EPCM Technology

ENGINEERING - EPCM has provided engineering services and technology to the base metals industry for over three decades.

EPCM applies its expertise to developing creative and practical solutions which will enhance their clients' needs for better operation, lower maintenance costs, higher reliability and productivity. Our experience includes new plant design, expansion/modernization, process optimization, safety and environmental projects.

EPCM has developed its business based on personalized service, design creativity, project management and cost control. Complete turnkey services are offered for project execution and single responsibility including Basic Engineering Studies, Detailed Designs, Procurement, Project Management, Plant Upgrades and Optimization.

TECHNOLOGY - EPCM has participated in projects that today utilize over 800,000 cathodes and produce over 5,000,000 tonnes of copper annually.

Cathodes, Equipment, Engineering Supply & Services

EPCM has more than 20 years of experience in the provision of Stainless Steel Cathodes, Cathode Handling Equipment and Engineering for modernization and new projects for copper electrorefining and electrowinning production plants. The SP cathode and the robotic stripping system with new cathode wash technology makes EPCM your preferred technology!

Cathode Manufacturing

Tecnologias Cobra Limitada, an EPCM company, operates a new cathode manufacturing facility conveniently located in Antofagasta, Chile, the heart of the world copper belt. Cobra was inaugurated in 1998 and provides manufacturing and service to the copper industry. Over 600,000 permanent cathodes have been manufactured in Cobra's plant with the largest single order being 132,000 for the largest refinery in the world. Cathodes manufactured by Cobra are in service globally.

SERVICE – Client support includes spare OEM parts, on-site machine service, equipment upgrades, cathode maintenance, hydraulic component repair and training.

Taking responsibility for the maintenance of your production equipment is a demanding challenge. Our team of professionals and technicians work hard to keep the equipment under their responsibility operating well. Contract maintenance has been adopted by some major producers.

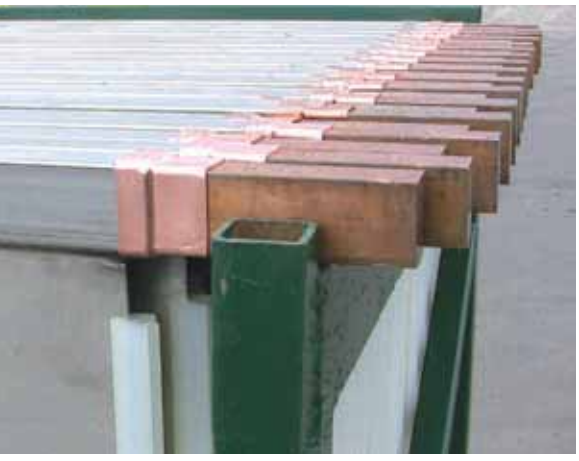
SP TANKHOUSE TECHNOLOGY

Your Winning Solution

EPCM
2829 Sherwood Heights Drive,
Oakville, Ontario, L6J 7R7 Canada

Tel : 1.905.829.1711 • Fax: 1.905.829.1717
oakville@epcm.com • **www.epcm.com**

Copper Refineries & Electrowinning Plants



EPCM has over 20 years of experience in the copper electrorefining and electrowinning industry, involving technology development, marketing, procurement, engineering and project management for technology supply to over 40 new and modernization projects. These plants today produce approximately 5 million tonnes of copper.

REFINERIES

		Capacity: T/Y	Stripping Machines	Cathodes
Kennecott Utah Copper	1994	280,000	2 @ 500	66,500
Grupo Mexico	1997	300,000	2 @ 500	66,010
LS-Nikko Refinery #2	1997	180,000	1 @ 500	29,250
Noranda CCR Refinery	1998	360,000	3 @ 500	82,000
LS-Nikko Refinery #2 Expansion	2001	40,000	--	7,500
Codelco – Chuquicamata	2002	870,000	4 @ 500	132,000
LS-Nikko Refinery #1	2005	275,000	2 @ 480	45,000
Jinlong	2007	100,000	1 @ 480	20,500
Jinlong Expansion	2008	75,000		15,000
Jinlong Expansion	2009	25,000		5,000
LS-Nikko Refinery #1 Expansion	2007	30,000		6,000
Metallo-Chimique	2009	30,000	1 @ 180	5,400
Yanggu Xiangguang Copper	2010	200,000	2 @ 500	20,000
Zijn Copper	2010	200,000		38,880
Guangxi Non-Ferrous	2011	300,000		55,500
Baiyin Non-Ferrous	2011	200,000	2@500	40,000
LS Nikko Refinery Ref. #1 Exp.	2011	30,000		6,000
TOTAL		**3,495,000 Tonnes/Yr**		**640,540**

ELECTROWINNING PLANTS

		Capacity: T/Y	Stripping Machines	Cathodes
Empresa Minera de Mantos Blancos – Mantoverde	1995	40,000	1 @ 300	9,000
– Santa Bárbara	1995	40,000	1 @ 300	9,500
Compañía Minera Carmen De Andacollo	1996	20,000	1 @ 60	3,970
Sociedad Contractual Minera EL ABRA	1996	225,000	2 @ 500	46,200
Asarco Inc. - Silver Bell	1997	16,600	1 @ 120	3,680
Codelco - Radomiro Tomic	1997	180,000	2 @ 500	42,475
Compañía Minera Gibralter Lomas Bayas	1998	60,000	1 @ 300	11,160
Compañía Minera Dona Inés de Collahuasi	1998	55,000	1 @ 350	11,480
Minera Escondida Ltda.	1998	137,000	2 @ 350	27,720
Minera Maria S.A. de C.V.	1999	25,000	1 @ 125	5,130
BHP Tintaya S.A.	2000	35,000	1 @ 150	6,900
Inco Limited	2000	10,900	1 @ 125	
Disputada Los Bronces	2000	17,800	1 @ 125	4,080
Codelco-Radomiro Tomic Expansion	2000	75,000	1 @ 500	16,320
Escondida Sulphide Project	2005	180,000	2 @ 500	25,000
Mantos de la Luna	2005	20,000	1 @ 60	
Codelco Gaby Project	2007	150,000		30,000
China Gold	2007	20,000		3,400
Kamoto Operating SPRL	2007	30,000		6,000
Miduk Heap Leaching	2010	5,000	1 @ 60	1,000
Central Asia Metal	2011	10,000		2,500
TOTAL		**1,352,300 Tonnes/Yr**		**268,015**

In addition to the above copper related projects, EPCM enjoys a 30 year history of Engineering, Procurement and Construction Management Services in the heavy industrial process sector.

Your Winning Solution

YSP TANKHOUSE TECHNOLOGY

EPCM
2829 Sherwood Heights Drive,
Oakville, Ontario, L6J 7R7 Canada

Tel : 1.905.829.1711 • Fax: 1.905.829.1717
oakville@epcm.com • **www.epcm.com**

SP Robotic CSM*

EPCM is a leading supplier of Stainless Steel Cathodes and Cathode Stripping Systems for the base metal electro refining and electrowinning industry. Our systems have a range of automation levels that vary from 40 to 500 cathodes per hour. Since 1992, EPCM has been involved in projects that are utilizing more than 900,000 cathodes and which produce over five million tonnes of copper annually.
Our development and continuous improvement programs have created innovations which are a major benefit to copper producers around the world. Some of the innovation highlights are:

- Robotic material handling
- SP Cathode washing
- Under running transfer car
- Full length edgestrip press

Superior Performance

EPCM cathode washing and stripping systems utilize robotic technology for material handling. The benefits of robotics over conventional carousel and linear conveyor systems are:

Reliability Leveraging the rigorous reliability demands of the automotive industry, EPCM brought this standard to the tankhouse by pioneering the Robotic CSM. The robots used in the EPCM stripping systems have a history of over 64,000 operating hours between major failures (MTBF).

Flexibility The use of robots increases operating and layout flexibility. Since the stripping stations are modular, multiple stations can be used to increase operating capacity. As well, optional stations such as sampling, dimpling and clinching can easily be added to an existing system without a major cost or down time.

Noise Reduction The use of robots for stacking eliminates the need for traditional sheet stackers which drop sheets a greater distance generating higher noise levels.

Lower Capital Cost In most applications, a robotic stripping system can be installed on a flat floor slab without the requirement for extensive "pits" and machine foundations.

Improved Maintainability The use of robots results in a better equipment installation for maintenance and cleaning access.

Energy Efficient The robots utilize efficient servo motor drives which have greater electrical efficiency than hydraulic systems commonly used on custom material handling equipment.

** Patent pending*

SP TANKHOUSE TECHNOLOGY

Your Winning Solution

EPCM
2829 Sherwood Heights Drive,
Oakville, Ontario, L6J 7R7 Canada

Tel : 1.905.829.1711 • Fax: 1.905.829.1717
oakville@epcm.com • **www.epcm.com**

SP Cathode Wash*

Total Cathode Surface Wash

The cathodes travel through the SP cathode wash system perpendicular to the direction of the wash water spray so that the entire copper surface is exposed for cleaning. Direct water contact with the copper surface is a major improvement over traditional cathode wash systems where the water approaches the copper surface from the top and sides.

Four Wash Stages

- Two wash stages with a line of nozzles spraying recirculated water directly at the copper face.
- A rinse stage where a line of nozzles sprays fresh hot water directly onto the copper surface to remove residual wash water.
- An integrated drying tunnel utilizes the make-up ventilation air to evaporate the surface water as the cathodes exit the wash booth. This new drying concept reduces energy consumption while producing a drier cathode product for further processing.

Dropped Cathodes Eliminated

The cathodes are bottom-supported as they are conveyed through the wash system, eliminating copper pre-stripping and inherent production stoppages.

Reduced Energy Consumption

Since cathodes enter and exit the wash booth parallel to the direction of travel, the openings in the booth are minimized. With less ventilation air required to contain the water over-spray, energy consumption is reduced through lower fan power requirements, less water evaporates and the building make-up air heating is reduced.

Internal Heat Recovery Baffles are strategically placed in the wash tank to segregate the wash water for heat recovery.

Reduced Water Consumption Fresh water consumption in the rinse stage is substantially reduced by more effective direct surface rinse spray and by turning off the water when the conveyor is stopped.

Walk-In Maintenance Access Mandoors and an internal walkway allow full access into the wash booth by operators and maintenance personnel.

** Patent pending*

SP TANKHOUSE TECHNOLOGY

Your Winning Solution

EPCM
2829 Sherwood Heights Drive,
Oakville, Ontario, L6J 7R7 Canada

Tel : 1.905.829.1711 • Fax: 1.905.829.1717
oakville@epcm.com • **www.epcm.com**

SP Cathode*

EPCM SP Cathode

In 2007, EPCM developed the Superior Performance (SP) Cathode to provide improved corrosion resistance, while maintaining the highest electrical performance in the industry. Over 100,000 SP Cathodes are in production in copper producers in South America, Asia, Africa and Europe.

The SPU Cathode is a design upgrade which provides the same performance as the SP cathode but at a lower cost. Over 100,000 SPU Cathodes are in production.

Cobra Technology, an EPCM company, was established in 1998 to support Permanent Cathode technology users. Today it operates a modern cathode manufacturing and repair facility in Antofagasta, Chile; the heart of the South American copper belt. To date, Cobra has manufactured over 500,000 permanent cathodes that are in service in base metal tankhouses globally.

Superior Performance

- Consistent low voltage drop during the cathode lifecycle
- Industry leader in structural integrity
- Corrosion resistant
- Easy to repair
- Residual value at the end of productive use

Superior Design Features

- Stainless steel blank welded to a copper hanger bar for long term low voltage drop and electrical efficiency
- Hanger bar wrapped with stainless steel sheath for structural integrity and weld zone corrosion protection
- Dual barrier end seal with inert epoxy and copper sleeve to prevent electrolyte ingression

** Patent pending*

SP TANKHOUSE TECHNOLOGY

Your Winning Solution

EPCM
2829 Sherwood Heights Drive,
Oakville, Ontario, L6J 7R7 Canada

Tel : 1.905.829.1711 • Fax: 1.905.829.1717
oakville@epcm.com • **www.epcm.com**

Permanent Cathode Production

Cathode manufacturing in Tecnologias Cobra started in 2000 and rapidly became the principle manufacturer for the Kidd Process. Production capacity increased with the construction of a "world class" facility in 2003. Cathode manufacturing became a major business activity for new projects and replacement cathodes.

NEW PROJECTS

Year	Project	Quantity	Type
2000	Codelco - Radomiro Tomic	16,000	Sheathed Cathodes
2000	Codelco - Radomiro Tomic	7,500	Sheathed Cathodes
2001	Xstrata - Tintaya	6,900	Sheathed Cathodes
2001	Disputada - Los Bronces	4,080	Standard Cathodes
2001	Codelco - Radomiro Tomic	2,700	Sheathed Cathodes
2002	Codelco - Chuquicamata Modenization	132,000	Sheathed Cathodes
2003	Biocobre	1,420	Standard Cathodes
2004	LS-Nikko Refinery #1	45,000	Sheathed Cathodes
2005	Nornanda - CCR	1,915	Sheathed Cathodes
2006	Escondida Sulphide	22,979	Sheathed Cathodes
2006	Jinlong	20,200	Sheathed Cathodes
2007	Enami - Taltal	1,600	Sheathed Cathodes
2007	Codelco - Gaby	31,130	Sheathed Cathodes
2007	LS-Nikko Refinery #1 Expansion	6,000	Sheathed Cathodes
2007	China Gold	3,500	Sheathed Cathodes
2007	BHP- Billiton Maganese Metal Company	188	Sheathed Cathodes
2007	Chemaf SPRL	2,560	Standard Cathodes
2007	Jinlong	15,000	EPCM "SP" Cathodes
2007	Kamoto Operating SPRL	6,000	Standard Cathodes
2007	RioZim	400	Standard Cathodes
2009	Xstrata Lomas Bayas	1,600	Standard Cathodes
2009	Enami Vallenar	200	EPCM "SP" Cathodes
2009	Codelco Chuquicamata	1000	EPCM "SP" Cathodes
2009	Biocobre	547	Standard Cathodes
2009	Anglo American Manto Verde	1,200	Standard Cathodes
2009	Metallo Chimique	5,400	EPCM "SP" Cathodes
2009	Jinlong	5,000	EPCM "SP" Cathodes
2010	Zijin	38,880	EPCM "SP" Cathodes
2010	Miduk Heap Leaching	1,000	EPCM "SP" Cathodes
2010	Yanggu Xiangguang Copper	20,000	EPCM "SP" Cathodes
2011	Guangxi Non-Ferrous	55,500	EPCM "SPU" Cathodes
2011	Baiyin Non-Ferrous	40,000	EPCM "SPU" Cathodes
2011	LS Nikko Refinery Ref. #1 Expansion	6,000	EPCM "SP" Cathodes
	TOTAL	**503,399**	**Cathodes**

SP TANKHOUSE TECHNOLOGY

Your Winning Solution

EPCM
2829 Sherwood Heights Drive,
Oakville, Ontario, L6J 7R7 Canada

Tel : 1.905.829.1711 • Fax: 1.905.829.1717
oakville@epcm.com • **www.epcm.com**

EPCM

Parts & Service

For over 20 Years...

Our technical team has been committed to suppling superior products and services for a wide range of production support needs in the metals and minerals industry.

Partnering with EPCM Supply Inc. for your replacement parts has benefits:

- Timely delivery
- Proactive expediting and order acknowledgement
- Environmentally friendly packaging
- Tagged & labelled parts for easy identification
- Critical parts inventory
- Engineered solutions

Production equipment maintenance service - A growing alternative:

Taking responsibility for the maintenance of your production equipment is a demanding challenge. Our team of professionals and technicians work hard to keep the equipment under their responsibility operating well. Contract maintenance has been adopted by some major producers.

YSP TANKHOUSE TECHNOLOGY

Your Winning Solution

EPCM Supply Inc.
2829 Sherwood Heights Drive,
Oakville, Ontario, L6J 7R7 Canada

Contact: Dave Walters
Tel : 1.905.855.4219 • Fax: 1.905.829.1717
dwalters@epcm.com • **www.epcm.com**

EPCM

Product Line

HYDRAULIC COMPONENTS

ASA • ASB • ASCOLECTRIC • ATICO • BARKSDALE • BOSCH-REXROTH
BUCHER • CALORITECH • CANFIELD • DAMAN • DAYCO • DELTA
DMIC • FLOW PLUS • GAST • GATES • GEMS • GREER • HANSON
HAWE • HTF • HYDAC • HYDRA-FAB • HYDRAULIC RING
HYDRO-CRAFT • HYDRO-LUX • LHA • MAGNALOY • MAGNETROL
MAILHOT MASDOM • MP FILTRI • NASON • PALL • PARKER • ROTEX
SHRADER BELLOWS • STAUFF • STERLING • SUN • THERMAL TRANSFER
VESCOR VICKERS • WINTERS

ELECTRICAL COMPONENTS

ABB • ALLEN-BRADLEY • BRAD HARRISSON • BUSSMANN • CARLO
GAVAZZI • CROUSE-HINDS • EDWARDS • ENTRELEC • GREENLEE
HAMMOND • HOFFMAN • HONEYWELL • HUBBELL • IPEX • LAMBDA
MICROSWITCH • NOVA • OMRON • ORTRONICS • PHOENIX • RITTAL
ROCKWELL • SCHIENDER • SICK • SIEMENS • SQUARE D
TELEMECANIQUE • THOMAS & BETTS • TURK • UNIVERSAL
WEIDMULLER • WIELAND • WOODHEAD • SARASOTA

PUMPS AND MOTORS

A.O. SMITH • BALDOR • BROOK CROMPTON • BROOK HANSEN
CHARLYNN • DANFOSS • DENISON • EATON • EMERSON • G.E.
HAWE • HYDROMATIK • LEESON • MADISON • MAGNETEK • MOOG
OILGEAR • PARKER • POLCLAIN • REXROTH • ROSS • TECO
US ELECTRICAL • VICKERS • WEG

HYDRAULIC CYLINDERS, REPAIR KITS AND ACCESSORIES

ENERPAC • MILLER FLUID POWER • MILWAUKEE • NORGREN
PARKER-HANNIFAN • SHEFFER

MECHANICAL COMPONENTS AND FABRICATIONS

ASHCROFT • ASSOCIATED SPRING • AURORA • AUSCO
BANYAN CHAIN • BOSTON GEAR • BUNTING • CANADIAN WEIGH
CHICAGO RAWHIDE • COOPER • DEMAG • DODGE • DUFF-NORTON
E&E PRODUCTS • ELECTRONICS INC. • ENDINE • ENERTROL • FAG
FAIRFIELD • FANUC • FESTO • GARLOCK • GENERAL KINEMATICS
GLEASON • GLOBAL CHAIN • GORTITE • HABONIM • HARDY
HELICAL PROD • HOHNER • IGUS • KABELSCHLEPP • KOP-FLEX
KOYO • LECHLER • LORD • LOVE-JOY • MAGNALOY • MARSH • INA
MCGILL • MORSE • NORGREN • NSK • NTN • NUMATICS • OSBORN
PRODUCTO • RENOLD • SIGNODE • SAMUEL STRAPPING
SEW-EURODRIVE • SKF • SPAE-NAUR • TB WOODS • TECOM • THK
TIMKEN • TORRINGTON • TRAKAR • TRU-ARC • UNION • WARNER
WEBSTER • WIKA • WINTERS

We have experienced Service Technicians to perform field services at your discretion. Let us prepare an engineering study to upgrade or modify your existing equipment or ask about our latest generation Cathode Stripping Machine.

Your Winning Solution

VSP — Tankhouse Technology
www.epcm.com

ONEIRA — Engineering Services
www.oneiracorp.com

COBRA TECHNOLOGY — Cathode/Anode Supply & Service
www.tecnologiascobra.cl

CMT — CMT Shanghai Co., Ltd.
加金贸易(上海)有限公司