

FLUID DYNAMICS®

Mamtec America Corporation

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February 6, 1997

Royal Oak Mines Inc.
Northwest Division - Giant Mine

Attention: Mr. Kent Morton

Reference: Fluid Dynamics Quotation BS-9676

Dear Mr. Morton:

It was good to talk with you today concerning the application of our Metal Bag™ filters in your oar roasting project. As I stated over the phone, we have several years of experience with our filters in hot gas filtration projects similar to the one intended for your facility and the pilot work conducted by RPC.

We are enclosing several tables which will describe some of the materials and their related processes where our filters are currently utilized. Unfortunately, we are not at liberty to divulge customer names at this time. While we are sure that your interest in seeing an operating facility are related only to the performance of the filters themselves, we're sure you also understand the reluctance of customers allowing their names to be used or facilities visited. However, should this become a critical issue, we will make additional efforts to secure permission to either conduct a telephone interview or possibly visit a site.

Relative to the concern expressed over blinding of the filters, to date we have not had this problem as long as the gas stream is maintained at a temperature above the due point of the materials being filtered. In the event the due point is reached, condensation on the surface of the filter results in solid particles collecting on the surface and effectively blocking the media. However, this is typically a surface phenomena which can be alleviated with either a soap or chemical cleaning off line. The media matrix is not permanently plugged.

When there is a need for a shut down, the filter housing is typically kept at an elevated temperature or purged with hot gases and/or inert gas. Prior to start-up, hot gas without contaminant are passed through the filters to preheat the vessel and elements to a temperature above the due point. In some cases, the filters are removed and cleaned prior to start-up. In either case, the filters are not replaced. They are either conditioned or cleaned.



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By way of further explanation of our filter media over our competition, we place the very finest level of filtration on the outside of the media structure. As a result, the pore size on the surface is 1 um absolute with a percentage of pores less than 1 um (i.e.; @ 98 % removal efficiency the pore size is 1 um., @ 75 % removal efficiency the pore size is around 0.5 um, etc.). Therefore, particle migration into the media matrix is eliminated. On the other hand, sintered powder media tends to have a relatively large exterior pore size in comparison as a result of limitation of SS powder particle size and manufacturing practices. The result is a more open pore structure compared to SS fiber media. To compensate for the larger pore size and obtain the desired level of filtration (1 um in this case) a thicker media is provided. The lower rating is obtained as a result of the longer capillary length and tortuosity of the media combined with a lower operating face velocity. However, due to the larger surface pore size, this media (SS powder) is more susceptible to blinding/plugging.

Typically a sintered SS powder media is around 35 to 40 % porosity compared to 60 to 65 % for sintered SS fiber. As a result of the lower porosity and thicker structure, a sintered SS powder media has a higher clean pressure drop and typically has a higher stabilized pressure drop after blowback.

Following your review of the enclosed information, please let me know if there are any further details we can provide or discuss. In addition, if it would be of benefit, I am willing to visit your site with samples and technical presentation on our products and their application.

Best Regards,



Robert A. Smith
V.P. Fluid Dynamics
Memtec Group

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CASE STUDY: MAHLEIC ANHYDRIDE (MAH)

LICENSOR & PROCESS	ALMA FLUID BED SOLVENT RECOVERY	B.P. CHEMICALS & MITSUI FLUID BED AQUEOUS RECOVERY	ALMA FLUID BED SOLVENT RECOVERY
PROCESS CONDITIONS:			
► Gas	N ₂ , O ₂ , C's	N ₂ , O ₂ , C's	N ₂ , O ₂ , C's
► Flow Rate (ACFM)	21,280	10,800	24,670
► Pressure (psig)	21.17	14	21.04
► Temperature (°F)	527	392	374
BLOW BACK CONDITIONS:			
► Blowback Gas	N ₂	N ₂	N ₂
► Pressure (psig)	109	85	71.1
► Temperature (°F)	356	350	356
SYSTEM SPECIFICATIONS:			
► Media	XS37 (1µm ABS)	XT08 (1µm ABS)	XS37 (1µm ABS)
► Element Diameter (inch)	3.5	2.5	3.5
► Element Length (inch)	114	60.5	114
► Number of Elements per Housing	150	138	150
► Number of Housings	2	3	2
► Total Filter Area (ft ²)	2,580	1,353.8	2,580
► Face Velocity (FPM)	8.25	7.98	9.56
► Estimated Clean ΔP (PSID)	0.08	0.08	0.09
► Actual Dirty ΔP (PSID)	2.61	N/A	4.25

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CASE STUDY: HOT GAS FILTRATION

LICENSOR / PROCESS	ORE SMELTING (FLY ASH)	POLYETHYLENE POWDER	ALUMINA POWDER
PROCESS CONDITIONS:			
► Gas	SO _x , O ₂ , CO ₂	N ₂ & HYDROCARBON GAS	H ₂ & HYDROCARBONS
► Flow Rate (ACFM)	8,060	12,000	1,490
► Pressure (psig)	~ 0.5	5.0	75.4
► Temperature (°F)	284	230	300
BLOW BACK CONDITIONS:			
► Blowback Gas	AIR	NITROGEN	HYDROGEN
► Pressure (psig)	87	100	515
► Temperature (°F)	70	185	300
SYSTEM SPECIFICATIONS:			
► Media	D124 (1µm ABS)	XT88 (40µm ABS)	XS37 (1µm ABS)
► Element Diameter (inch)	3.5	3.5	3.5
► Element Length (inch)	79	76	76
► Number of Elements per Housing	396	96	36
► Number of Housings	1	2	2
► Total Filter Area (ft ²)	2,257	1,113.6	208.8
► Face Velocity (FPM)	3.57	10.8	7.1
► Estimated Clean ΔP (PSID)	0.1	0.21	0.09
► Actual Dirty ΔP (PSID)	0.4	0.39	N / A

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CASE STUDY: HOT GAS FILTRATION

LICENSOR / PROCESS	CATALYST MANUFACTURING (V ₂ O ₅)	DRIED AL ₂ O ₃	CALCINED AL ₂ O ₃
PROCESS CONDITIONS:			
▶ Gas	AIR / AMMONIA	AIR / STEAM	AIR / STEAM
▶ Flow Rate (ACFM)	4,800	5,386	6,621
▶ Pressure (psig)	0.75	0.38 (-)	0.75
▶ Temperature (°F)	450	677	1200
BLOW BACK CONDITIONS:			
▶ Blowback Gas	AIR	AIR	AIR
▶ Pressure (psig)	95	80	80
▶ Temperature (°F)	N/A	70	70
SYSTEM SPECIFICATIONS:			
▶ Media	XS37 (1µm ABS)	XS37 (1µm ABS)	Y55Z (1µm ABS)
▶ Element Diameter (inch)	3.5	3.5	3.5
▶ Element Length (inch)	96	118	114
▶ Number of Elements per Housing	64	142	175
▶ Number of Housings	2	1	1
▶ Total Filter Area (ft ²)	911	1,221	1,505
▶ Face Velocity (FPM)	5.27	4.41	4.40
▶ Estimated Clean ΔP (PSID)	0.1	0.15	0.15
▶ Actual Dirty ΔP (PSID)	N / A	0.36	0.36