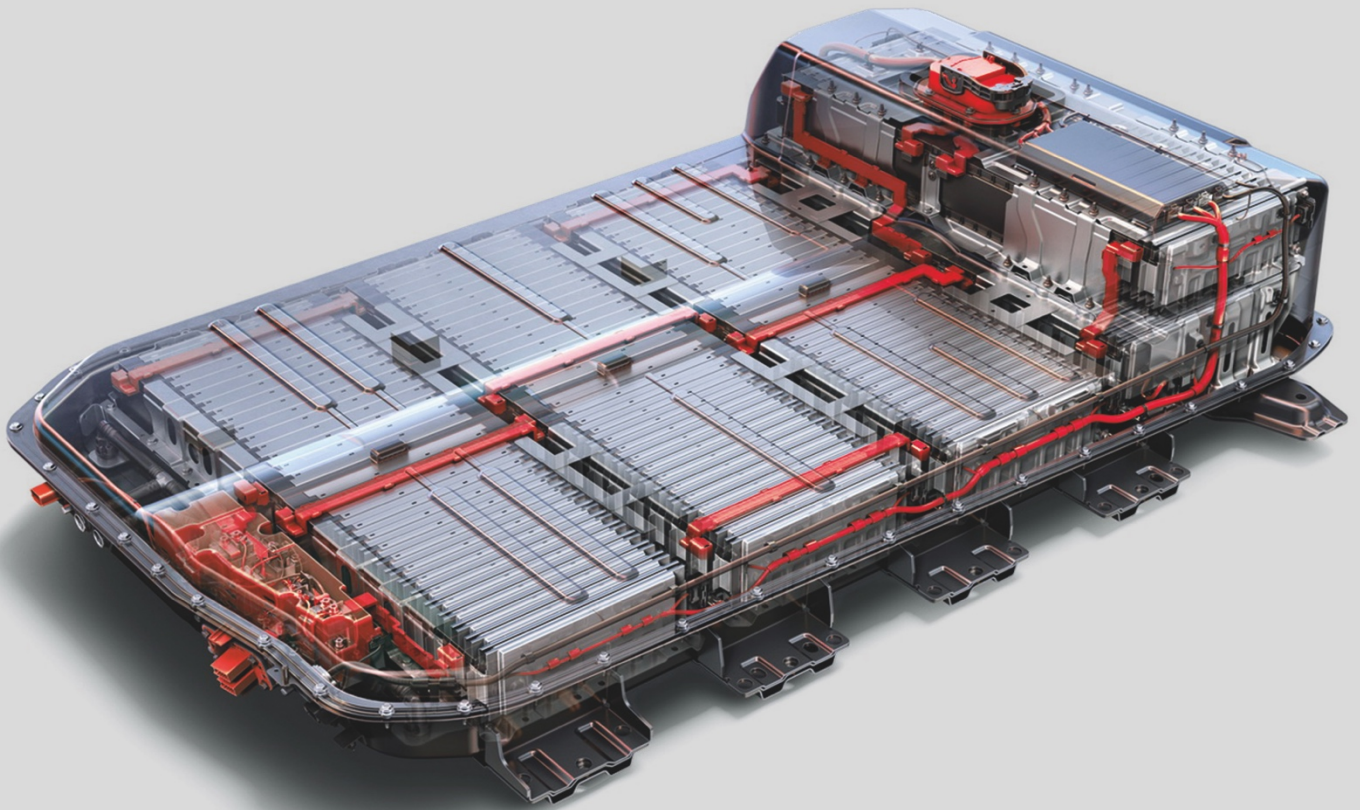


CLEAN TEQ

Powering innovation



OUR TECHNOLOGY

OUR TECHNOLOGY

Clean TeQ's Clean-iX® continuous ion exchange process provides highly efficient extraction and purification for a range of valuable strategic metals from slurries and solutions. Clean TeQ is focused on applying its proprietary ion exchange processes to the recovery of strategic metals from ores and tailings where the conventional routes are economically marginal or pose an environmental burden that is not sustainable.

Clean-iX® covers the complete spectrum of leach systems (both acid and alkaline):

- Continuous Resin-In-Column (cLX) for clarified leach solutions (<4% solids);
- Continuous Resin-In-Pulp (cRIP) and Resin-in-Leach (cRIL) for slurries (4-50% solids);
- Continuous Elution (U-Column) for metal elution and purification.

Clean-iX® has the following benefits for mining applications:

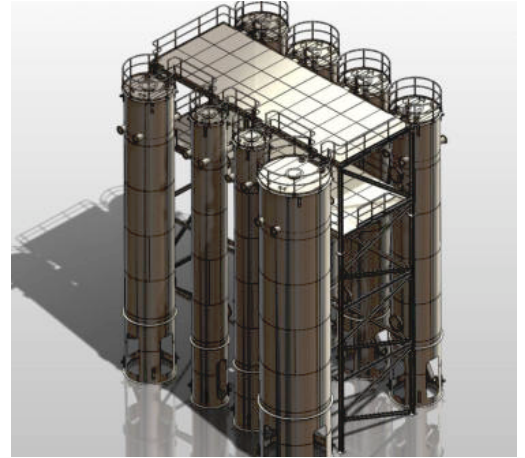
- Optimised resin inventories, up to 25% less than fixed or batch systems;
- Simple to operate and maintain;
- High turn turn-down ratios to allow for fluctuations in feed grade and operations;

Clean TeQ will own, joint venture or develop assets where the application of our technical approach opens significant values that were previously not able to be captured. Focus will be on ores that are lower grade or polymetallic where the advantages of using a direct concentration process to provide the economic driver. Those metals that are of a strategic nature and where future offtake is growing are also on our radar.

Continuous Resin-In-Column (cLX)

Clean-iX® Continuous Resin-In-Column (cLX) is a continuous counter-current process that extracts metals from clarified leach solutions. The cLX system uses moving packed bed resin columns, where the solution and resin are contacted in counter-current flows.

The Clean-iX® cLX system is the most efficient method of direct adsorption available and is suitable for large and small flow rates. cLX operates on solutions with up to 4% solids, minimising pre-filtration requirements.



Continuous Resin-In-Pulp (cRIP)

Clean-iX® Continuous Resin-In-Pulp (cRIP) is a continuous counter current process that directly extracts metals from leached pulps (up to 50% /w solids) and with high resin concentrations (up to 40%v/v). The resin and slurry are mixed directly and moved counter currently in a series of contactors, maximising the efficiency of the process and recovery of target metals. cRIP systems can be integrated with any leaching, elution and purification technology.

In some applications, Continuous Resin-In-Leach (cRIL) gives higher leach recovery rates with a reduction in leaching lixivants. Here, resin is contacted with slurry during the leaching process for metal extraction.



Continuous Elution

Clean-iX® Elution systems use continuous counter current processing of loaded resins to produce a high purity and concentration metal product solutions.

Clean TeQ's patented UColumn Elution uses a "concentration desorption" process, concentrating the metal in solution as well as scrubbing impurities off the resin. This reduces or eliminates the requirement for downstream purification processes as the product eluate stream contains a high concentration of target metals with minimal impurities. Due to its high efficiency, CleaniX® Elution systems typically have lower reagent consumptions (up to 33%) compared to batch systems.



Metals

Clean-iX® can be used to recover the following metals:

Precious Metals:	Platinum Group Metals:	Base Metals:	Rare Earth Elements:	Specialty Metals:
Gold Silver	Platinum Palladium Rhodium Iridium	Copper Nickel Cobalt Zinc	Light (LRE) Medium (MRE) Heavy (HRE)	Scandium Vanadium Niobium Tantalum Uranium Titanium

hydrogen 1 H																	helium 2 He						
lithium 3 Li	beryllium 4 Be																	boron 5 B	carbon 6 C	nitrogen 7 N	oxygen 8 O	fluorine 9 F	neon 10 Ne
sodium 11 Na	magnesium 12 Mg																	aluminum 13 Al	silicon 14 Si	phosphorus 15 P	sulfur 16 S	chlorine 17 Cl	argon 18 Ar
potassium 19 K	calcium 20 Ca	scandium 21 Sc	titanium 22 Ti	vanadium 23 V	chromium 24 Cr	manganese 25 Mn	iron 26 Fe	cobalt 27 Co	nickel 28 Ni	copper 29 Cu	zinc 30 Zn	gallium 31 Ga	germanium 32 Ge	arsenic 33 As	selenium 34 Se	bromine 35 Br	krypton 36 Kr						
rubidium 37 Rb	strontium 38 Sr	yttrium 39 Y	zirconium 40 Zr	niobium 41 Nb	molybdenum 42 Mo	technetium 43 Tc	ruthenium 44 Ru	rhodium 45 Rh	palladium 46 Ph	silver 47 Ag	cadmium 48 Cd	indium 49 In	tin 50 Sn	antimony 51 Sb	tellurium 52 Te	iodine 53 I	xenon 54 Xe						
cesium 55 Cs	barium 56 Ba	57-70 *	lutetium 71 Lu	hafnium 72 Hf	tantalum 73 Ta	tungsten 74 W	rhenium 75 Re	osmium 76 Os	iridium 77 Ir	platinum 78 Pt	gold 79 Au	mercury 80 Hg	thallium 81 Tl	lead 82 Pb	bismuth 83 Bi	polonium 84 Po	astatine 85 At	radon 86 Rn					
francium 87 Fr	radium 88 Ra	89-102 **	lawrencium 103 Lr	rutherfordium 104 Rf	dubnium 105 Db	seaborgium 106 Sg	bohrium 107 Bh	hassium 108 Hs	meitnerium 109 Mt	ununnium 110 Uun	ununium 111 Uuu	unubium 112 Uub	ununquadium 114 Uuq										

Heavy Metals
Platinum Group Metals
Precious Metals
Radioactive Elements
Base Metals
Rare Earth Elements
Other Extractable Elements

*Lanthanide Series	lanthanum 57 La	cerium 58 Ce	praseodymium 59 Pr	neodymium 60 Nd	promethium 61 Pm	samarium 62 Sm	europium 63 Eu	gadolinium 64 Gd	terbium 65 Tb	dysprosium 66 Dy	holmium 67 Ho	erbium 68 Er	thulium 69 Tm	ytterbium 70 Yb
**Actinide Series	actinium 89 Ac	thorium 90 Th	protactinium 91 Pa	uranium 92 U	neptunium 93 Np	plutonium 94 Pu	americium 95 Am	curium 96 Cm	berkelium 97 Bk	californium 98 Cf	einsteinium 99 Es	fermium 100 Fm	mendelevium 101 Md	nobelium 102 No