DUNDEE
SUSTAINABLE TECHNOLOGIES

CYANIDE-FREE PROCESS FOR GOLD EXTRACTION

DUNDEE SUSTAINABLE TECHNOLOGIES

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Our Vision

"The development of an economically viable alternative to the conventional and widespread cyanide process for gold extraction without the short and long term environmental impacts. "

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Corporation Information

- Founded in 1997 as Nichromet Extraction and renamed Dundee Sustainable Technologies (DST) in January 2014
- Company strategy oriented towards the development of new technologies for treatment of refractory ores based on chlorination
- Controlling shareholder: Dundee Corporation
- 30 M$ investment since its foundation in development of technologies and properties
- Current portfolio of technologies includes :
  - Nickel from laterites (high Mg content)
  - Production of specialty fertilizers
  - **Stabilisation of arsenic**
  - **Precious metals extraction by chlorination**

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Current Global Situation

- Pressure over cyanide is increasing worldwide
  - Banned in the US states of Montana & Wisconsin, the Czech Republic and Hungary
  - Restricted in the Mexican state of Morelos and Argentina's Chubut province
- Environmental impacts are now a decisional factor in many new mine projects
- Government authorities have a right and the obligation to legislate in order to protect the environment and the population
- The mining industry has a responsibility to innovate and develop new alternative
- Companies have a duty to consider novel and environmentally safe technologies

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DST's Technology

Fast
- 1-2 hour contact time

Green
- Cyanide-free process
- Sulphur recycled as sulphuric acid
- No effluents, no tailings pond
- Barren and stable solid residues

Flexible
- Tolerate base metals
- May treat ores containing organic carbon
- May treat ores containing Tellurium

Profitable
- Process costs ($/oz) similar to cyanidation
- Inferior (10-15%) capital cost

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Process Introduction

CYANIDE-FREE PROCESS

- Patented process for precious metals (Au & Ag) extraction, using chlorination instead of cyanidation
- Based on a century old known chemistry using chlorine but applied with modern techniques
- Using hypohalides, instead of free halogens, simplifies operation, safety and recycling of halogens by electrolysis
- Closed circuit approach with full recycling of reactants
- If present, base metals (Cu, Zn) and PGE's are also recovered

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Characteristics of Circuit

- Mild conditions
  - The leaching of precious metals is done in vat leaching at atmospheric pressure and ambient temperature
- Produce inert tailings
  - The barren solid after gold/silver extraction is essentially sulphur-free, inert and stable
- Closed-circuit
  - Water is fully recycled using reverse osmosis for rinsing of the barren solids leaving no effluent for the process

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Process Overview

Sulphide Ore → Controlled Oxidation → Sulphuric Acid

Controlled Oxidation → Acid Digestion → Base Metals

Acid Digestion → Chlorination → Precious Metals

Chlorination → Barren Residues

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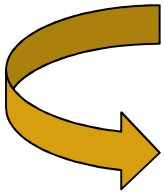
Chlorination Chemistry Involved

Chlorine, along with a catalytic amount of bromine, is used as oxidizing agents because of the particularly **fast reaction of bromine with gold.**

The capability of chlorine to oxidize bromides to bromine, explains the low concentration of bromide required in the brine.

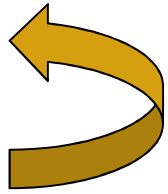
$$2\,HOCl + 2\,HCl \rightarrow 2\,Cl2 + H2O$$

$$2\,NaBr + Cl_2 \rightarrow 2\,NaCl + Br_2$$



$$2\,Au + 3\,Br_2 \rightarrow 2\,AuBr_3$$

$$2\,AuBr_3 + 3\,Cl_2 \rightarrow 2\,AuCl_3 + 3\,Br_2$$



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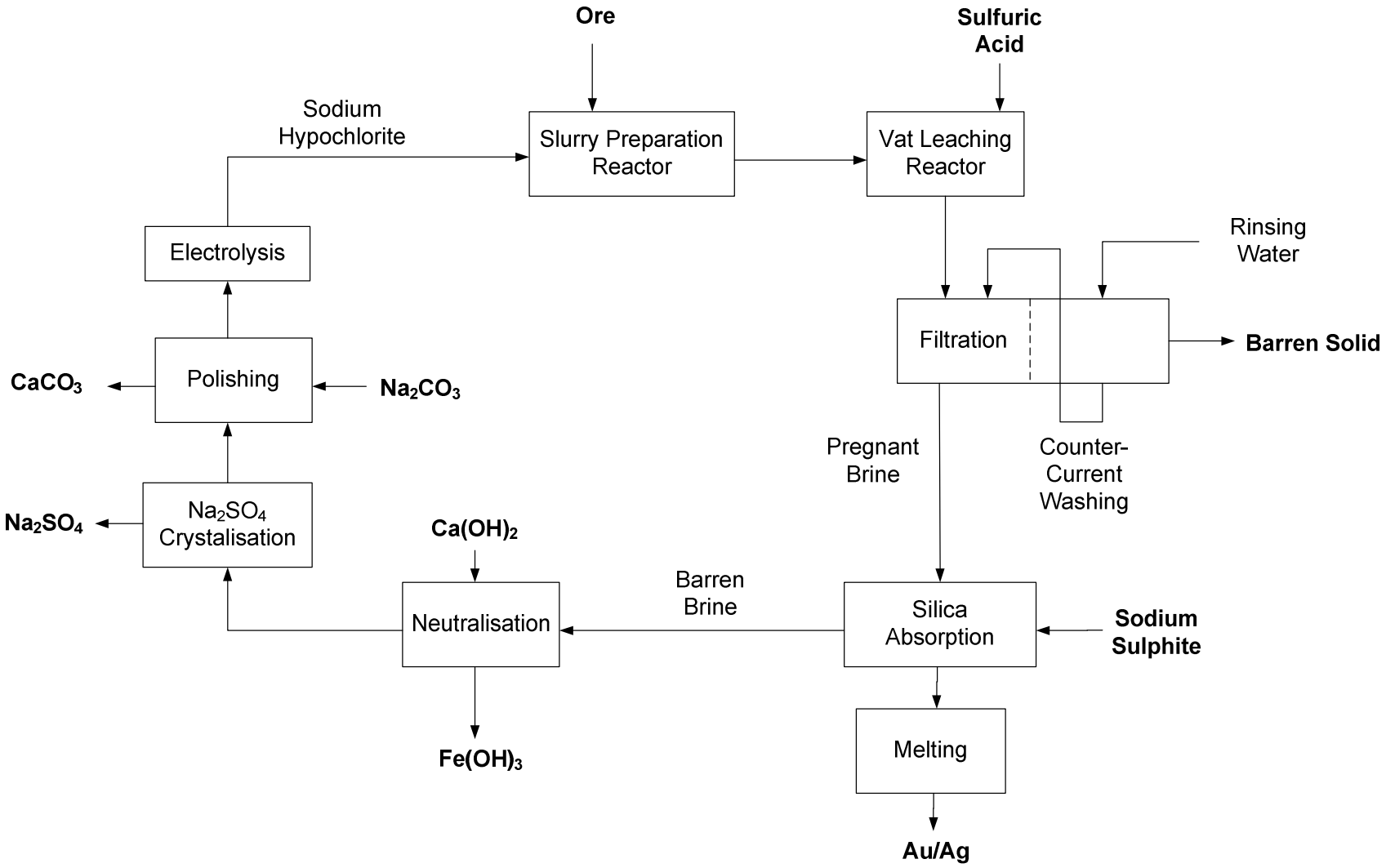
Chlorination Circuit Overview



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A key Process Step: Regeneration of Hypohalides

- Chlorine/bromine are uses as the active agents in the reactor itself
- Chlorine/bromine generated in situ by introducing hypohalides in the reactor under acidic condition

$$2\ HOCl + 2\ HCl \rightarrow 2\ Cl_2 + H_2O$$

- Hypohalides are further regenerated by electrolysis
- The active elements, chlorine/bromine, are generated in an electrolytic cell without separated compartments

Anode:	$2\ Cl^-$	$\rightarrow$	$Cl_2 + 2e^-$
Cathode:	$2\ Na^+ + 2e^-$	$\rightarrow$	$2\ Na$
	$2\ Na + 2H_2O$	$\rightarrow$	$2\ NaOH + H_2$
Mixing :	$2\ NaOH + Cl_2$	$\rightarrow$	$NaOCl + NaCl$

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Environmental Advantages

- **No Cyanide**
- **Closed-loop** process with recycling of reagents and water, eliminating the need for ponds and the risks of containment collapse
- No liquid or gaseous effluents
- Solid residues are sulphur and base metal depleted, **not acid generating** and easily meet environmental regulation

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Environmental Reconnaissance

700 k$ grant from the Green Technologies Demonstration Programme.
Québec Government 2011-2012

5 M$ grant from Sustainable Development Technology Canada.
Canadian Government 2013-2014

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Pilot Plant Summary

- Built in 2010 (1 TPD capacity)
  - Nearly 3 years of operation
- 7 different ore or concentrates processed so far
  - Approximately 100 T of ore processed
- Over 1 000 hours of operation
- Extraction yield
  - **> 90 % in all cases**
  - 95% in most cases
- Demonstrated on whole ore and concentrates
- Alternative for gold extraction to the conventional cyanidation process

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Successfully Demonstrated

Sources	Type	Gold Grade (g/T)	Barren Solid (g/T)	Yield (%)
1: Canada (Quebec)	Ore	2,58 g/T	0,07 g/T	97,5 %
2: Canada (Quebec)	Ore	3,45 g/T	0,34 g/T	93,2 %
3: Canada (Quebec)	Ore	13,9 g/T	0,79 g/T	95,4 %
4: Canada (Ontario)*	Conc.	55,3 g/T	4,79 g/T	94,0 %
5 : Eastern Europe*	Conc.	7,5 g/T	1,48 g/T	91,0 %
6: Canada (Quebec)*	Conc.	53,5 g/T	3,56 g/T	94,1 %

*Flotation concentrates requiring pre-treatment by oxydation

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Pilot Plant in Picture

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Economic Comparison to Cyanide

- Operation costs are similar to cyanidation on a $/oz basis
- **Lower capital costs** by a factor of about 10-15 % due to:
  - Reaction time, gold extraction in hours instead of days (24X shorter process time)
  - Smaller plant and site
  - No need of costly tailings pond facilities
- Allows for valuation of **refractory ore** deposits to conventional cyanidation
- Reduced site **rehabilitation costs** due to smaller site footprint and less environmental liabilities

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Process Economics

- Evaluation of operating costs for a 400 TPD plant
- Compares advantageously to industry standards

REVENUS	Units
Ore grade	4.38 g/T
Value (1300 $/oz, 95% recovery)	173 $/T
PROCESS COSTS*	**Units**
Crushing/grinding	10.00 $/T
Gold Extraction	9.15 $/T
Labor	8.05 $/T
Energy	1.85 $/T
G&A	0.95 $/T
TOTAL PROCESS COST	21.95 $/T
	156 $/oz Au

* Mining not included

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Industrial Implementation

- Design of a 25 M$ demonstration plant underway in Thetford Mines
  - 15 TPD concentrate capacity
  - Gold pyrite concentrates as feed material
  - Includes a 300 TPD concentration plant
- Construction scheduled to start 2nd quarter of 2014
  - Start-up scheduled for 1st quarter 2015
- 2 year demonstration program will lead to production of 10 000 oz gold on a continuous basis 24h/7d plant

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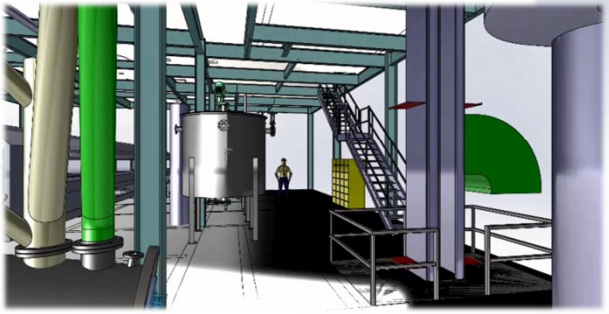
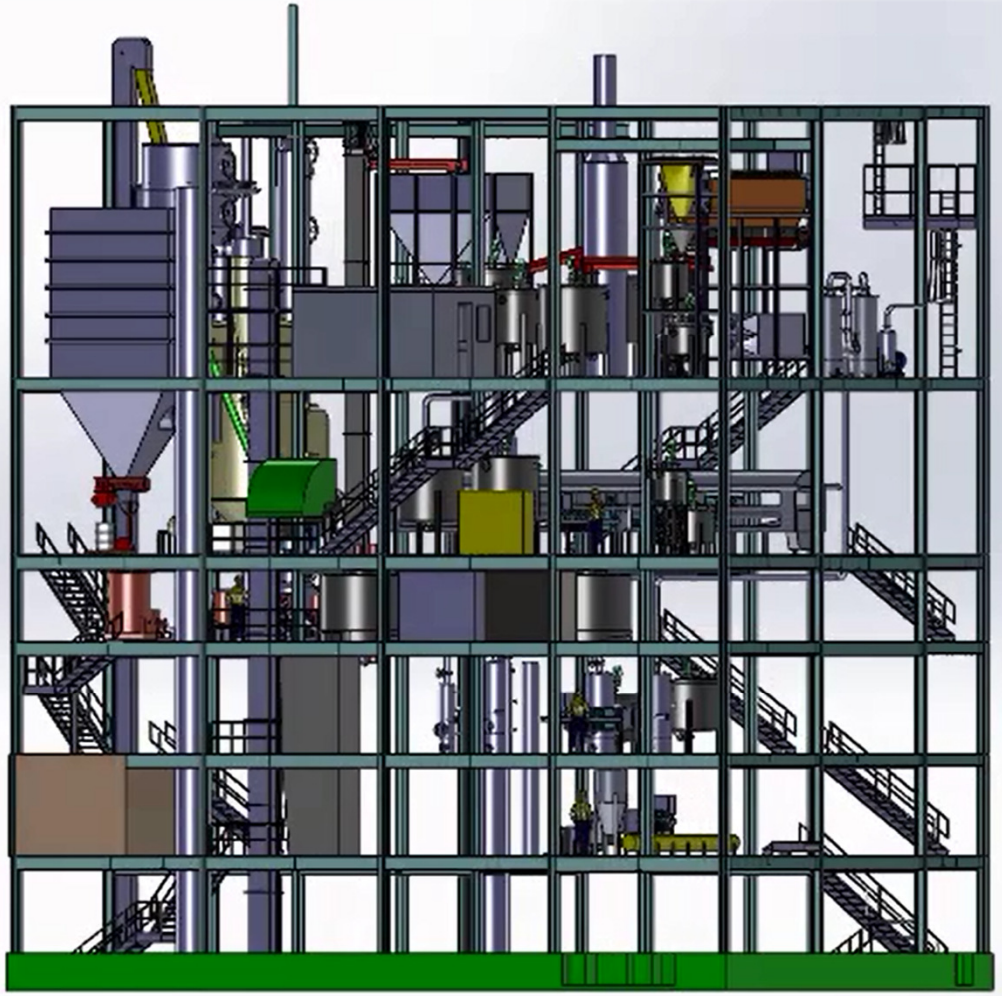
Demonstration Plant Design





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Benefits for the Mining Industry

- **Environmentally friendly** extraction process based on chlorination
  - Cyanide free process
  - Barren solid residues
  - No tailings pond
- Technology developed for **treatment of refractory ores**
  - Possibility to re-evaluate the economic viability of low recovery projects
- Opportunity to re-vamp and improve the mining industry
  - By eliminating traditional cyanidation
  - Increasing efficiency
  - **Increasing social acceptability** by promoting environmentally safe processes
- **Advantageous capital costs** without the environmental mortgage
- Implementation may be modular

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Towards a Greener Gold Industry

- DST developed proprietary hydrometallurgical processes featuring environmental considerations
- Technology successfully demonstrated at pilot scale with first industrial implementation by 2015
- Support from majority shareholder (Dundee Corporation) and the Québec and Canadian Government

Companies with advanced exploration or pre-feasibility stage projects are invited to submit samples for lab demonstration performed at DST's own cost

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Capital Structure

Fully Diluted Share Capital

The following tables outline the expected number and percentage of securities (subject to rounding) of Dundee Sustainable Technologies to be outstanding on a non-diluted and fully-diluted basis after giving effect to the Amalgamation:

Resulting Issuer Shares	DUNDEE CORPORATION	Total Number of Shares	Percentage[1] (undiluted)	Percentage[1] (fully-diluted)
Shares Issued				
Dundee Sustainable Technologies - Subordinate Voting Shares	128,068,497	227,445,202	31.27%	27.75%
Dundee Sustainable Technologies - Nichromet Multiple Voting Shares	50,000,000	50,000,000	68.73%	61.00%
Subtotal	**178,068,497**	**277,445,202**		
Reserved for issuance under the:				
Dundee Sustainable Technologies - Options		23,970,000	n/a	2.92%
Dundee Sustainable Technologies - Warrants		68,305,566	n/a	8.33%
Total (fully-diluted)		**369,585,768**	**100.00%**	**100.00%**

Notes:

1. Percentages refer to the voting power attached to such securities.

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