



COMO
ENGINEERS
SPECIALIST EQUIPMENT



MODULAR & KIT GOLD STRIPPING PLANTS

'CLIENT SATISFACTION IS OUR SUCCESS'



MODULAR & KIT GOLD STRIPPING PLANTS

Como Engineers has become a recognized leader in the design and construction of modular gold desorption (elution), carbon regeneration and gold refining systems.

Using our extensive technical and practical experience, Como Engineers Specialist Equipment Division have developed proprietary technology that out performs any similar technology currently on the market.

These fully furnished plants can be broken down into minimally de-constructed units for containerized shipping anywhere in the world. Reassembly of modular plants typically takes around 2 weeks (subject to the size of the plant) with only terminations of waters, reagents, power and carbon tie-ins required to begin commissioning and operation of the equipment.

REST ASSURED YOUR DESORPTION PROCESS WILL PERFORM

With Como Engineers' extensive experience in the operation and design of desorption, carbon regeneration and refining systems, you can be rest assured in the knowledge that your Como system is optimized for your process and will operate efficiently and effectively. Como's modular & kit systems are the bench mark for gold processing solutions, offering superior performance over comparable systems on the market.

Como will undertake the full detailed process, mechanical, electrical and control engineering design with minimal design frustration for your company. We will then fabricate, trial assemble and wet commission your unit prior to it being shipped to your gold project.

MODULAR (1-10T) - SAVING YOU TIME & MONEY

Delays in construction on site may translate into expensive cost overruns and project short falls. Como Engineers' MODULAR plants can help reduce or negate this aspect of your project by providing you with a fixed price - fixed time - guaranteed product in a modular form. Our MODULAR plants, are rapidly installed at site with minimal equipment, materials and labour.

KIT PLANTS (8-20T) – FLEXIBILITY & EASE OF MAINTENANCE

Based on a 'kit' supply rather than pre-assembled modules, the Como KIT Plants provide a fully distributed approach to the elution, carbon regeneration and goldroom installations. Traditionally larger systems would be designed by an engineering firm, procured from several suppliers and site constructed, Como KIT Plants incorporate all of Como's extensive system design knowledge into one convenient package. Our KIT plants provide the performance that you'd come to expect for our Como MODULAR systems, within more spacious layouts to deliver enhanced operational and maintenance accessibilities for large capacity gold stripping plants.

HIGH PERFORMANCE PRESSURE ZADRA

Como Engineers have refined the Zadra elution process to achieve market leading efficiencies through the optimization of system flows, elution temperatures, reagent combinations, electrowinning cell and rectifier designs. Our proprietary designs, coupled with our interactive PLC automation packages, can deliver batch operated plants which complete concurrent elution and electrowinning cycles in as little as 8-10 hours.

Offering both a smaller footprint and lower costs, when compared to AARL, the Zadra process is also the most forgiving if your site suffers from poor water quality. Designed to be robust, fast and effective, our High Performance Pressure Zadra has proven itself to be an industry leading technology.

Como Engineers also offers Atmospheric Zadra systems for operations that wish to avoid superheated processing of carbon.

INTEGRAL PRESSURE STRIP (IPS)

Como Engineers introduced the first Integral Pressure Strip elution circuits to the market in the late 1980's having developed the production plant in conjunction with metallurgist Ken Baxter in Perth, Australia.

The proprietary design provides the fastest desorption and electrowinning cycle available on the market, with a 5-8 hour cycle duration. By pressurizing the electrowinning cell, the gold-cyanide complex within the solution is destabilized and as a result electrowinning efficiency increases, thus reducing the solution tenors exiting the cell. With low solution tenors returning back to the elution column, optimal kinetics for rapid eluting of the precious metals off loaded carbon is achieved.

With no requirement for a de-pressurizing stage, prior to electrowinning (as occurs in the Pressure Zadra and AARL processes), associated energy losses are avoided. Making the Como Integral Pressure Strip the most energy efficient of all carbon desorption processes.

AARL

Conventional and Split AARL designs are available for operations which prefer this traditional carbon desorption process.

OPTIONS, SUPPORT AND SPARE PARTS

Como Engineers offer complete stripping plant packages, stand-alone system modules and individual equipment sales for new facilities or as upgrades to existing brownfields circuits.

All our clients receive ongoing technical support from our global team of experts. We also offer our knowledge and expertise to assist in on-site erection, commissioning, operator training and plant optimization. In addition, Como is your one stop shop for all required spares throughout the operating life of your plant.

SOME RECENT INSTALLATIONS:

- Client: Banro Corporation, Twangiza Operations, DRC; 3 tonne automated PLC controlled Pressure Zadra System with carbon regeneration structural and goldroom, 2013
- Client: Co Company, Tiout Operations, Morocco; 2 tonne automated PLC controlled Pressure Zadra specified for silver-gold recovery with containerized goldroom, 2013
- Client: Agnico Eagle, Laronde Operations, Canada; 8 tonne automated DCS controlled Pressure Zadra System with 500kg/hr natural gas carbon regeneration kiln, fine carbon recovery, transfer water system and goldroom, 2013
- Client: MCC, Sudan Pilot Plant, Sudan; 2 tonne manual Pressure Zadra elution plant with modular containerized goldroom, 2012
- Client: Metso Minerals SALA, Nordic Mines Laiva Plant, Finland; 6 tonne automated PLC controlled Pressure Zadra system with 300 kg/hr LPG carbon regeneration kiln, transfer water tank and fine carbon recovery system and collapsible goldroom, 2011



For more detailed information and technical specifications please contact:

martin.smith@comoeng.com.au
or **spares@comoeng.com.au**

ELUTION MODULE

The elution modules are available in either relay controlled operation with manual valves or full batch PLC control with touchscreen operation and include:

- Acid Wash Column with direct acid injection manifold and HCl acid dosing facility
- Thermally lagged Elution Column with integral carbon filters
- Como's proprietary 'Direct Eluate' heating circuit (indirect available as option only to 120°C operation) with fuel fired package burners available in LPG, Natural Gas or Diesel. Electric direct heating is also available
- Skid mounted thermally lagged reagent tank(s)
- Control system (Basic option - relay/programmable controller operation or full PLC batch control with automation of valves)
- Electrowinning cells located in secured electrowinning room
- SCR or Switch Mode Rectifiers
- All Piping and Instrumentation
- Available in sizes from: 1 tonne – 10 tonne carbon capacity in MODULAR form or 8 tonne – 20 tonne carbon capacity in KIT form

Metso Minerals - Nordic Mines Gold Project, Laiva Finland

Como Engineers were engaged to supply a 6 tonne PLC automated Pressure Zadra System with 300kg/hr LPG fired carbon regeneration kiln and integral goldroom.

The plant is the most modern of Como's MODULAR designs and was designed in accordance with strict European EU Directives with fully audited Quality Control Documentation assessed by EU Notified Body - Lloyds.

The system included a 1500kW Direct Eluate Heating system with full PLC control of all elution process steps, plus a 300kg/hr LPG fired regeneration kiln with a twin quench tank system. The Nordic Mines plant also saw the introduction of our collapsing modular goldroom system which uses interconnecting modules to assemble a goldroom of any size to client specifications.



Laronde Deep Mine - Agnico Eagle Laronde Deep Mine Project, Canada

Como Engineers were engaged by Agnico Eagle, based in Cadillac Quebec, for the detailed engineering design and equipment supply for the elution, regeneration, goldroom and carbon recovery systems of their Laronde Deep Mine project.

To be located at their existing mine processing facility located in the Abitibi region of Quebec, Como was also responsible for the supply of much of the process equipment. Supplied equipment included our proprietary designed ASME elution and acid wash columns (8 tonne capacity), our ESF Series stainless steel range of electrowinning cells, quench tank pressure vessels, a 500 kg/hr Custom Furnaces Carbon regeneration kiln and ancillary accessories.

Agnico Eagle is a repeat client of Como Engineers having utilized one of our automated elution and regeneration packages on their Lapa mine in the same region in 2008.



Banro Corporation - Twangiza Gold Project, Democratic Republic of Congo

Como Engineers supplied a 3.0 tonne Modular PLC automated Pressure Zadra Elution System with integral Goldroom and Carbon Regeneration Structure.

The plant was fully constructed, assembled and hot run tested in Perth, prior to being dismantled and shipped to site in nine 40' sea containers.

The system included a 700kW Direct Eluate Heating system with full PLC control of all elution and electrowinning process cycles. The system allows for client customization of the system control interface to allow for the site's primary language for the system operation.

This system was manufactured to Como's latest design, and included new enhancements for improved operability.

REGENERATION MODULE

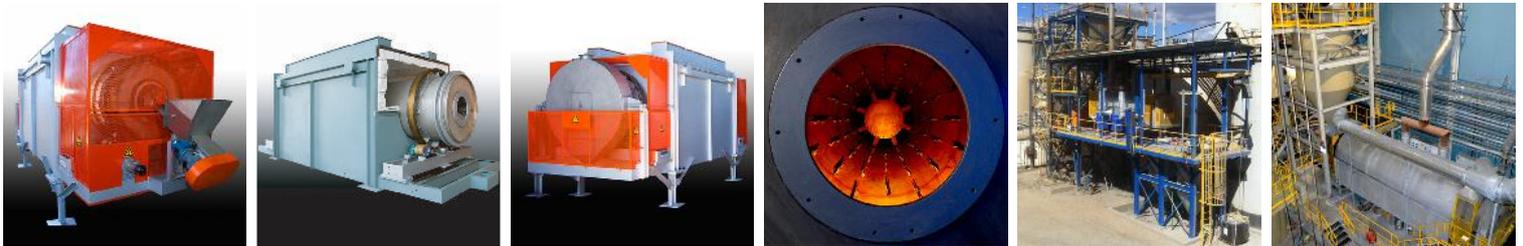
The regeneration plants are available in relay controlled-manual valve operation or with full PLC operation and include:

- Custom Furnaces horizontal regeneration kiln (LPG, NG, Diesel or Electric fired)
- Coded (ASME, BS or AS) pressurized carbon quench tank
- Elevated regeneration kiln support structure (floor mounted system available on request)
- Carbon feed hopper with access platform
- Barren carbon dewatering screen (DSM design best suited for this application)
- Dry or wet carbon sizing screen
- All Piping and Instrumentation
- Available in sizes from: 50 kg/hr to 1400 kg/hr

Custom Furnaces

Como Engineers is proud of its long history as a distributor for the class leading carbon regeneration kilns from Custom Furnaces. All Como MODULAR & KIT Gold Stripping Plants include the integration of Custom Furnaces horizontal rotary kilns, which complement Como's high performance elution designs by achieving top quality regeneration of the eluted carbon to activities greater than 90%.

The kilns are strictly designed around proven process fundamentals with attention placed on ensuring sufficient thermal conduction of heat to the carbon. This is achieved by providing adequate thermal area in the retort tube, a suitable lifter design for gentle bed agitation and a minimum of 20 minutes retention time at process temperatures. An ever present reducing steam atmosphere and co-current exhaust flows prevents the re-contamination of cold carbon with by-products of pyrolysis, ensures Custom Furnaces' carbon regeneration kilns deliver consistent and high quality carbon performance to maximize the efficiency of your adsorption process.



GOLDROOM MODULE

Como supplies both MODULAR collapsing goldrooms or full multi-floor structural KIT goldrooms complete with all the required equipment for gold processing and refining, including:

- Integration of electrowinning cells and rectifiers
- Cathode wash bays
- Pendant controlled gold barring furnaces A100-A1000 (LPG, NG or Diesel) complete with extraction systems
- Barring furnace gold dust collection baghouses
- Calcine Ovens with extraction systems
- Mercury retort systems (if required)
- Cupellation furnaces (if required)
- Gold Safes
- Workbenches & Tooling (needle guns, polishing/buffing equipment/drill presses etc.)
- Security monitoring system pre-fitted (Optional)

Kit Goldroom

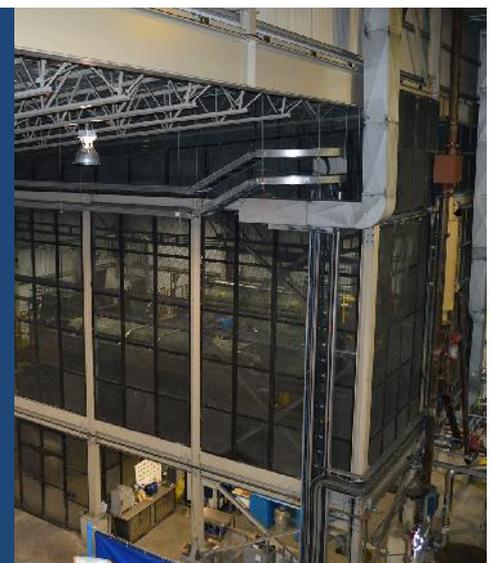
Como Engineers first developed our KIT goldrooms when we were engaged by Agnico Eagle, based in Cadillac Quebec, to deliver the goldroom design for their Deep Mine project.

The KIT goldroom design provides a two level structural goldroom with the lower floor containing the gold processing equipment and optional laboratory space, and the second floor dedicated to the electrowinning.

The elevated electrowinning level can be provided with various containment options, these include:

- Sealed chequer plate bunding;
- Integrated Bondek formwork, reinforcement and ceiling system for site slab pour, or;
- Hollowcore pre-fabricated beams which only require a sealing layer of grout.

All security screens, structural members and piping are pre-fabricated and packed into standard shipping containers for transportation to site.



OPTIONAL EQUIPMENT OVERVIEW

Our Fresh Carbon Conditioning, Transfer Water, Fine Carbon Recovery and Sludge Processing Systems provide further enhancements to your Como Modular & Kit Gold Stripping Plant.

Fresh Carbon Conditioning System

Optimal carbon management starts with minimizing the introduction of carbon fines into your adsorption circuit from fresh carbon additions. Comprising of an agitated conical bottom tank, carbon transfer eductor, fresh carbon feed chute, support structure and electric monorail, this system conditions fresh carbon for more effective sizing prior to its entry into your CIL/CIP/CIC circuit.

Transfer Water System

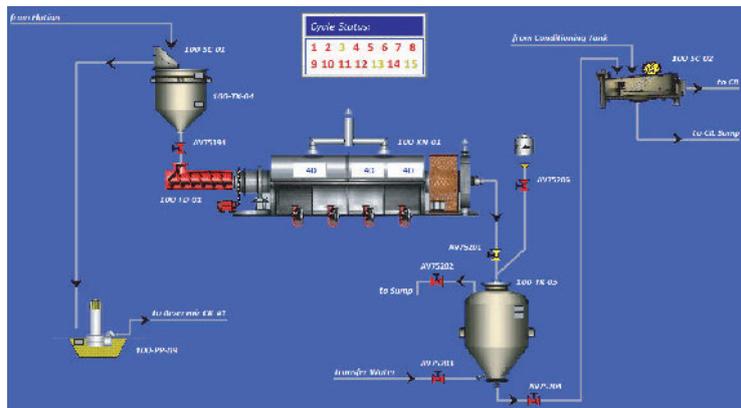
Como's pressurised hydraulic carbon transfers, used throughout our elution and regeneration systems, minimizes carbon attrition and consequently fine carbon losses. Our Transfer Water Systems, comprising of a fine carbon settling transfer water tank and a transfer water pump system, supplies the motive waters that transport carbon around the plant. The transfer water used is recovered and recycled back to the transfer water tank, thus minimizing your plant's overall water consumption. The returning transfer water carries with it loaded carbon fines which have migrated to elution from the adsorption circuit. The transfer water tank incorporates a solids settling design to capture and retain the loaded carbon fines for their recovery and processing.

Fine Carbon Recovery System

Often in CIL/CIP/CIC systems, carbon attrition generates significant volumes of floating carbon fines which can migrate to the elution system. Consequently, elution systems can receive in the order of 5-10kg of fine carbon per tonne of sized carbon stripped. When used in conjunction with the Transfer Water System, a new gold revenue stream can be realized through the recovery and processing of loaded carbon fines. The Fine Carbon Recovery System bleeds a constant stream of recovered transfer water through a plate and frame filter press recovering the loaded carbon fines which have settled within the transfer water tank. With fine carbon loadings typically higher than stripped carbon, our Fine Carbon Recovery System maximises the return on investment for your processing facility.

Sludge Processing System

Como has developed a highly effective system of recovering metal sludge when stainless steel mesh sludging is utilized in electrowinning. Incorporating a sludge settling tank, plate and frame filter press and transfer pumps, this system operates in a closed circuit to separate the fine dendritic sludge from the eluate permeate. The resulting cake is firm, compact and low in residual water enabling immediate low temperature oven drying and dore processing. Far more effective than cumbersome pressure pot filtering or decant methods, our Sludge Processing System offers a simple, reliable and efficient solution for metal sludge processing applications.





COMO
ENGINEERS

MECHANICAL & MINERAL PROCESS ENGINEERS

PERTH | MELBOURNE | JAKARTA

HEAD OFFICE:

130 Stirling Highway
North Fremantle
Western Australia 6159

+61 (8) 9432 0100

www.comoeng.com.au
reception@comoeng.com.au



www.comoeng.com.au