unit** With 8" Inlet >1,500gpm (5.7m<sup>3</sup>/min)

**EP 1500 Unit** With 10" Inlet >2,000gpm (7.6m<sup>3</sup>/min)

Unlimited Throughput & Continuous Operation

Achievable Using Multiple Filter Units

Standard Cake Capacity 200 cuft

Custom Cake Capacity 250 cuft

Other Custom Options Available

### Durco Filters QP Series Overhead Recovery Filter Press Models

**The Ultimate Filter Press Technology** - designed & engineered for Your most demanding applications where conditions include high pressure, high temperature, or corrosive process streams:



**4-Bar Design** - Engineered and constructed for ease of use with low maintenance and extreme durability.

**Overhead Plate Shifting** - for high performance filtration without bypass at higher operating pressures.

**Overhead Design** - prevents cake build up on side bars, protects operator during filter plate shifting / discharge.

### **Durco Filters Mining Filtration Equipment**

**For Durco Filters Mining Filtration Equipment Sales Call 716-693-9381 ext.217**

**For Laboratory & Pilot-Scale Testing Call ext.217**

**For Durco Filters OEM Mining Filtration Media & Filter Parts Call ext.207**