

02/16/89

10:45

416 363 4258

Pamour Inc.

*** YELLOWKNIFE

001/015



Tel: 416/338-3470 - (toll-free) 1-800-220-14 - Fax: 416/338-3477

FAX COVER SHEET

DATE: February 16, 1989

ATTENTION: K. Mortor

CC: J.S. McAlpine

FAX NO.: Q 5

FROM: K. Blower

SUBJECT: R.P.C. TESTING OF SINTERED METAL FILTER

REF: KB16FE-2

NO. OF PAGES: 15

(Including cover page)

Beland

MEMORANDUM


TO: K. Morton
CC: J.S. McAlpine
FROM: K. Blower
SUBJECT: R.P.C. TESTING OF SINTERED METAL FILTER
DATE: February 15, 1989

Yours of today.

Figgess has a letter dated January 11 from Pall indicating that they will provide the filter at their cost as the information is required for engineering the production unit. Please follow up on this.

My feeling is that we should not commit to further pilot work until we have Board approval. However, in making my submission to the Board I need to know the cost of the pilot work that they will be committing to.

I now have the letter from C.S.I. that Dan Zeraldo had received (copy attached). It sounds very promising.


Ken Blower

Lavalin

RUSH, PLS.

Facsimile Request (Telecopier)

Form No. (416) 756-4998

DATE (YYMMDD)	PROJECT NUMBER	ACTIVITY	LEVEL 1 2 3	DEPT.	EMPLOYEE NUMBER	N. M. FIGURES
890208	53138	A1	000000	0604	73301	2327

Addressed to: Ken Blower Fax. No. (416) 363-5477
Company: GIANT YELLOWKNIFE MINES
City: TORONTO Province or State: ONT. Country: _____
Number of Pages: 12 Price: _____
(including Cover)

Instructions/Message: RE: GIANT WAROX PROJECT
POROUS METAL FILTERS

Attached please find copy of budget proposal received from PALL for filters.

If there is any problem in transmitting this message, operator will advise the sender.
If you have any problem in receiving this message please call (416) 756-1333 ext. 3069

To be Completed by Operator

Operator's Name: _____ Date: _____

This Confirms Transmittal of Your _____ Page Facsimile Message.

Signature: _____

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Pall (Canada) Limited

ONTARIO SALES OFFICE
7205 Millbrook Drive
Mississauga, Ontario
L5N 3R3
(416) 542-0330
Fax: (416) 542-0331
Telex No. 65-960411

QUEBEC SALES OFFICE
210 Rue Migonien
St. Laurent, Quebec
H4T 1Y7
(514) 735-8311
Telex No. 65-024073

January 11, 1989

Fenco
2235 Sheppard Ave. East.
Willowdale, Ontario
M2J 5A6

Attention: Mr. Nick Figgess

SUBJECT: PALL POROUS METAL (PSS) BLOWBACK FILTERS FOR
WAROX PROJECT AT GIANT YELLOWKNIFE MINES LTD.

Pall Budget Proposal # B7BB77L184

Dear Nick,

On behalf of Dave Howson (our area technical sales representative), Rene Shanks (our AEC Marketing Specialist), and myself, Pall (Canada) Ltd. is pleased to provide the following budget proposal for a Pall PSS Blowback Assembly to suit the needs of your client for the referenced high temperature filter application.

After careful review the basic application parameters, as "faxed" to us on Dec. 8, 1989, we believe a Pall Porous Metal filter can be well tailored to this application utilizing existing Pall Filter technology found in similar, high flow applications throughout the world.

Background

The application of Pall sintered metal filter assemblies to remove particulate from high temperature gas streams has been practiced for over 30 years. We have built virtually hundreds of units for self-cleaning blowback applications and wish to utilize this experience and work with you on this very important Roaster Exhaust Gas project.

Blowback Filter Design Criteria

In order to achieve a successful installation, Pall Corporation has learned that the design of porous metal blowback filters is based on the following criteria:

continued

CORPORATE AFFILIATES

Pall Trinity Micro Corporation, Cortland
Pall Europe Ltd., Portsmouth, England

APM, St. Petersburg, Fla.
Pall Corporation, Glen Cove, N.Y.

... Pall (Canada) Limited

Fence

Quote No. B78B77L184

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1. Cleanability- Capable of being efficiently blown back while in service, to provide repeatable self-cleaning cycles once an equilibrium pressure drop is achieved.
2. Efficiency- Must be able to remove 100% of (extremely fine) particulate.
3. Media- Must be such that surface texture is compatible with particulate.
4. Uniformity- Pore structure should be fairly uniform to insure even filtration and blowback over the entire filter surface.
5. Fabricated element strength- Able to withstand the mechanical and thermal stress of the application.
6. Alloy- Proper alloy relative to the specific environment.
7. Element Configuration -Proper element spacing, and relationship to housing and hardware with the proper diameter versus length ratio.
8. Assembly Design- Proper housing configuration and tube sheet/element bundle-support design. Housing/element relationship must be considered.
9. Particulate- Should identify Solids loading, as well as nature and size distribution of particulate.
10. Cycle Time- Proper blowback cycle technique and dewpoint considerations.
11. Housing configuration -For proper flow profile and solids deposition.

Once the above criteria is established, our engineering and SLS personnel study the information, enabling us to design an optimum blowback filter.

continued

Pall (Canada) Limited

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Design Conditions Considered

Gas Flow Rate:	1785 ACFM
Gas Temperature:	750 F
Process Line Pressure:	To be determined
Process Line Size:	10 inch
Dirt Load:	75 grams/ACF
Particle Size Distribution:	100% less than 10 microns

Particle Composition : Iron Oxides
Insoluble Compounds
Arsenic Trioxide
Antimony

Gas Composition:	Water Vapour	6%	by volume
	Carbon Dioxide	4%	
	Arsenic Trioxide	8%	
	Nitrogen	79%	
	Oxygen	2%	

FILTER ASSEMBLY DESIGN

For this application, we propose our automated Jet Pulse Blowback filter concept (see Pall product bulletin GSS-V3 attached for an general design description). This technique utilizes downward vectorial force created by the movement of inlet gas flow, to assist in particulate collection during filter element blowback cycle after the fluid particulate has been separated and terminal pressure drop has been reached across the filter media. The approach is well suited to applications of higher flow densities where the process contaminant is fine and low in bulk density.

Our preliminary sizing indicates that our system would comprise one 38 inch O.D. vessel of carbon steel construction, with 10 inch inlet and outlet connections and a conical shaped vessel bottom to accommodate for solid discharge. The vessel would house a total of approximately ninety six (96) 95 inch long by 2 3/8 inch O.D. Pall Porous Metal S-Series filter elements having an absolute removal rating of 5 microns. The elements have a Venturi style nozzle configuration, and are welded into a removable tube sheet assembly.

continued

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Dimensions- For study purposes please refer to Bulletin GSS-V3 which provides a basic overview of the dimensions of the assembly quoted.

Delivery can be estimated at 14 to 16 weeks from receipt of formal approval to manufacture from the purchaser to Pall (Canada) Ltd.

Terms Unless otherwise negotiated, Net 30 days F.O.B. Mississauga, Ontario.

Pall Scientific Laboratory Services (SLS)

Laboratory Testing

Performing a simulated test, either at our SLS facility in Glen Cove, New York, or at your plant will be necessary to the establishment of optimum design criteria.

Testing in our lab facilities is provided to the customer on a nocharge basis.

The lab analysis will include:

1. Identification of the sample(s) particle size distribution.
2. Total particulate fluidization in a test filter rig, at several flow densities to establish the interface characteristics of the contaminant and several grades of our filter media.
3. Actual scale cycling in the test rig, to establish filter media in-situ cleanability for a representative period of time. (Generally in excess of 2000 cycles).
4. Media compatibility with all operation conditions.

We understand that the particulate involved is considered toxic and may limit our test efforts at our corporate facilities. We feel that a logical option would be to have our SLS personnel visit RPC to assist with the design testing.

continued

Pall (Canada) Limited

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The element would utilize 304 SS solids and 316 SS porous metal materials.

An automated, programmable controller would provide the automation for the high temperature quick action butterfly valves used in the blowback system.

Total Filter Assembly Budget Price: \$250,000CDN

Technical Comments

Our basis for the design of this system (i.e. removal efficiency and flow density / sq. ft. of porous metal media) is a result of numerous discussions with Mr. Ross Gilders of the Research and Productivity Council (RPC) in New Brunswick. However, our 40 years of experience with Porous Metal technology leaves us with some design concerns regarding blowback technique and optimum flow density. For these reasons, we strongly suggest a meeting of our Scientific and Laboratory Services (SLS) personnel, those of GYM/RPC and/or Fenco at your earliest possible convenience.

As per our experience we can also comment on the following:

1. A minimum of a 30 SCFM at a 60 PSIG blowback gas supply would be required to provide the pulse gas necessary for the blowback function.
2. With regards to interrupted flow operation, in order to avoid problems associated with damp filter cake and vessel and element corrosion, the assembly would have to be maintained at a temperature above the lowest possible process gas dewpoint with a margin of safety to be determined after evaluation of the application particulate. We can only assume that a bleed of process gas would be incorporated to satisfy this requirement. Alternately a side stream heating method may also be the most practical choice.
3. Insulation of the assembly, vessel support structure, conduit to the control panel, and solids recovery handling equipment, are not included in our pricing supply scope.

continued

Pall (Canada) Limited

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We welcome yourself and other members of your firm to witness these tests in our facilities once the basic design criteria has been established.

Field Testing

A representative scale field side stream test at your facility will also provide valuable performance data of our filters in your application.

SLS assistance will also be made available at no-charge, to help set-up, run and collect performance data necessary for your purchase evaluation.

Successful Installation Reference

To further demonstrate the capabilities of Pall PSS blowback filters, we attach a selection of Filter installations for your review. The same design approach as per the above resulted in the effective operation of the systems at these locations.

We trust that the information provided is to your company's satisfaction and certainly look forward to the opportunity to work with you on this project. Should you have any questions or require additional information, please do not hesitate to contact us.

Very truly yours,



Paul Vaarsi
Applications Engineer

CC: B. McLeod
R. Shanks
B. Ferneyhough
P. Vaarsi
N. Cathcart



GSS FILTER VESSELS DOWNDRAFT JET PULSE DESIGN

Description

Pall downdraft jet pulse design vessels are fitted with the GS series of PSS® sintered metal powder elements. Blowback is accomplished by directing a short duration pulse of high pressure gas into the throat of each element, while maintaining full forward flow. The central pipe induces a downward flow of gas around the elements to assist the settling and discharge of light solids (bulk density less than 20 lb/ft³).

The vessels are available in carbon steel, 304 stainless steel, or other alloys as required. Standard designs offer a maximum pressure of 600 psig at 400°F and a maximum temperature of 1400°F at 100 psig (see Table 1). Higher design limits are available. Other options include refractory linings for high temperature insulation, jacketed vessels for precise temperature control, and fluidizing cones to assist solids discharge. External mounting lugs are provided as standard. All vessels are designed for ASME Section VIII, Division 1 and "U" stamped. The system includes all instrumentation and solenoid valves to control blowback operation.

The vessel head is bolted to the vessel, capturing the tube sheet and elements between the vessel body flanges. This allows for easy access and removal of the elements should service be necessary. The gas inlet connects with the central pipe to create the downward flow direction around the elements. A cone angle of 30° is standard to facilitate solids discharge.

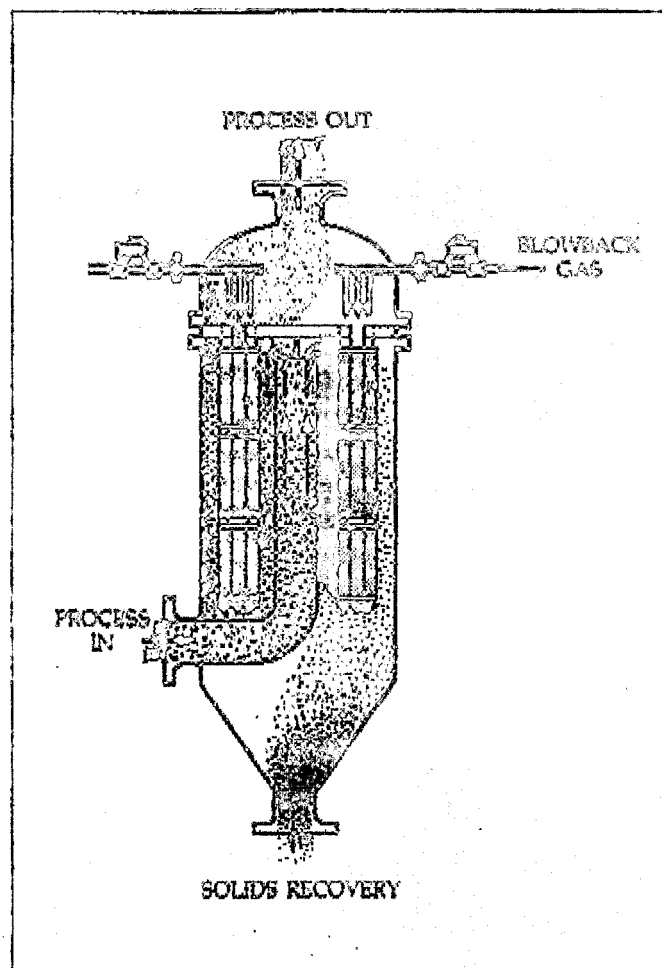


Figure 1. Downdraft Jet Pulse Schematic

Table 1. Vessel Specification

Carbon Steel				Stainless Steel			
Type	Flanges	Pressure (PSIG)	Temp (°F)	Type	Flanges	Pressure (PSIG)	Temp (°F)
Low Pressure	150 lb.	50	750	Low Pressure	300 lb.	10	1400
		60	650		150 lb.	50 60	900 400
High Pressure	600 lb.	500	750	High Pressure	600 lb.	100	1400
		600	650			500 600	900 400

Table 2. Filter Characteristics

Number of CE Elements	Area ft ²	Vessel Diameter (Inches)	Vessel Length (Inches)	Inlet/Outlet Nozzles (Inches)	Drain Nozzle (Inches)	Dimension A (Inches)	Dimension B (Inches)	Differential Pressure Loss Factor K _d
5	20	12	109	3	3	92	10	1.9×10^{-4}
10	40	16	110	4	4	92	14	5.1×10^{-5}
19	76	22	120	6	6	109	19	1.3×10^{-5}
31	124	28	128	8	8	109	28	4.8×10^{-6}
42	169	36	132	10	8	112	22	2.8×10^{-6}
68	272	48	149	12	8	116	24	9.5×10^{-7}
93	384	60	162	14	10	123	28	5.0×10^{-7}
130	520	72	184	18	10	135	36	2.5×10^{-7}
170	660	84	193	20	12	143	42	1.5×10^{-7}

Table 3. Approximate Vessel Weights (lbs.)

Vessel Diameter (Inches)	Carbon Steel (Weight)		304 SST (Weight)	
	Low Pressure	High Pressure	Low Pressure	High Pressure
12	650	1300	575	1275
16	950	2050	850	2050
22	1750	3650	1550	3500
28	2650	5100	1850	5000
36	3100	6350	2100	5850
48	3350	9000	3350	9050
60	4700	12350	4700	12350
72	5650	15600	5650	15600
84	7450	23700	7450	23700

Pressure Drop Calculations

Clean Pressure Drop:

Clean $\Delta P = \Delta P_{\text{Vessel}} + \Delta P_{\text{Filter Elements}}$

$$= K_v \rho Q^2 + K_m \mu Q/A$$

where K_v and K_m are loss coefficients for the vessel and filter medium respectively, ρ is the gas density in lb/ft³, μ is the viscosity of the gas at operating conditions in centipoise, Q is the gas flow rate in ACFM and A is the filter area in ft². The terminal pressure drop at which the filter is blown back is determined by the customer to fit within the pressure drop available in the system. K_v values are given in Table 2.

K_m values are:

PSS Grade	K_m (for 3/32" medium thickness)
PH	2.0
PF	0.45

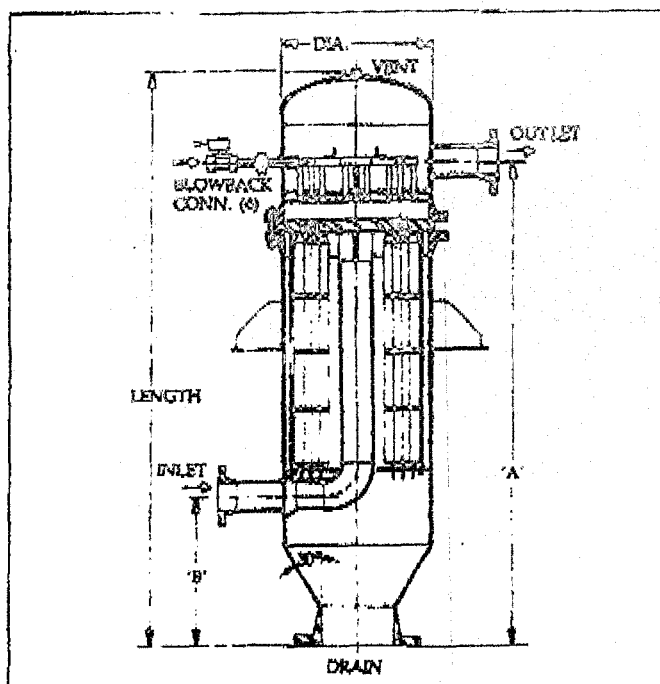


Figure 2. Dimensional Drawing of a Standard Downdraft Design Vessel



Pall Porous Metals Filter Corporation
3699 West Road
Cortland, N.Y. 13045
(607) 753-6041 (607) 756-7535
Telex: 93-7295 TWX: 510-252-0791
FAX: (607) 753-9988

Serves the Refinery, Natural Gas,
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Electronics, and Food and Beverage
Industries.

<u>COMPANY</u>	<u>LOCATION</u>	<u>APPLICATION</u>
Fluor/Aljubaal	Irvine, CA	Polyethylene
G.E. Waterford	Waterford, NY	Polycrystalline-fumed silica
Goodyear Atomic	Piketon, OH	Pneumatic system filter in enrichment plant
Gulf Oil Corp.	Orange, TX	Catalyst Recovery Polyethylene
Gulf Oil Corp.	Pitt., PA	Fly Ash- Shale Oil
Kerr-McGee	Gore, OK	Fluorinator offgas treatment in wet process conversion plant
Koch	Windsor, CN	Venturi Blowback Fluid bed volume reduction
Koppers Company	Bridgeville, PA	Phthalic anhydride process catalyst recovery
Los Alamos	Los Alamos, NM	Low level radwaste incinerator offgas treatment
McCartney Mfg. Co.	Baxter Springs, KS	Low density polyethylene production
Northern Petro Chem	Morris, IL	Polypropylene
SASOL	South Africa	Catalyst recovery from reactor regenerator offgas in synthetic fuel plant
Science Applications Incorporated	LaHolla, CA	R&D for offgas treatment system of slagging pyrolysis radwaste incinerator
Soltex Polymer	Deer Park, TX	Catalyst reactivator filter
Texas Instruments	Dallas, TX	Proprietary fluid bed reactor offgas system
Union Carbide	Paducah, KY Oak Ridge, TN	Pneumatic system filters in enrichment plants Offgas in nuclear fuel reprocessing pilot plant

Pall (Canada) Limited

PSS BLOWBACK FILTER APPLICATIONS

<u>COMPANY</u>	<u>LOCATION</u>	<u>APPLICATION</u>
AB Chemicals	Deer Park, TX	Catalyst Recovery
Allied Chemicals	Metropolis, IL	Reductor, hydrofluorinator, and fluorinator off gas treatment
American Cyanamid	Willow Island, WV	Catalyst Recovery Aniline
Amoco	Naperville, IL	FCC semi-works plant. Filters are downstream of cyclones and above catalyst regenerator
Argonne National Laboratories	Argonne, IL	Nuclear Fuel Cycle R&D
Badger	Cambridge, MA	Catalyst removal in various fluid bed technologies
Badger/Sasol	South Africa	Pilot Plant
Battelle Northwest Laboratories	Richland, WA	Remove transuranic element oxides from spray calciner
C-E Nuclear	Hematite, MO	Uranium recovery from converter off gas in DC Process for nuclear fuel in fabrication
Chemplex	Rolling Meadows, IL	Catalyst Recovery
Chevron	San Francisco, CA	Fly Ash- Shale Oil
City Service	Houston, TX	Pilot Plant
Dart Industries	Odessa, TX	Catalyst Recovery
→ Diamond Shamrock	Greens Bayou, TX	Catalyst fines from fluid bed reactor and regenerator
E.I. duPont deNemours	Orange, TX Victoria, TX	Catalyst Recovery Polyethylene
E.I. duPont deNemours Savannah River Lab	Aiken, SC	Remove transuranic element oxides from spray calciner offgas

Pall (Canada) Limited

<u>COMPANY</u>	<u>LOCATION</u>	<u>APPLICATION</u>
Union Carbide	Seadrift, TX Sarnia, Ontario Sweden	Remove catalyst fines from polyethylene reactor product discharge tanks
USI Chemicals	Tuscola, IL Deer Park, TX	Catalyst recovery
Westinghouse	Columbia, SC	Vent filter, Nuclear fuel



CSI

P.O. Box 640 • Harrisburg, North Carolina 28075 • (704) 455-5181

February 6, 1989

Giant Yellowknife Mines Ltd.,
Suite 1601,
95, Wellington Street West,
Toronto, Ontario,
M5J 2N7
Canada.

Dear Sirs:

CSI hereby indicates its interest in the Refined Arsenic Trioxide which Giant Yellowknife is considering producing, commencing in 1990.

The sample, examined by CSI, was found to be of good quality.

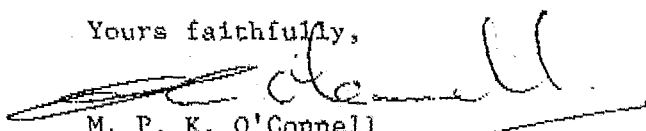
The 5,000 ton p.a. production, which Giant projects, could all be taken by CSI, if a significant economic advantage was available.

The deciding factor, for CSI, would be the economics, offered by Giant Yellowknife. Giant needs to bear in mind that the CCA industry by no means exclusively uses high grade 99% + As_2O_3 . Acceptable grades varying from 95% to 98% are utilised and this would have to be recognised.

A North American source would be of interest, as would offering the facility to take back Arsenic bearing sludges and re-process them.

CSI would certainly like to discuss, in more detail, this potential production, as matters develop.

Yours faithfully,


M. P. K. O'Connell
Commercial Director

MPKO:mc