

Giant
YELLOWKNIFE MINES LIMITED

MEMO TO: D. J. Emery
CC: K. Morton
FROM: K. Blower
DATE: October 21, 1987
SUBJECT: ARSENIC TRIOXIDE FUMING TESTS


As you will see in the attached memo, we have progressed with the arsenic study to the point of actual pilot testwork. The economic potential of recovering both arsenic and gold warrants a continued priority for this important element of our 5 year plan.

We are proposing a 3-stage pilot program that can be discontinued at the end of each stage should progress or costs become inappropriate.

Stage I	\$123,050
Stage II	113,275
Stage III	<u>125,775</u>
TOTAL	\$362.100.

After our discussions re arsenic trioxide prices, we are re-examining the economics of a production facility at 40¢ and 30¢ per pound of product to compare with the 50¢ per pound used in this study.

My recommendation is that we proceed with Phase I of the Pilot Plant tests in any event, while we pursue the marketing issues.


Ken Blower

/kid

Attachment

GIANT YELLOWKNIFE MINES LTD

ARSENIC RECLAIM PROGRAM

Introduction

Arsenic bearing dust from roaster exhaust gas has been stored in underground chambers since Oct. 1951 and today there are some 214,000 tons of dust in storage containing approximately 127,000 oz. Au and 166,000 tons arsenic trioxide.

Stope	Tons dust	% As	Oz./t Au.	Tons As ₂ O ₃	Oz. Au.
B2-08	32,369	65.66	0.354	28,062	11,468
B2-12/13/14	65,355	61.75	0.452	53,285	29,567
B2-30-36	64,157	45.69	1.220	38,705	78,332
B-11	3,084	68.42	0.134	2,786	412
C-12	18,679	65.15	0.172	16,179	3,214
C-9	20,276	67.48	0.124	18,067	2,512
C-10	10,548	66.00	0.133	9,307	1,408
Total	214,468	58.75	0.592	166,391	126,913

Summary

During the early 1980's, a serious effort was made to market a portion of the crude arsenic trioxide being produced at the time and a surface storage and bulk loading facility was built for the purpose. However, it was found that the product was incompatible with the client's upgrading method and shipments were stopped after about a year of operation.

Prior to this, there was a major testing program done in 1979-80 to determine a practical means of upgrading the product to render it marketable and to recover the gold contained in the resulting residue.

The testing program was quite comprehensive and involved pilot testing of the hot water leach/crystallization process that was subsequently installed at the Con mine, as well as a series of fuming/condensation tests in lab scale done by Falconbridge Metallurgical Lab personnel.

Both methods worked quite well on currently produced Giant baghouse dust, achieving product grades exceeding 99.4% As₂O₃ in the case of HWL and 99.7% using the fuming method. Recoveries of 99.02% and >95% As₂O₃ respectively were achieved though lower recoveries using fuming are attributed to design problems with a homemade hot filter. It is expected that recoveries approaching 100% can be achieved using well designed equipment.

In addition to testing of Giant baghouse dust, Con's arsenic sludge from surface storage ponds was tested in the HWL pilot plant. Test results

indicated that As₂O₃ extraction efficiencies of 81.5% and product grades of >99% As₂O₃ could be achieved. The test also showed that a high concentration of water soluble salts other than arsenic tended to foul leach solutions and retard dissolution of arsenious oxide.

Despite the metallurgical problems, Con proceeded to build a HWL arsenic recovery plant at a final capital cost of more than \$13,000,000. As recently as a year ago the plant was capable of achieving only 30% of its design production capacity because of the solution fouling problems. From a recent discussion with mill superintendent, Holgar Kreutzelman however it seems that the process chemistry is now clearly understood and the plant is running quite smoothly. He did not say what production rates were now being achieved. When asked when the reclaim facility would no longer be required, he could not be sure, since they are considering mining refractory ore and may need the arsenic plant for future arsenic production.

The high capital and operating costs combined with low productivity at the Con HWL facility has made this upgrading alternative much less attractive to us and a careful re-examination of the fuming process is justified before embarking on a large scale arsenic reclaim program. That the reclaim program should proceed, there is little doubt. Not only would a toxic waste site of some concern, both to the company and to regulatory agencies be satisfactorily disposed of, the savings in storage costs combined with revenue from As₂O₃ and Au sales could be very substantial.

Gross product value at 100% recovery using current market prices of \$600 oz. Au and \$0.50 per lb. As₂O₃ is \$242,000,000. This does not include the many thousands of tons of high grade ore that will be freed up in making crown pillars accessible.

Marketing

Naturally the wood preservative market, which is by far the largest user of As₂O₃, cannot absorb 166,000 tons of As₂O₃ all at once but it is not unreasonable to expect to enter the market at a production rate of, say 7000 stpy with a growth rate of 5%/yr. If this rate of growth can be sustained, the arsenic stopes will be depleted after about 17 years (assuming the mine remains in production) and the plant will have achieved an annual production rate of 15,280 stpy, as shown below.

Year	Tons/yr	Cumulative
1	7000	7000
2	7350	14350
3	7717	22067
4	8103	30170
5	8508	38678
6	8933	47611
7	9380	65924
8	9849	75773
9	10341	86114
10	10858	96972
11	11401	108373
12	11971	120344

13	12570	132914
14	13199	146113
15	13859	159972
16	14552	174524
17	15280	189804

Increasing plant throughput from 7000 to 15000 stpy can be achieved through redesign and replacement of undersized equipment as production rates increase or by building flexibility into the plant right from the beginning. It is likely that a combination of both approaches will be the best way to avoid inefficiencies.

Before detailed planning can be done, a marketing study would help to determine cash flow estimates and plant design parameters. Terms of reference for such a study would be:

Current price of >99.5% purity As₂O₃, as set by the wood preservative industry.

How much high quality As₂O₃ can the market absorb initially?

What is the projected growth rate?

What additional sources of supply will be coming on stream?

What current suppliers are likely to drop out?

Armed with information provided by the study, we can detail a mining plan that will permit us to most effectively reclaim dust from underground storage and permit access to the valuable crown pillar ore.

It is possible that the arsenic reclaim plant will remain in operation for some years after conventional ore reserves are depleted and for this reason it will be necessary to recover the crown pillars early in the program while ensuring that the upgrading plant and underground reclaim facilities can be self supporting if required. Preparation of access drifts and raises may have to be done well in advance of when they will be used, to take advantage of existing mining capabilities.

Cash Flow Estimate

Sensitivities

1987 Canadian dollars	
Arsenic trioxide price	\$0.50 lb.
Gold price	\$600.00 oz.
Operating cost	\$685.00 ton
As recovery	100%
Au recovery	85%
Production rate	7000 stpy
Growth rate	5% yr
Reclaim sequence	
years 1-4	B2-08
years 5-7	B2-30-36
years 8-12	B2-12/13/14
years 13-14	C10-12
years 14-17	C9-B11-etc.

Year	Tons/yr As2O3	Stope	Rec Au oz/yr	\$/yr As2O3	\$/yr Au	\$/yr Total
1	7000	B2-08	1948	\$7,000,000	\$1,168,800	\$8,168,800
2	7350	"	2241	7,350,000	1,344,600	8,694,600
3	7717	"	2630	7,717,000	1,578,000	9,295,000
4	8103	"	2921	8,103,000	1,752,600	9,855,600
5	8508	B2-30-36	19961	8,508,000	11,976,600	20,484,600
6	8933	"	22176	8,933,000	13,305,600	22,238,600
7	9380	"	24395	9,380,000	14,637,000	24,017,000
8	9849	B2-12-14	3766	9,849,000	2,259,600	12,108,600
9	10341	"	4395	10,341,000	2,637,000	12,978,000
10	10858	"	5022	10,858,000	3,013,200	13,871,200
11	11401	"	5649	11,401,000	3,389,400	14,790,400
12	11971	"	6277	11,971,000	3,766,200	15,737,200
13	12570	C10-C12	1863	12,570,000	1,117,800	13,687,800
14	13199	"	2060	13,199,000	1,236,000	14,435,000
15	13859	C9-B11	1425	13,859,000	855,000	14,714,000
16	14552	"	1583	14,552,000	949,800	15,501,800
17	15280	"	1742	15,280,000	1,045,200	16,325,200

Year	Capital cost	Operating cost	Revenue	Cash flow	Deprec	Taxable revenue	Tax	Net of tax	Cash flow (after tax)	NPV	ROR%
1	5000000	4795000	8168800	-1626200	294117	-1920317	-825736.	-1094580	-800463.69	22773906	0.15
2		5034750	8694600	3659850	294117	3365733	1447265.	1918467.	2212584.81		
3		5286145	9295000	4008855	294117	3714738	1597337.	2117400.	2411517.66	17014542	0.2
4		5550555	9855600	4305045	294117	4010928	1724699.	2286228.	2580345.96		
5		5827980	20484600	14656620	294117	14362503	6175876.	8186626.	8480743.71	13069599	0.25
6		6119105	22238600	16119495	294117	15825378	6804912.	9020465.	9314582.46		
7		6425300	24017000	17591700	294117	17297583	7437960.	9859622.	10153739.31		
8		6746565	12108600	5362035	294117	5067918	2179204.	2888713.	3182830.26		
9		7083585	12978000	5894415	294117	5600298	2408128.	3192169.	3486286.86		
10		7437730	13871200	6433470	294117	6139353	2639921.	3499431.	3793548.21		
11		7809685	14790400	6980715	294117	6686598	2875237.	3811360.	4105477.86		
12		8200135	15737200	7537065	294117	7242948	3114467.	4128480.	4422597.36		
13		8610450	13687800	5077350	294117	4783233	2056790.	2726442.	3020559.81		
14		9041315	14435000	5393685	294117	5099568	2192814.	2906753.	3200870.76		
15		9493415	14714000	5220585	294117	4926468	2118381.	2808086.	3102203.76		
16		9968120	15501800	5533680	294117	5239563	2253012.	2986550.	3280667.91		
17		10466800	16325200	5858400	294117	5564283	2392641.	3171641.	3465758.31		

Total profit

69413851.32

Pilot Testing

In addition to marketing information, we must ensure that we are capable of achieving production rates and product qualities that are consistent with our planning. The only practical means of doing this is through a comprehensive pilot program. One that not only investigates the metallurgical characteristics of the baghouse dust but also looks at the gold recovery potential and the physical reclaim of the dust from underground storage.

The pilot testing would likely be done in a custom testing facility in three distinct stages that would permit evaluation of the program at each stage. We would not want to have a large tonnage of crude baghouse dust in storage at the pilot plant, only to find that there is no economical way of treating or disposing of it.

Stage I would treat current baghouse dust only. This would provide the best opportunity to get the plant up and running and once this is accomplished, recovery and quality control testing would proceed.

Stage II, assuming the results of testing at Stage I justify proceeding, would treat dust from Stope B2-08 and would help to determine what difficulties may be expected in treating lower grade feedstocks. The rationale for choosing B2-08 is that it will probably be the first material treated in full scale production and we will need good background information in setting up the treatment plant.

Stage III would test material from a few of the other stopes. Some of this dust is quite crude and may be expected to cause operating problems such as fluid bed agglomeration, blinding of hot filters, poor gold extractions, etc.. It is hoped that many of these potential problems can be overcome in the pilot stage rather than causing unnecessary losses in full scale operation.

Use of a custom pilot roasting facility seems to make a lot of sense in that we will not have to worry about employment and training of operators on a temporary basis, nor will we have to rely on consultants to advise on design and operating parameters. On the other hand, when we are ready to go into operation with the full scale plant, we will have to train operators from scratch.

The cost savings through custom testing will be substantial though we will not have a pilot scale roasting plant at the conclusion of the test, something that would undoubtedly come in handy from time to time. We will however, have established a relationship with a custom roasting facility that may help to offset this disadvantage.

Timing of the testwork to permit construction of the full size plant next summer would give the advantage to commercial testing, since it is highly unlikely that detailed design studies and construction of a sophisticated pilot plant could be accomplished in a short time, especially since we do not have the benefit of Falconbridge's support services.

Pilot Plant Cost

The RPC pilot plant roasting facility in New Brunswick has two small reactors available for testing, a 6" unit and a 14" unit. The smaller reactor is able to handle about 40 kg/hr. They like to operate around the clock 100 hour test runs and they have personnel on site to do this. They operate with 2 men/shift, 3 shifts/day for a week at a time.

For plant design studies, they recommend quite sophisticated, highly controlled testing, ie. scientist on duty during the test. They estimate a cost of \$2000 - \$2500/day throughout, not including analytical testing which might, depending on requirements, be an additional \$300/day. They claim to have the best analytical lab in Canada.

Cost EstimatesSample collection

equipment	\$4,000
drill rental	20,000
labour	<u>8,500</u>
subtotal	32,500

Transportation

bulk shipments @ \$736/t	73,600
demurrage 15 wks @ \$400	<u>6,000</u>
subtotal	79,600

<u>Pilot plant operation</u>	250,000
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Total	362,100
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It looks like a three month test could cost as much as \$250,000 not counting the cost of recovering and shipping the 100 tons of dust for the test. It is estimated that this would cost an additional \$112,100 for a total cost of \$362,100. This compares with the in-house pilot test proposed by S.Fekete as follows

25 weeks of operation	5 day week	
6 operators	3 @ \$17.76/hr	
	3 @ \$16.10/hr	
	X 1.35 NWLC	\$5485/wk

2 technicians	\$1828/wk
1 professional	\$2250/wk
consulting	\$2250/wk
travel and misc	<u>\$1200/wk</u>
total labour	\$13013/wk

X 25 weeks	\$325,325
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This is about twice the cost estimated in 1980 and, using the same multiplier, equipment and construction cost will be \$150,000, contingency will be \$66,000.

Total pilot plant cost, \$541,325, about \$180,000 more than custom testing

One other point to consider, Fekete's estimate included FML and Falconbrige head office assistance, which is no longer available.

Process Description

Dry feed conveyed to surface from underground storage via a pneumatic conveying system will be stored in a feed hopper sized to hold approximately one day's supply. Feed will be metered into the fluid bed of the fuming reactor via a screw conveyor.

The fluid bed fuming reactor will consist of a firing chamber producing combustion gases at 900 deg C by burning propane to be introduced via the tuyeres into the fluid bed consisting of sand or other suitable inert material. The hot combustion gases will serve as a fluidizing medium and a heat carrier to supply the necessary energy for the fuming. The temperature in the fluid bed will likely be maintained in the range of 350 to 400 deg C by modulating the dry feed input.

The flue gases leaving the fluidizer will pass through a cyclone to recycle fluid bed media and then to a baghouse equipped with heat resistant bags to capture the fine residue. The purified gas containing the arsenic oxide vapours will be cooled by direct contact with ambient air of sufficient quantity to cool the gases to 110 deg C and condense the arsenic trioxide. Subject to pilot plant studies, the condenser will consist of a cylindrical chamber, receiving the hot gases axially on one end and being fed with cooling air tangentially at several points along the length of the condenser. The gradual cooling is expected to promote crystal growth and produce a relatively coarse product for ease of handling. The cooled gases, carrying the solid arsenic trioxide, will pass through a second baghouse to collect the arsenic trioxide, while the clean gases will be exhausted to either the existing baghouse or the existing stack directly. The purified arsenic trioxide will be removed to the product silo for delivery to market.

The fine dust collected in the hot baghouse will be removed and directed to the carbon plant or cyanidation circuit for gold recovery. Since the quantity of this dust will normally be quite small, only intermittent dumping will be required.

Underground Reclaim

Testing of reclaim methods for recovery of stored baghouse dust, both for sample collection and for full scale production will also be necessary and some minor equipment purchases have been made in order to test some ideas in this regard.

It is intended that approximately 80 tons of dust from underground storage, along with 20 tons from current production should be collected for the pilot study. Sample collection will be done from the surface using the Vactor vacuum truck and a 4" suction line. Access will be via the 5 1/2" holes that were drilled in August of 1981 to enable samples to be collected. This work was conducted by Geocon and dust samples from 7 locations were collected, along with other physical data such as consolidation at depth, shear stress, etc..

Following the 1981 drilling program, the drill holes were plugged with Pozani plugs, pneumatic packers and grout, and can be drilled out as required.

BOREHOLE SUMMARY

Borehole No.	Stope No.	<u>Depth below ground level to</u>				
		Bedrock Surface ft.	Top of Stope ft.	Surface of Arsenic Dust ft.	Bottom of Borehole ft.	Top of Plug ft.
4	B2-08	49	106	138	202	87
5	B2-30	4.5	220	225	277	97
6	B2-33	4	122	145	254	97
7	B2-34	23.5	117	125	207	99
8	B2-35	32	109	123	231	97
9	B2-36	17	128	144	237	29
11	C-9	14	109	109	242	97

The full scale reclaim proposal incorporates two potential methods, depending on accessibility and storage chamber configuration. One method combines vacuum pickup from 1st level with pneumatic conveying to surface, while the other method involves withdrawing dust from the chambers through use of a screw conveyor located on the 2nd level and then pneumatically conveying to surface storage. Of the two methods, vacuum reclaim is expected to be the most practical and will probably be applied wherever possible.

One of the major difficulties to overcome in any reclaim scheme is the tendency of the material to either arch over or rathole. If the dust will not collapse as it withdrawn, then flow must be induced through artificial means, or else the pickup nozzle must be capable of horizontal as well as vertical movement.

A 1982 study by Jenike and Johanson found that the material --" has a strong tendency to ratholing ---- has the capability for arching over a slot of 2.1 ft. width after storage at rest for 168 hours. The flow problems which are particularly relevant to the problem of reclaiming the arsenic are the critical rathole diameters. --- The critical rathole diameter is the maximum size of the cylindrical void which the material can support. ---- at a depth of 10 ft., the material can support voids 12 ft. in diameter after 168 hours storage at rest. In practical terms, this means that a reclaim system which is incapable of removing material over an area which has a maximum plan dimension of less than 12 ft. will remove very little material indeed. On the other hand, if the reclaim system can cut a slot exceeding 12 ft. in length with a width exceeding 2.9 ft., the rathole will collapse and allow a much greater amount of material to be withdrawn."

In order to cut a slot as described, it will be necessary to be able to move the pickup nozzle horizontally and this will be accomplished through the use of remotely controlled cables and winches. We have designed a small remote control vehicle that will deliver one end of a lightweight string to one of the arsenic chamber fill holes from the access hatch, there to be picked up by a grapple and drawn up through

the fill hole. Progressively stronger string or twine will then be pulled through until the control cable is in place. It now remains to test the idea and arrangements have been made to conduct such a test in arsenic stope B2-08 in the near future.

B2-08 was chosen because, not only does it have relatively easy access, it is one of the stopes that should be emptied quite early in the program to free up approximately 45,000 tons of crown pillar grading 0.392 oz./t Au.

Gold recovery

Assuming the fuming process turns out to be the chosen method of upgrading the baghouse dust, the residue collected in the hot baghouse is expected to contain at least 99% of the gold originally contained in the dust, along with particulates of iron, silica, etc.. The weight of residue collected will be inversely proportional to the As₂O₃ concentration in the baghouse dust, which can vary from <60% to >90%. Gold concentrations in the residue will range from 1.5 to 6.0 oz./t. and will likely be processed in the existing cyanidation or carbon plant circuit without further treatment.

Testwork on gold bearing residues from the HWL pilot plant yielded recoveries of approximately 85% but these should not be directly compared with what recoveries might be expected from fuming plant residues. Unfortunately, gold recovery was not included in the FML lab scale fuming testwork but it seems likely that recoveries in the high 80's can be expected, provided that complete As vapourization takes place in the fuming reactor.

Cyanidation tests on fuming plant residues will be done in conjunction with the fuming pilot test.

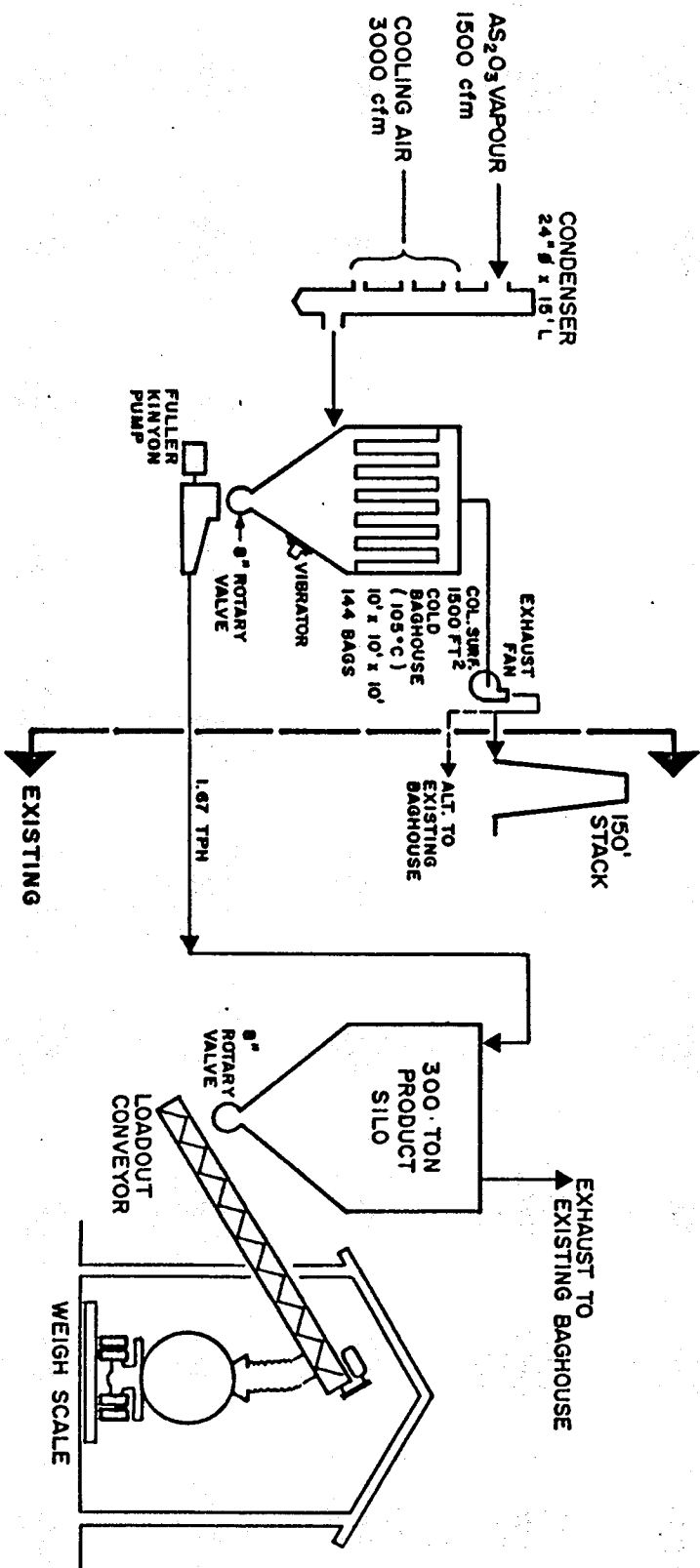
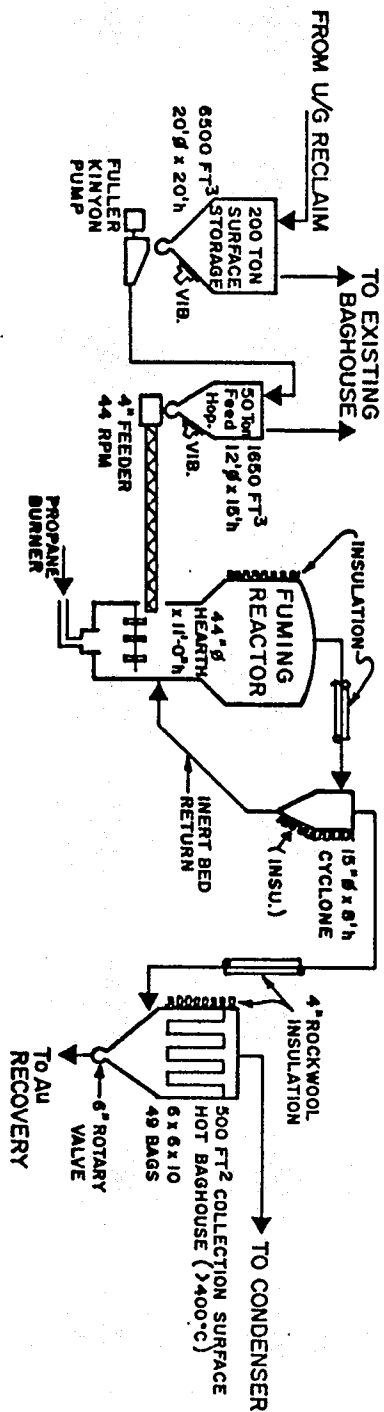
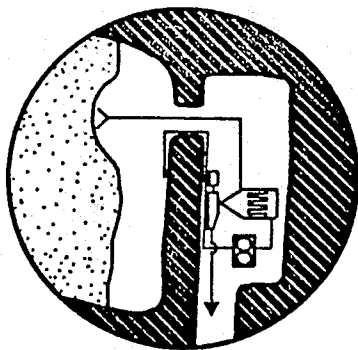
Conclusions and Recommendations

During this period of relatively strong economic growth in Canada and USA, the wood preservative industry is probably in a good position to accommodate new suppliers of arsenic trioxide. We should take advantage of our particularly favourable position; that of being able to assure a source of supply for many years while earning revenues from both As₂O₃ and Au production.

Aiming for plant production by Jan., 1989 will require that we take quick action in plant and process design, design and installation of reclaim systems, plant construction, etc., and it is suggested that work to achieve this target should begin at once.

Pilot fuming tests should be completed before detailed plant engineering commences and we should try to have the test results available by Mar., 1988. In the meantime a drum of current production baghouse dust has been sent to RPC to assist them in determining a bulk handling procedure, etc.

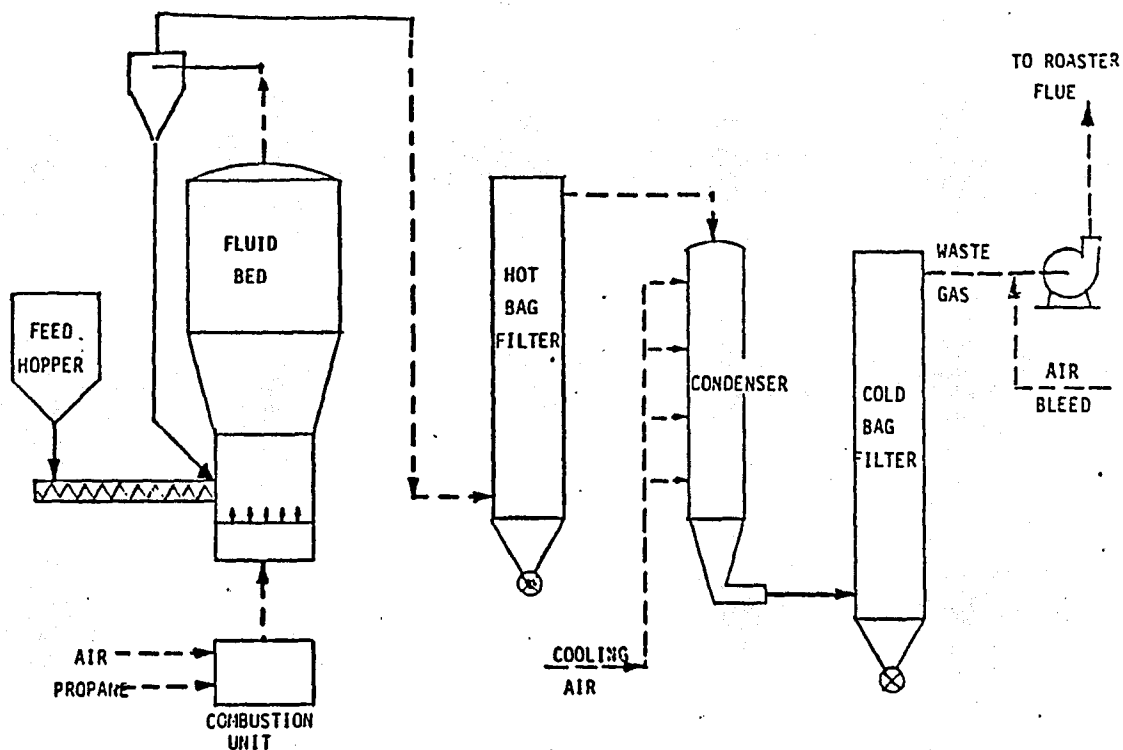
UNDERGROUND RECLAIM



40 TPD ARSENIC RECLAIM PLANT

SCALE : NTS.

PILOT PLANT FLOWSHEET



Approximate Operating Conditions

Feed Rate - Baghouse Dust	40 kg/Hr
Air to Combustion Unit	15 scfm
Propane to Combustion Unit	0.52 lbs/Hr.
Fluidryer off gas volume @ 400° C	40 cfm
Cooling Air to Condenser	70 scfm
Waste Gas @ 150° C	125 cfm

Temperatures: Combustion Chamber	800 - 900° C
Fluid Bed	350 - 400° C
Hot Bag Filter	325 - 375° C
Cold Bag Filter	150° C

PICK UP
HEAD

VACUUM SUCTION
LINE

TV CAMERA
LIGHT

VACUUM RETURN LINE

SEAL

BULKHEAD

BAGHOUSE

VACUUM PUMP

EXHAUST SILENCER

CONTROL ROOM

B208 A.D. SUB DR.

ARSENIC LINE TO SURFACE

CONTROL
WINCH

Arsenic Reclaim System

STOPE B208

As203 value \$0.50

Year	Capital cost	Operating cost	Revenue	Cash flow	Deprec	Taxable revenue	Tax	Net of tax	Cash flow (after tax)	NPV	ROR%
1	5000000	4795000	8168800	-1626200	294117	-1920317	-825736.	-1094580	-800463.69	22773906	0.15
2		5034750	8694600	3659850	294117	3365733	1447265.	1918467.	2212584.81		
3		5286145	9295000	4008855	294117	3714738	1597337.	2117400.	2411517.66	17014542	0.2
4		5550555	9855600	4305045	294117	4010928	1724699.	2286228.	2580345.96		
5		5827980	20484600	14656620	294117	14362503	6175876.	8186626.	8480743.71	13069599	0.25
6		6119105	22238600	16119495	294117	15825378	6804912.	9020465.	9314582.46		
7		6425300	24017000	17591700	294117	17297583	7437960.	9859622.	10153739.31		
8		6746565	12108600	5362035	294117	5067918	2179204.	2888713.	3182830.26		
9		7083585	12978000	5894415	294117	5600298	2408128.	3192169.	3486286.86		
10		7437730	13871200	6433470	294117	6139353	2639921.	3499431.	3793548.21		
11		7809685	14790400	6980715	294117	6686598	2875237.	3811360.	4105477.86		
12		8200135	15737200	7537065	294117	7242948	3114467.	4128480.	4422597.36		
13		8610450	13687800	5077350	294117	4783233	2056790.	2726442.	3020559.81		
14		9041315	14435000	5393685	294117	5099568	2192814.	2906753.	3200870.76		
15		9493415	14714000	5220585	294117	4926468	2118381.	2808086.	3102203.76		
16		9968120	15501800	5533680	294117	5239563	2253012.	2986550.	3280667.91		
17		10466800	16325200	5858400	294117	5564283	2392641.	3171641.	3465758.31		
			123896635	246903400	Total profit		69413851.32				

As203 value \$0.40

Year	Capital cost	Operating cost	Revenue	Cash flow	Deprec	Taxable revenue	Tax	Net of tax	Cash flow (after tax)	NPV	ROR%
1	5000000	4795000	6768800	-3026200	294117	-3320317	-1427736	-1892580	-1598463.69	16493921	0.15
2		5034750	7224600	2189850	294117	1895733	815165.1	1080567.	1374684.81		
3		5286145	7751600	2465455	294117	2171338	933675.3	1237662.	1531779.66	12244410	0.2
4		5550555	8235000	2684445	294117	2390328	1027841.	1362486.	1656603.96		
5		5827980	18783000	12955020	294117	12660903	5444188.	7216714.	7510831.71	9285725.	0.25
6		6119105	20452000	14332895	294117	14038778	6036674.	8002103.	8296220.46		
7		6425300	22141000	15715700	294117	15421583	6631280.	8790302.	9084419.31		
8		6746565	10138800	3392235	294117	3098118	1332190.	1765927.	2060044.26		
9		7083585	10909600	3826215	294117	3532098	1516802.	2013295.	2307412.86		
10		7437730	11699600	4261870	294117	3967753	1706133.	2261619.	2555736.21		
11		7809685	12510200	4700515	294117	4406398	1894751.	2511646.	2805763.86		
12		8200135	13343000	5142865	294117	4848748	2084961.	2763786.	3057903.36		
13		8610450	11173800	2563350	294117	2269233	975770.1	1293462.	1587579.81		
14		9041315	11795200	2753885	294117	2459768	1057700.	1402067.	1696184.76		
15		9493415	11942200	2448785	294117	2154668	926507.2	1228160.	1522277.76		
16		9968120	12591400	2623280	294117	2329163	1001540.	1327622.	1621739.91		
17		10466800	13289200	2802400	294117	2508283	1078561.	1429721.	1723838.31		
			123896635	210729200	Total profit		48794557.32				

As203 value \$0.30

Year	Capital cost	Operating cost	Revenue	Cash flow	Deprec	Taxable revenue	Tax	Net of tax	Cash flow (after tax)	NPV	ROR%
1	5000000	4795000	5368800	-4426200	294117	-4720317	-2029736	-2690580	-2396463.69	10213937	0.15
2		5034750	5754600	719850	294117	425733	183065.1	242667.8	536784.81		
3		5286145	6208200	922055	294117	627938	270013.3	357924.6	652041.66	7474278.	0.2
4		5550555	6614400	1063845	294117	769728	330983.0	438744.9	732861.96		
5		5827980	17081400	11253420	294117	10959303	4712500.	6246802.	6540919.71	5501851.	0.25
6		6119105	18685400	12546295	294117	12252178	5268436.	6983741.	7277858.46		
7		6425300	20265000	13839700	294117	13545583	5824600.	7720982.	8015099.31		
8		6746565	8169000	1422435	294117	1128318	485176.7	643141.2	937258.26		
9		7083585	8841600	1758015	294117	1463898	629476.1	834421.8	1128538.86		
10		7437730	9528000	2090270	294117	1796153	772345.7	1023807.	1317924.21		
11		7809685	10230000	2420315	294117	2126198	914265.1	1211932.	1506049.86		
12		8200135	10948800	2748665	294117	2454548	1055455.	1399092.	1693209.36		
13		8610450	8659800	49350	294117	-244767	-105249.	-139517.	154599.81		
14		9041315	9155400	114085	294117	-180032	-77413.7	-102618.	191498.76		
15		9493415	9170400	-323015	294117	-617132	-265366.	-351765.	-57648.24		
16		9968120	9681000	-287120	294117	-581237	-249931.	-331305.	-37188.09		
17		10466800	10213200	-253600	294117	-547717	-235518.	-312198.	-18081.69		
			123896635	174555000	Total profit		28175263.32				