



Precious Metal Processing

## ELUTION COLOUMN

### PRG-COLOUMNS

We manufacture column which has proven to be a very cost-effective means of maintaining the activity of activated carbon. Acid Wash columns are optimally designed for plug flow of eluate or fresh water for eluting gold cyanide complexes from activated carbon recovered from CIP/CIL gold adsorption circuits.

Designed and constructed according to available pressure vessel codes such as ASME VIII and can be manufactured from carbon steel plate for Pressurized applications, or higher grade SS316 or SS304 for specialist applications where dual elution/acid washing capabilities are required. Available with semi-ellipsoidal or alternatively cone base for reduced column base transfer wear.

- ✓ Carbon Elution Columns
- ✓ Cyanide Elution Columns
- ✓ Copper Elution Columns
- ✓ Gas Stripping and Scrubbing Columns
- ✓ Replacement Column Sparges & Strainers

### PARAGROUP Systems designs and manufactures elution columns complete:

- ✓ Carbon Steel or Stainless steel construction
- ✓ Complete with inlet / outlet manifolds , inlet and outlet screens
- ✓ Safety relief system which includes relief valves and bursting discs
- ✓ Designed, constructed, tested and certified as pressure vessel to recognised pressure vessel code e.g. ASME VIII Div 1 utilising approved 3rd party inspection authority
- ✓ MDR supplied

### Technical Data

- ✓ Pressure rating: 650 kPa / 750 kPa
- ✓ Design Temperature: -30 to 165°C
- ✓ Materials: Carbon Steel Boiler Plate, Stainless Steel Grade 316
- ✓ Internals: rubber lined / unlined
- ✓ External: painted / isolated



## SOLUTION HEATER SKID UNIT

PRG-HS

In the ADR process, temperature and pressure are the factors that directly affect the precious metal recovery. Stable temperature and pressure play an important role for keeping recovery rate at the highest level. It is aimed to keep the solution at maximum temperature by consuming minimum energy with the help of heat exchangers. Thanks to the necessary temperature and pressure assistance, the precious metals held by the carbon are released and transferred to the next process. Solution Heater System, raises the chemical-containing solution to high temperatures in a short time, shortens the process times and offers operations with maximum efficiency.

Designed for all capacities with flexible power configurations, PARAGROUP Solution Heater Systems offer maximum efficiency and metal recovery for ore enrichment operations.

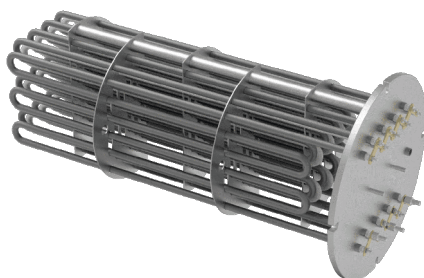
With the help of the automation system, the equipment status is instantly monitored and safe operations are achieved with maximum efficiency.

### Highlighted Features

- ✓ External Filter
- ✓ Filter systems prevent the particles carried by the solution from entering the heater unit during circulation.
- ✓ Automation System
- ✓ Advanced software and PID controlled automation system that provides control by mastering all process data.
- ✓ Easy Maintenance
- ✓ With the washing inlets on the equipment, there is no need to remove the heaters for the washing process. In this way, clogging and heat losses are kept to a minimum.

### Maximum Security

- ✓ Safety measures in international standards have been taken for the system operating at high temperature and pressure. Safety valves and electrolytic monitoring system protect operator and equipment against unexpected situations.
- ✓ Four Heat Exchanger System
- ✓ The exchanger system, which provides maximum heat recovery, consumes less energy during operation.



# Electrowinning Cell

**PRG-EWCELL**

PRG – Electrowinning Cell enables precious metals such as gold, silver and copper in the electrolytic solution to adhere to the cathode plates. With different material configurations our electrowinning equipment offers solutions for all process methods.

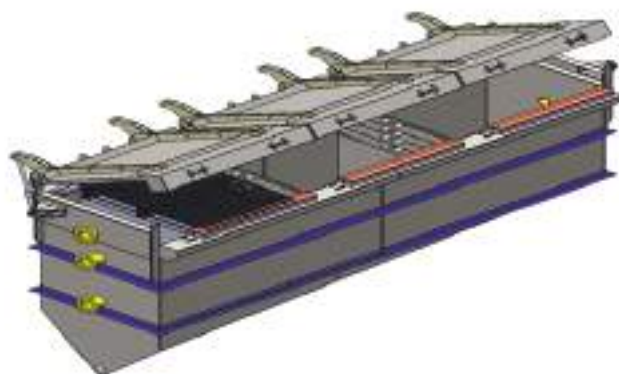
## Working Principle

Precious metal ions are stored on the relevant plate with the help of anode and cathode plates arranged in the electrolysis cell. Linear flow in the solution is obtained with separator plates mounted inside the cell. Precious metals accumulated on the cathode plates provide the opportunity to be washed in the cell without being transferred to another tank. In this way, metal losses during transfer are prevented and a separate tank is not needed for the washing system.

## Technical Features

- ✓ Cables coming from the rectifier are kept minimum with busbar system
- ✓ The integrated vapor suction system removes the formed steam in the equipment
- ✓ Mercury Retort Unit can easily connected and operated to the electrowinning cell for the processes containing mercury
- ✓ All auxiliary equipments required in precious metal process available under a single package option
- ✓ Any fumes generated during electrowinning are removed via the local electrowinning cell exhaust system.
- ✓ Stainless Steel Body Material Quality
- ✓ Copper Busbar Anode-Cathode Connection Type
- ✓ Fully Automated Hydraulic Cover System

Cell Size	2m <sup>3</sup>	3m <sup>3</sup>	4m <sup>3</sup>	6m <sup>3</sup>	8m <sup>3</sup>
# Anodes	14	20	28	28	45
# Cathodes	13	18	26	26	42
Rectifier Amper	750	1.000	1.500	2.000	2.500



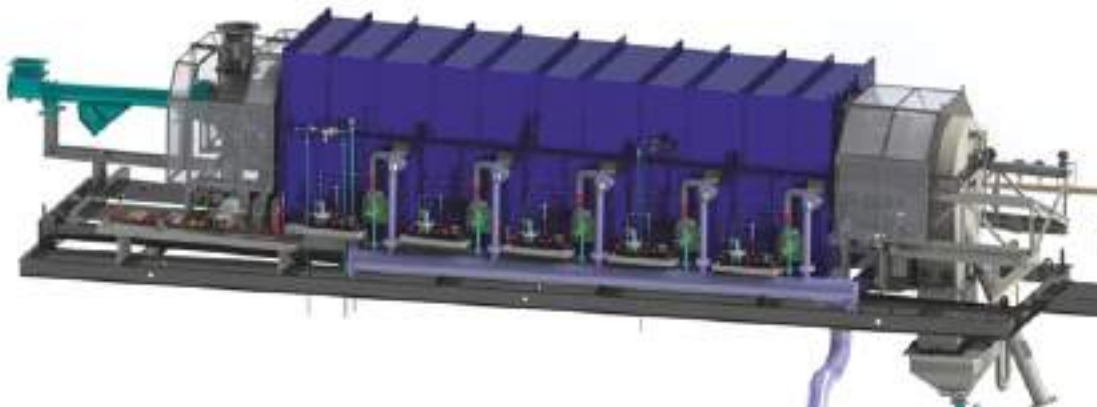
# Carbon Regeneration System

**PRG-KILN**

The activated carbon regeneration system is used to increase the sorption activity of the carbon after the desorption process. A decrease in sorption activity is inevitable in the CIL/CIP process due to the presence of organic compounds in the process solutions. During the desorption process, some organic compounds do not pass into solution but remain on the surface of the coal. In addition, the pores of the carbon may be clogged mechanically by organic compounds. To reduce the consumption of fresh activated carbon, to reduce losses of precious metals in the CIL/CIP process, a carbon regeneration unit is used.

## Working Principle

Its principle is based on the fact that under the influence of temperature, organics are burnt off from the carbon surface, thus opening the carbon surface for the sorption process. The furnace is designed in such a way that the material is not overheated, and the carbon is not burnt off unnecessarily. To increase the mechanical properties of the carbon after the regeneration process, we additionally recommend the installation of a carbon hardening tank.



## Technical Features

Our plant is made of high-quality steel which minimizes corrosion and aggressive environment inside the drum of the coal deactivation system. The furnace is divided into 3 heating sections. Depending on the required output and type of coal, the rotation speed and temperatures for each zone are adjusted. Our installation does not require pre-drying of the coal and is designed for a capacity of up to 15 tons per day.

PRG Oven	1 tons	2 tons	6 tons	10 tons	15 tons
KW	60	120	360	600	900
Tube size, m Ø/L	0,6*6,7	0,6*6,7	0,9*7,6	1,2*12,8	1,4*14,6
Dimension, m L/W/H	9*2*2	9*2*2	11*2,3*2,3	14,5*3*3	16*3,5*3,5
Mass, t	7,3	7,3	11	19,8	23,8

# Carbon Firing System

**PRG-CC**

In the CIL CIP process, the sorption and desorption sections produce substandard grade coal fines that contain significant amounts of noble metals. It is not possible to return the substandard carbon fines to the main process as they will be screened in the sorption process and sent to the tailings. However, the sorption properties of substandard carbon are equivalent to those of conditioned carbon, so the loss of substandard grade is undesirable due to precious metal losses.

To avoid the loss of substandard carbon with the tailings, traps are installed at the plants to separate the substandard carbon from the conditioned carbon. However, the processing of the substandard class by classical CIL CIP methods is difficult for the reasons mentioned above.

## Working Principle

Our plant is based on the principle of carbon combustion, in order to maximise the sorption properties of the material and to uncover the precious metals that are in the pores of the substandard carbon. The system operates intermittently. The substrate is loaded with substandard carbon, the system is connected to the aspiration and heating starts. The heating temperature is regulated by a thermocouple, heating is carried out by electric heating elements. The system is fully automated. Air is forced into the hearth space, which passes through the layer of carbon, oxidising it to carbon dioxide. Then, through water, chemical and mechanical traps, the gas is discharged into the atmosphere. After roasting, the resulting ash, depending on the noble metal content, can be used in CIL CIP, intensive cyanidation or directly smelted either separately or together with the cathode sludge.

## Technical features

Our unit is made of high quality materials that can withstand high temperatures and keep the system sealed throughout use. To reduce the environmental impact, our system has special traps to eliminate arsenic, antimony and mercury emissions into the atmosphere. A mechanical filter is provided in the aspiration system to capture gold.



Carbon Firing System	Loading, kg/day	T max, C	Dimension, m L*W*H	Mass, tons	EIC Connection
	100	800	7*5*3	6	3 phase

# Agitated Nutsche Filters & Filter Dryers

Agitated pressure filters, filter-dryers, and pressure Nutsche filters perform most effectively in batch operations as cake filters used to separate concentrated suspensions.

Agitated Nutsche Filters and Filter Dryers (ANF and ANFD) are designed and manufactured with state-of-the-art technology by PARAGROUP. These are versatile units for deep bed, solid-liquid separation using a filter screen.

## Main Advantages

All operations of an ANF and ANFDs are performed in an enclosed system, ensuring product quality, product consistency, and operational safety.

Our ANF and ANFDs are also available in GMP/Sterile designs, which adhere to CIP/SIP requirements.

ANF and ANFDs are available in stainless steel, Hastelloy, and special alloys. For extremely corrosive applications, we offer glass-lined ANF and ANFDs.

## Key Features and Options

- ✓ Available filtration surface area from 0.1 to 1.5 m<sup>2</sup>
- ✓ Manual or hydraulic base plate lowering
- ✓ Tilting or swivelling top cover
- ✓ Body flange with C-clamps or quick-lock
- ✓ Cake retainer ring
- ✓ Mobile or stationary designs
- ✓ Special designs with tilting vessel or manual agitator
- ✓ Available in stainless steel, Hastelloy or other special alloys, glass-lined or with fluoropolymer linings



Model	Filtering Area (m <sup>2</sup> )	Inside Diameter (mm)	Nominal Volume (m <sup>3</sup> )	Filter Cake Height (mm)	Blade Lifting Height (mm)	Motor Power (kw)
PRG-NF010	1	1200	1.2	250	300	7.5
PRG-NF015	1.5	1400	1.9	300	350	11
PRG-NF020	2	1600	2.59	300	350	15
PRG-NF025	2.5	1800	3.2	350	400	15
PRG-NF030	3	2000	4.5	400	450	18.5
PRG-NF040	4	2300	6.4	400	450	22
PRG-NF050	5.3	2600	9	400	450	22



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