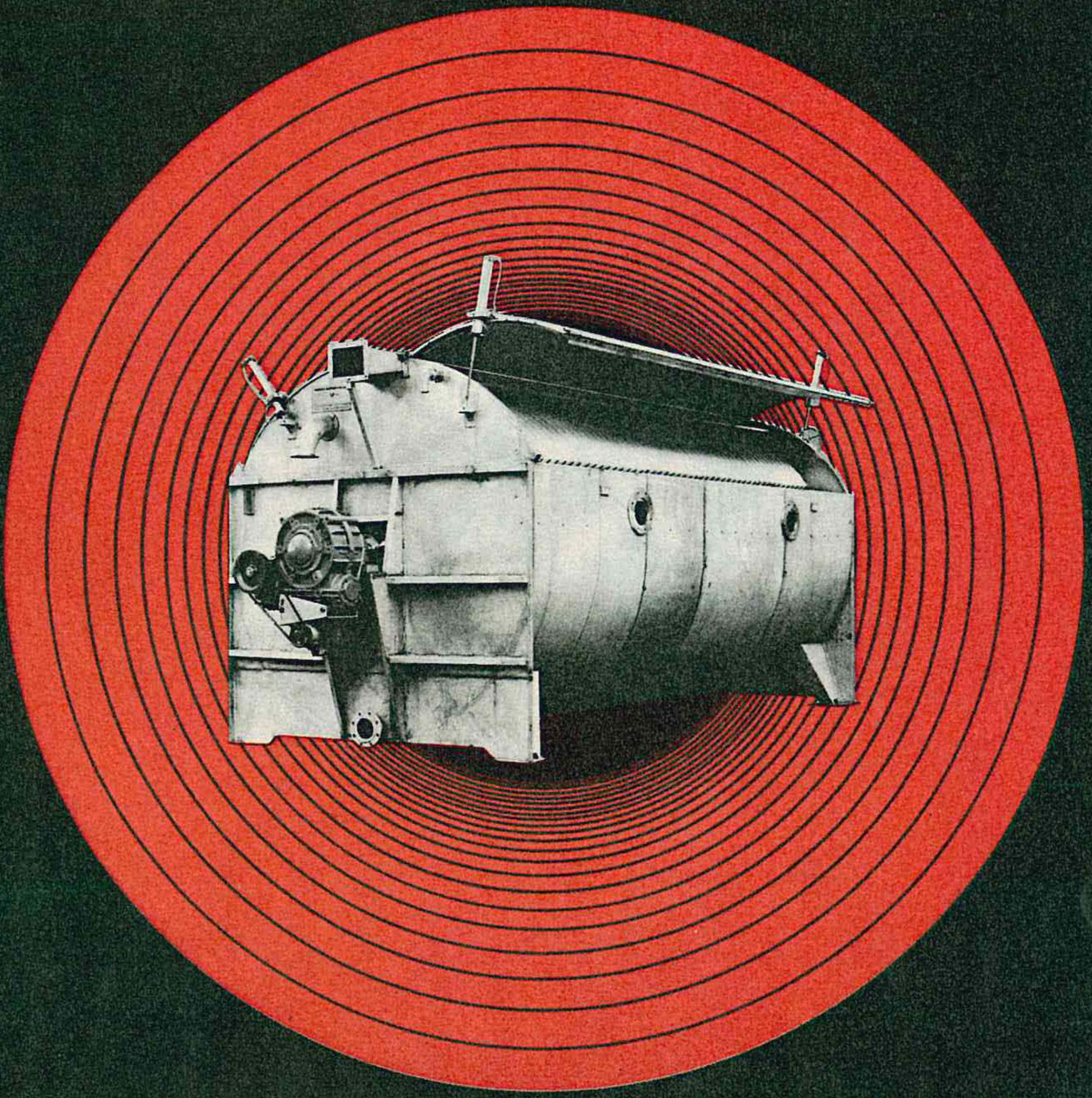


POLCON VARGO SUPER FILTER

POLCON CORPORATION

POLCON VARGO SUPER FILTER

Specially designed for high volume filtration of paper mill white water and other effluents containing fibre, the POLCON VARGO SUPER FILTER features:

- **High volume**
- **High efficiencies (95%+)**
- **Effluent recirculation**
- **Fibre recovery**

The POLCON VARGO SUPER FILTER provides high efficiencies—over 95% suspended solids removal—with very little or no precoat.

The excellent quality of the filtrate allows the filter to be used as an alternative to sedimentation with the added feature of permitting reuseable fibre to be reclaimed.

Suspended solids are removed without the use of vacuum pumps or drop leg. And, because clarities unattainable with existing filtration equipment are provided by the PVSF, discharge water can be recirculated or directed to the receiving body of water.

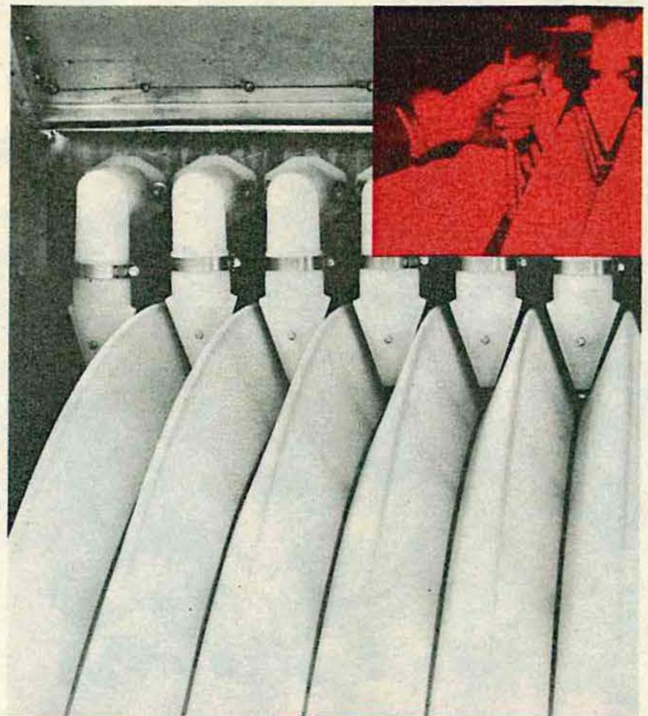
The PVSF has been utilized as the primary clarification unit in numerous installations in Europe and now on the North American Continent.

Description of the Filter

The outside perimeter of the filter drum consists of V-shaped corrugations, each approximately 4 in. wide and 4 in. deep. The filter cloth is shrunk onto this corrugated frame to form a tightly stretched screen cloth over the surface. No back-up cloth or wire is required.

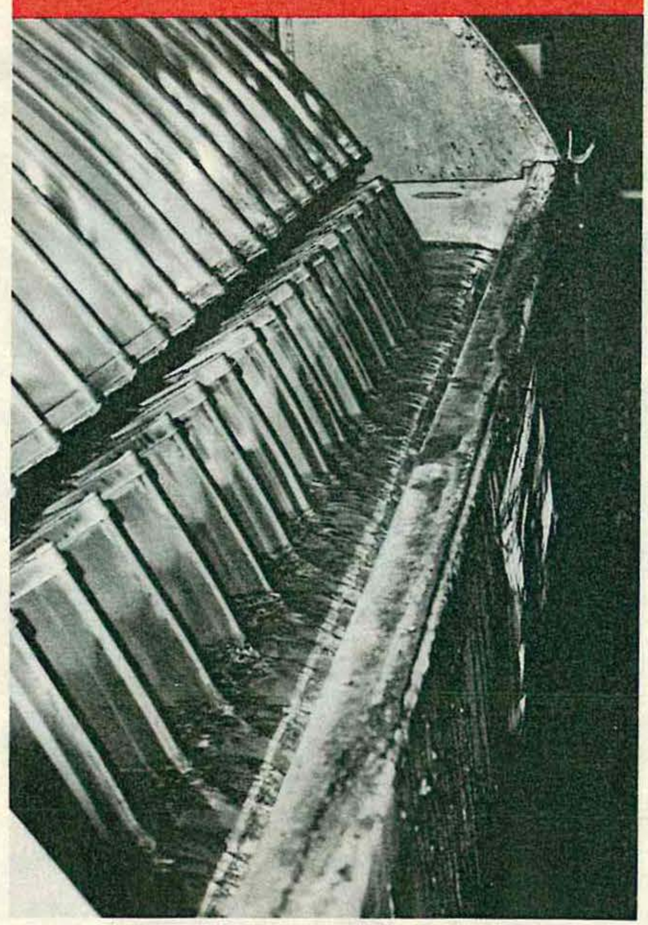
Influent is introduced through the open end of the filter drum, which rotates at variable peripheral speeds of approximately 6 ft./min. to 60 ft./min.; filtration taking place from the inside of the drum outwards. As the filtrate passes through the screen, a fibre mat is formed inside the V-shaped grooves. Carried by the rotating drum to the top of the drum, this mat is blown or sprayed downwards to a tray and is discharged through a pipe at one end of the suspended tray. The screen is washed from both sides of the drum during each cycle.

The cloudy filtrate passing through the screen before a fibre mat has been formed can be collected and recycled.



V-Shaped Corrugations and Air Knock-Off Nozzles

Final Effluent Discharged Over Weir



Advantages of the Polcon Vargo Super Filter

LOW PRESSURE DROP ACROSS THE SCREEN

A pressure drop of only 8 to 12 in. w.g., is maintained across the screen. A permeable fibre mat is obtained which gives high cleaning efficiencies and filter capacity.

No vacuum pumps or drop leg is necessary to provide the required low vacuum.

LOW TURBULENCE IN THE DRUM

The level of turbulence and shear forces are so low inside the drum that the fibre mat is not disrupted during filtering in spite of its low density. Thus, a clean filtrate is possible with minimal or no precoat stock.

NO REPULPERS AND AGITATION EQUIPMENT NECESSARY

The stock discharged from the filter is between 3% and 3.5% consistency, ideally suited for pumping or direct reintroduction into the process.

NO VACUUM PUMPS OR DROP LEGS

Substantial savings can be realized inasmuch as no vacuum pumps and/or cloudy and clear seal pits are required. Low power requirements are achieved.

LOW "PREFILTRATE" VOLUMES

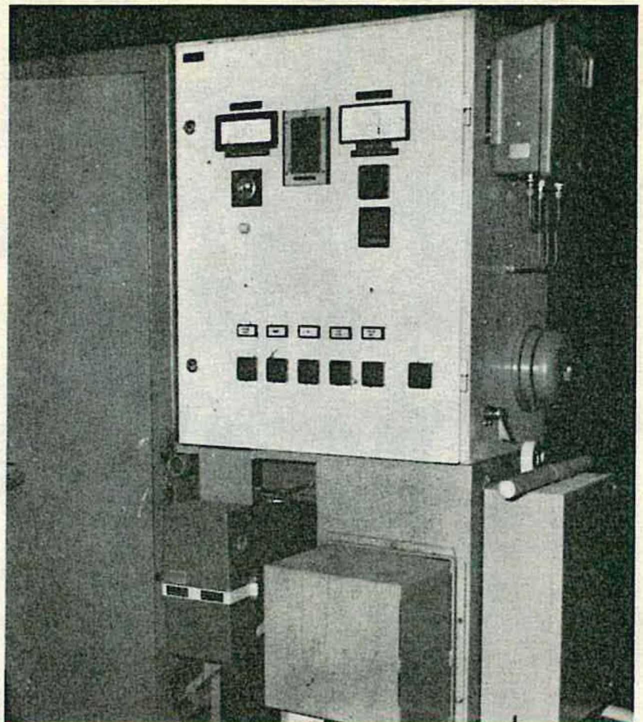
Extremely clear filtrates can be obtained even with a very low "prefiltrate" portion. This filtrate is easily recycled directly into the original feed tank or it may be used as dilution waters in the system.

EASE OF MAINTENANCE

Due to the low speeds and low flow velocities, equipment wear and tear is negligible. A filter segment of approximately 1 sq. yd. can be easily changed in less than 20 minutes, and a new cover can be installed in the mill.

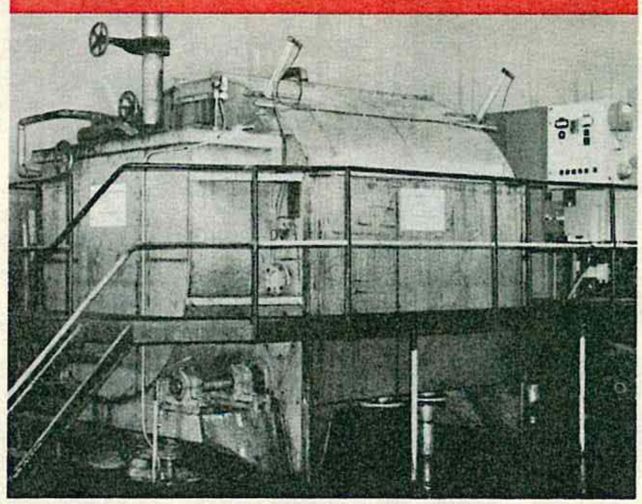
COMPLETE PACKAGE OFFERED

Complete instrumentation will be offered with the POLCON VARGO SUPER FILTER, and technical assistance will be given regarding installation, control systems, alarms and safety devices.



Typical Completely Automated Instrument Panel

Model 1 (320 ft²) PVSF Domtar - East Angus - P.Q.



FOR A QUOTATION THE FOLLOWING DATA ARE REQUIRED:

- Rate of influent flow to be clarified (gpm)
- Grade of pulp used and type of paper produced
- Freeness of pulp after machine refiners (CSF or SR number)
- Fibre content of influent to be clarified (mg/l)
- Grade of pulp to be used for precoat pulp
- Freeness of precoat pulp. (CSF or SR number)

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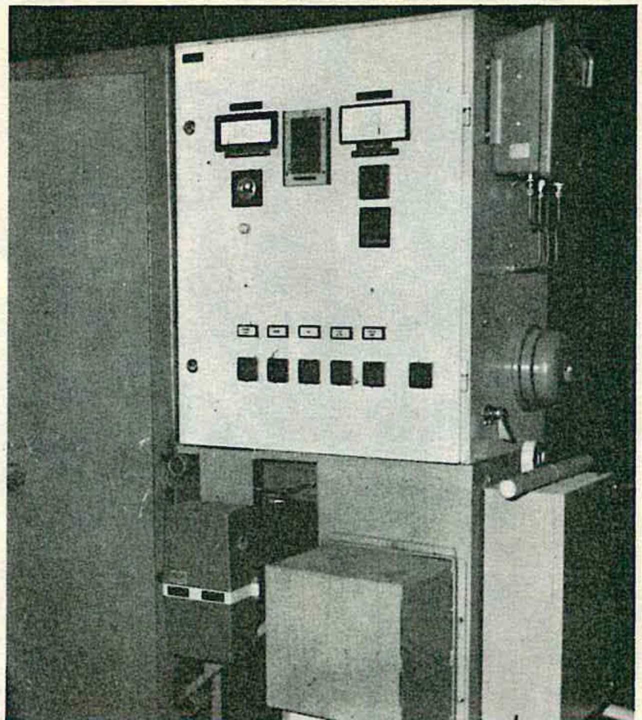

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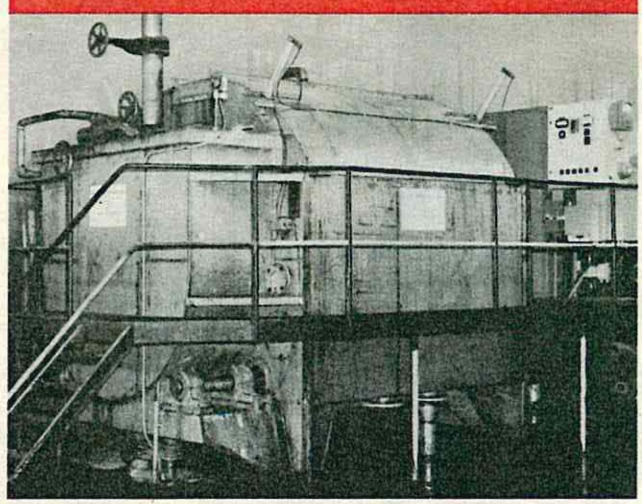

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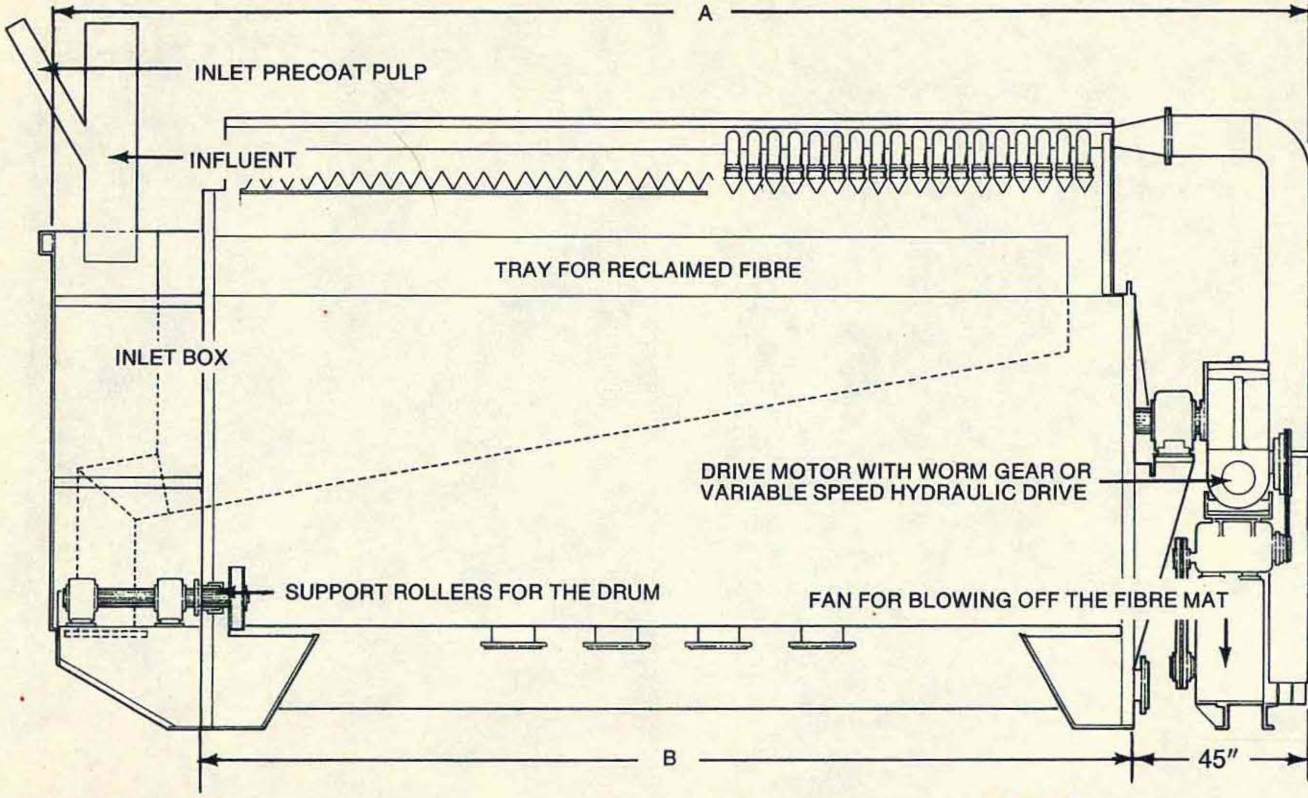
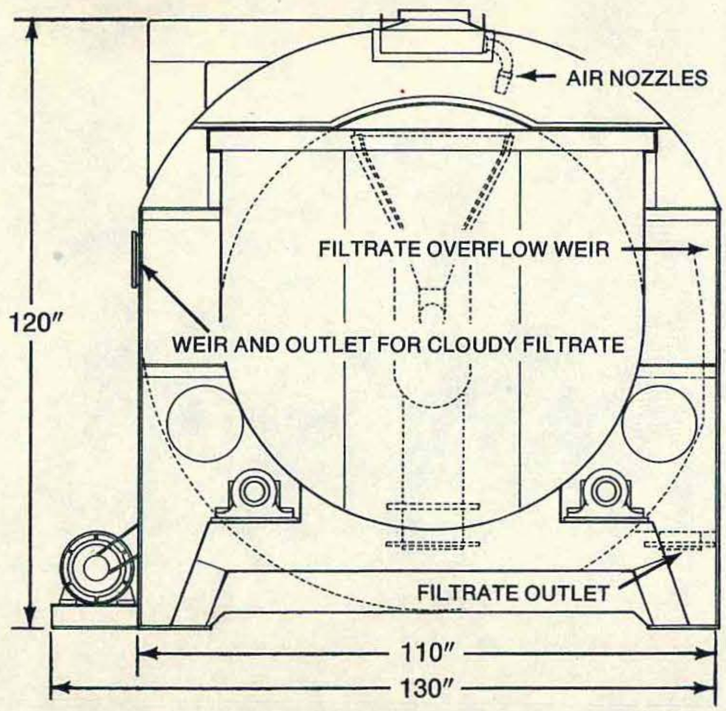
POLCON VARGO SUPER FILTER





Dimensions and Data

Drum diameter: .... 8 ft
Drum lengths: .... 6.5, 10, 13, 16 ft
Screen areas: .... 375, 540, 750, 915 ft²
Drive motor: .... 2 - 5 kW, 1800 rpm
Variable speed drive
Peripheral speed: .... 6 - 60 ft/min

FILTER SIZE		A	B	WEIGHT	
				EMPTY	FULL
#	(ft²)	(in.)	(in.)	(tons)	(tons)
1	320	170	95	5.7	20
2	540	210	135	6.8	26
3	750	250	175	7.9	33
4	915	290	215	9.0	40

POLCON CORPORATION *environmental control systems*

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Brochure: PVSF-1-73

PRINTED IN CANADA

POLCON CORPORATION environmental control systems

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POLCON - VARGO SUPER FILTER

Technical Description

The Polcon-Vargo Super Filter is a drum filter especially designed for the cleaning of dilute suspensions of fibre or other light-weight material as is found in paper mill white water effluents.

The Filter is comprised of a headbox, a vat and rotating drum travelling at a peripheral speed between 6 and 60 FPM. The Filter is offered as a complete package with all the necessary auxiliary equipment engineered to provide an easy and trouble-free startup.

The water to be filtered enters through the open end of a horizontal rotating drum of 8ft. diameter covered with a plastic screen. The fibrous material is retained on the inside surface of the screen while the filtrate flows into a vat and overflows over a weir into an outlet pipe.

Various filter sizes are offered; the selection being based on hydraulic flow requirements and type of stock to be handled. General specifications are as follows:-

	Drum Length		Drum Diameter		Overall Length		Overall Width		Overall Area	
Model #.	Ft.	M.	Ft.	M.	Ft.	M.	Ft.	M.	Ft.	M.
1	6.3	2.0	8.0	2.4	14.1	4.3	10.8	3.3	320	30
2	10.0	3.0	8.0	2.4	17.5	5.3	10.8	3.3	540	50
3	13.0	4.0	8.0	2.4	20.8	6.3	10.8	3.3	750	70
4	16.0	5.0	8.0	2.4	24.2	7.3	10.8	3.3	915	85

(Note: Not to be used for engineering detail)

The drum is folded as a V-belt pulley with folds approximately 4 inches deep and 4 inches wide. This has several advantages:-

1. the filter area becomes more than twice as large as a flat surface;
2. the cloth can be shrunk onto the framing so tightly that no base cloth is needed;
3. the folds dampen turbulence and protect the fibre mat from rupture;

and finally,

4. the folds make it easier to lift the wet fibre mat from the water surface to the centrally located collection trough without drop off.

The screen normally used is a 120 mesh polyester cloth. Other mesh sizes can be delivered down to 10 microns light opening. The surface of the filter drum consists of square sections of screen, 3.5 sq.yds., each with individual frames which are bolted directly on the drum. Such an arrangement facilitates wire changes; a ruptured section of wire is removed and a new section is bolted on. This process should not exceed half-an-hour.

The drum is driven by a 5 KW tyristor controlled D.C.motor. Normally the speed is controlled automatically to maintain a suitable level in the feed tank. The level in the inlet box of the filter is controlled by throttling a valve in the feed pipe.

The level differential across the screen is maintained automatically and should be set in the range of 4 - 12 inches. This low pressure drop, which is constant along most of the submerged path of the screen, is mainly responsible for the good results obtained with this filter. The flow velocities through the screen are comparatively low and the fibre mat is not sucked into the screen meshes or compressed to become impermeable. It is to be noted that the differential pressure requirements are so low that no vacuum pump or drop legs are required.

The filtrate overflows a weir running the full length of the filter. The water level above this weir is a measure of the rate of flow and can be read on a sightglass.

In spite of the low pressure drop, it is unavoidable that there will be more fibres in the first water that passes the screen before a fibre mat has been formed. This "prefiltrate" is separated off by a soft doctor blade and withdrawn at a rate of 10 - 20% of the total filtrate flow. The clarity of the final filtrate may be adjusted by increasing the volume of prefiltrate, as is easily accomplished by raising or lowering the height of the weir of the clean filtrate. The prefiltrate may have 5 - 10 times the consistency of the clean filtrate and is either re-circulated or used as dilution in the system.

The fibre mat retained on the screen travels with the rotating drum to a centrally positioned collection trough, into which it is blown by jets of pressurized air developed by a 25 HP fan. The stock consistency is in the 3 - 3.5% range and is ideally suited for direct insertion into either the machine chest or any dump chest. No repulper or dilution is necessary. The collection trough is located in the centre of the drum and is suspended from the journal of the drum and the rim of the inlet box. The trough is sloped towards a discharge pipe ready for stock reusage.

The screen is kept open by two shower pipes, one outside and one inside the drum. The pipes have nozzles, which deliver conical sprays into each fold. They should be fed at 60 psig and recycled clear filtrate would be adequate for these showers.

If precoat pulp is to be used, it should be added to the feed tank or the inlet box. The rate of flow should be tuned to the size and speed of the filter, since it is generally desirable to maintain a certain minimum dry basis weight at the end of the filtering cycle in order to prevent plugging of the screen cloth. The maximum basis weight possible depends upon stock quality but may be many times higher than the minimum one.

The Polcon-Vargo Super Filter requires considerably less precoat than many other filters. The quantity of precoat used, if any, will vary significantly depending upon the inlet consistency of the contaminated water, fibre length, clarity of effluent desired and precoat freeness. A recommendation regarding the precoat quantities will be made in each individual application.

The Filter offers excellent fibre recovery at the source of the fibre loss and permits the salvage of expensive pulp for immediate reuse.

It eliminates the use of outside clarifiers or sedimentation basins and their many associated equipment and problems. No drop leg or vacuum pump is necessary, obliterating the requirements of expensive seal pits and pump out systems. Stock recovered is in the process consistency range so that no presses, repulpers or dilution systems are necessary. Finally, the unit is sold as a complete package with instrumentation to minimize operator care and to optimize operation of the filter.

Materials of Construction

The Polcon-Vargo Super Filter is built entirely with Type 316 Stainless Steel. Special requirements, however, may dictate use of other materials and will be considered after discussions with the customer.

Instrumentation

An instrument package has been developed for the Filter, which encompasses the following equipment:-

1. Level controller for the screen inlet box;
2. Speed controller for the filter drum;
3. Alarm for low shower water pressure;
4. Alarm for low pressure on the air nozzles;
5. Alarm for discontinued feed of water to the filter;
6. Alarm for stop of filter drum;
7. Instrument panel.

It is also possible to tie the rate of flow of precoat pulp to the speed of the filter drum.

Some of the alarms can be tied to safety stops for precoat pulp and feed water pumps.

If the filter content is high, special precautions can be taken to avoid turbulence in the filter drum and equipment can be delivered for injecting a flocculation agent into the drum.

System Design

We should be pleased to discuss the application of the filter in any particular installation. We will welcome the opportunity to provide recommendations regarding any processes related to the Filter in your plant.

POLCON VARGO SUPER FILTER
AN ALTERNATIVE TO SEDIMENTATION CLARIFIERS

The Polcon Vargo Super Filter permits efficiencies as high as 95% (comparable to a sedimentation clarifier) for the removal of filterable solids holding less than 100 ppm. Precoat pulp is not required.

This, combined with the fact that vacuum pumps or drop legs are not needed, allows the PVSF to be utilized as an alternative to the conventional sedimentation clarifier.

The following points should be considered in assessing the merits of the Polcon Vargo Super Filter as an alternative:

1. Initial capital costs are less with the PVSF.

2. The PVSF can, in most instances, be accomodated in existing mill space.

3. Piping and pumping costs will be lower than those for an external clarifier.

4. Supervision and maintenance requirements are minimal and filter segments can be quickly changed in the mill.

5. The PVSF accepts variations in feed consistency, whereas sedimentation clarifiers are easily overloaded.

6. The stock recovered from the PVSF has left the white water system only minutes before and has had no time to degrade as has sludge in a clarifier. This is readily demonstrated by bacteria counts. The recovered stock is, therefore, easier to dewater and press and, after cleaning it can, in most instances, be used in the centre of board or in low grade papers. The handling of the recovered stock will cost much less than the transportation and treatment of sludge.

7. The PVSF will ensure less variation in filtrate fibre content than is experienced in effluent from clarifiers.

8. The effluent from the PVSF may be recirculated or used as dilution water in the system.

To accurately judge the potential of the Polcon Vargo Super Filter for a given situation it is necessary to be completely familiar with the unit. Therefore, Polcon Corporation not only will provide a quotation for the PVSF but also, if desired, will discuss the requirements and submit detailed system design.

Reprint from SVENSK PAPPERSTIDNING

75 (1972): 6, 221

The Vargo Super Filter—a filter for low pressure filtration

By Gunnar Gavelin

The Vargo Super Filter (VSF) is a drum filter especially designed for the cleaning of dilute suspensions of fibres or other light weight materials. The feed enters the inside of a horizontal, rotating drum provided with circumferential folds 100 mm deep which lend rigidity and increased surface area to the drum but also have several other functions described below. The reclaimed material is blown by air jets into a tray in the upper part of the drum. The filter medium is a plastic fabric of appropriate mesh kept open by water showers on both sides. Thanks to the folded design no supporting cloth is required.

Function

Fig 1 shows the general flow pattern inside the drum. Paddles fitted in the folds ensure that the liquid mass follows the slowly rotating drum with a minimun of shear between the fiber layer deposited and the liquid above it. For geometrical reasons it is much easier to avoid shear inside a rotating drum than outside, which is in favour of filtering from the inside. In the other case there will also be disturbances caused by friction at the wall of the vat.

The low shear in the VSF allows a fiber net-work to be formed and maintained with a minimum exposure

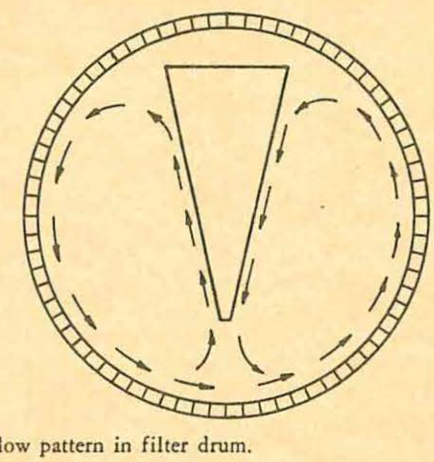


Fig 1. Flow pattern in filter drum.

to rupture at any stage of the filtration. This is believed to be a reasonable explanation of the manifest success of this filter. In analogy with cylinder vat drainage, which has been experimentally studied (1) (2), one can assume that a thickening of the fiber suspension occurs inside the drum, which will create a gradient of increasing strength of the fiber network towards the filter cloth, thus facilitating the filtering process.

Lecture on conference "Mekanisk separering" in Stockholm, December 17th, 1971, arranged by Ingeniörsvetenskapsakademiens Nämnd för kemiteknik.

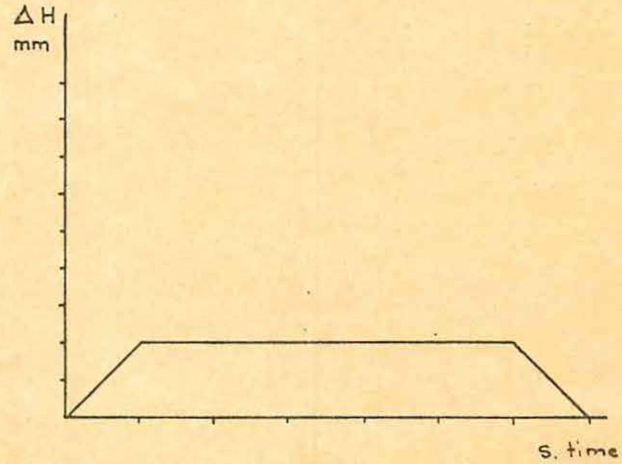


Fig 2. Pressure drop in filter as a function of time from start of filtering.

Another important feature of the VSF is the low liquid head required—about 200 mm w.g. The pressure drop across the fiber mat is constant over the main part of the drainage cycle (*Fig 2*). It is linearly related to the product of the liquid flow rate and the coefficient of drainage resistance.

Efficiency

The velocity of flow perpendicular to the drum and the consistency of the filtrate are represented by curves of the general shapes shown in *Figures 3 and 4*, conforming with the results from a study of cylinder vat drainage (2). For a filter the drainage should preferably be uniformly high all through the cycle. The initial peak flow through the drum has a high fiber content and should therefore be restricted as far as possible. The filtrate towards the end of the cycle is comparatively clean and should be kept flowing at a high rate by the avoidance of undue compression of the fiber mat or plugging of the plastic fabric.

As indicated in Fig 3 and 4 the effect of the high fiber content of the first filtrate can be reduced by recirculating this filtrate—although at the expense of some filter capacity. The rate of this recirculation is one of the parameters to be optimized for each installation.

It is interesting to note that the curve in Fig 4 asymptotically approaches a certain level of concentration. This may indicate that the effect of the increasing mat thickness is compensated by a lower compression of each layer. The pores increase in length but open up. This process may have to be considered during filtration with a low pressure drop. The pressure drop must match the elasticity of the fibers.

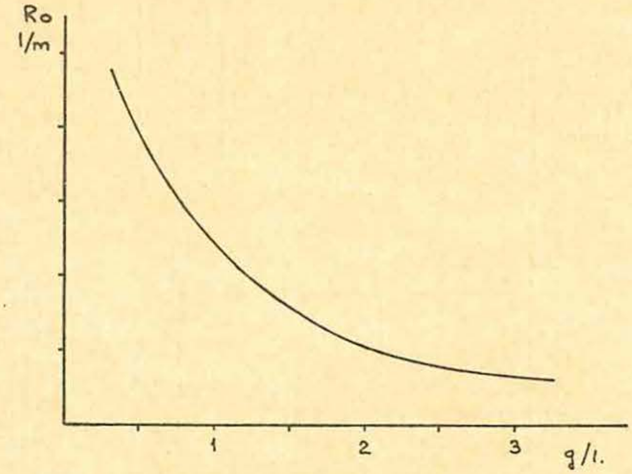


Fig 8. R_0 as a function of fiber consistency in filter drum (from ref. 2.)

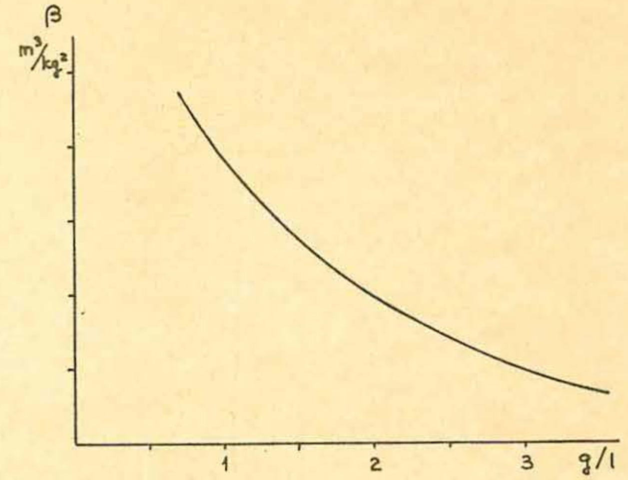


Fig 9. B as a function of fiber consistency in filter drum (from ref. 2).

does not give a higher retention, which checks with the asymptotic curve of Fig 4. The minimum basis weight desirable can be secured by running the filter slowly or by adding a filter aid ("precoat pulp").

Filtration resistance

The filtration resistance referred to in the previous discussion was measured by Lars Österberg *et al* on a countercurrent cylinder vat (2). It was found that the experimental data could be fitted to an equation of the form:

$$V(t) = \frac{\Delta p}{\eta} \cdot \frac{1}{R_0 + A \cdot W + BW^2} \qquad (1)$$

$V(t)$ = velocity of flow perpendicular to the drum surface
Δp = pressure drop across the filter mat
η = viscosity of water
W = dry basis weight at time t
R_0, A, B = constants
($V(t)$, p and W were independantly determined.)

Fig 8 is taken from one of these investigations and shows R_0 to be a function of the feed concentration. This result should be applicable also to the flow in a VSF, where Δp is of the same magnitude. R_0 is obviously the filtration resistance at basis weight zero or of the filter cloth used, and one should, therefore, expect it to be constant. Its increase with decreasing consistency below 1 g/l is explained as the effect of an initial blinding of the filter cloth by fine particles which can penetrate down into the meshes, when there are no fibers present to bridge those. This situation is avoided by a low drum velocity or by addition of precoat pulp. A low pressure drop also makes it easier for fibers to bridge the meshes without being pressed down into them.

Fig 9 shows a similar trend for the constant B, representing sheet formation. Low consistency gives good formation, desirable in cylinder vat drainage but bought at the expense of reduced drainage. In filtering, formation is uninteresting and the *B*-value can be kept down by the use of high consistency and generally by the promotion of flocculation inside the drum.

The constant A, finally, represents the drainage resistance of the pulp. Thus an unbeaten precoat pulp will give a low value of A.

According to equation (1) the filter capacity first increases with the feed consistency due to a decrease of R_0 and B—usually also A with an increasing proportion of long fibers in the mat. At a certain consistency, however, the effect of W dominates and the filter capacity starts to drop. A filter should be operated between the minimum basis weight for proper retention and the one

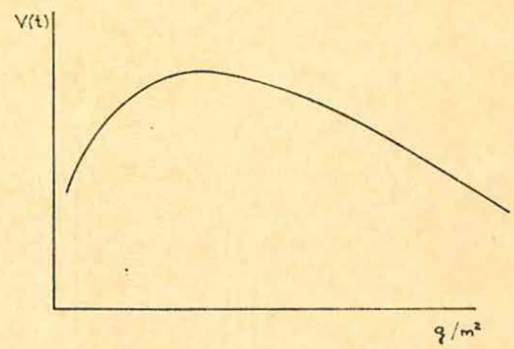


Fig 10. Velocity of flow through filter cloth as a function of basis weight. (trend curve)

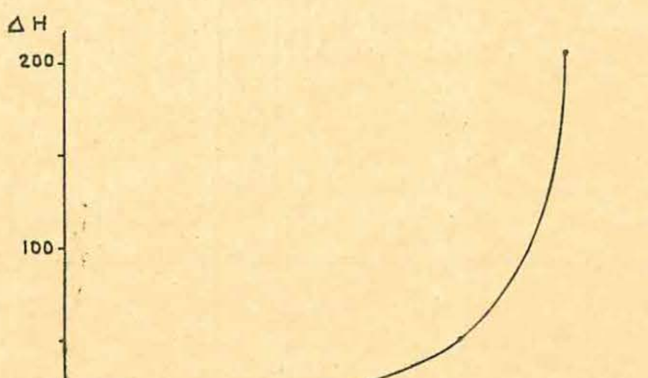


Fig 11. Velocity of flow through filter cloth as a function of pressure drop. (from ref. 2.)

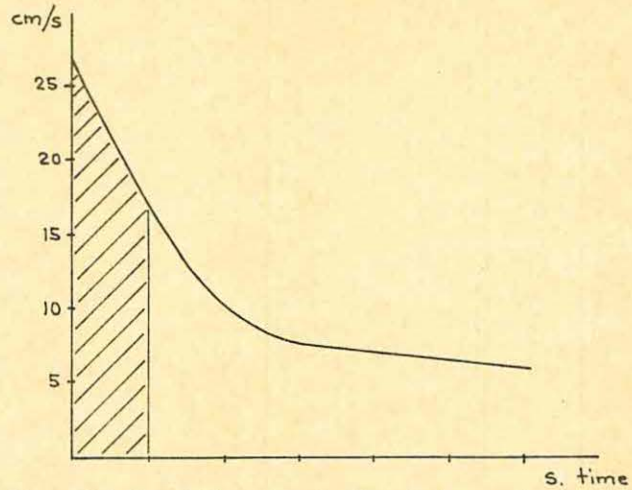


Fig 3. Velocity of flow through filter cloth as a function of time from start of filtering (from ref. 2.)

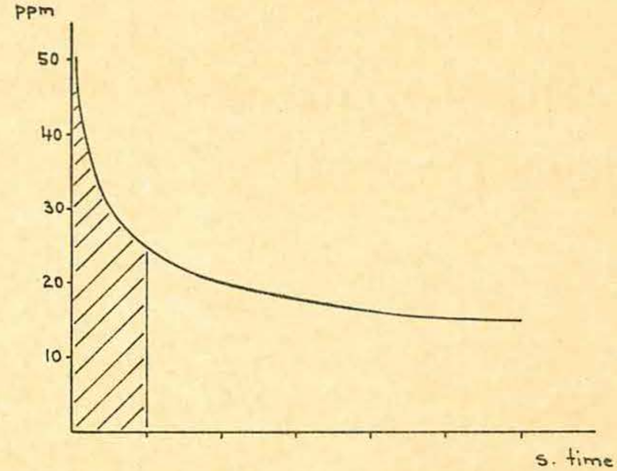


Fig 4. Suspended solids in filtrate as a function of time from start of filtering (from ref. 2.)

Fig 5 shows the growth of the fiber mat during one cycle. If this curve is studied against the one for filtrate velocity in Fig 3, one will find indications of an initial thickening of the fiber suspension. This may be a major problem in cylinder board manufacture. In filtering, on the other hand, one wants a high concentration of the fiber network above the filter cloth and a certain thickening in the drum and even a slip-off at the end of the cycle (as indicated in Fig 5) should be advantageous.

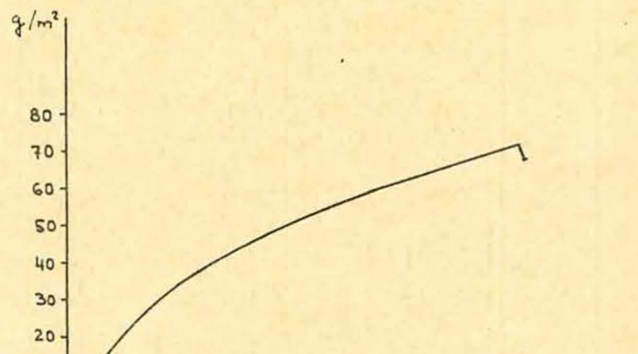


Fig 5. Basis weight on filter drum as a function of time from start of filtering. (from ref. 2.)

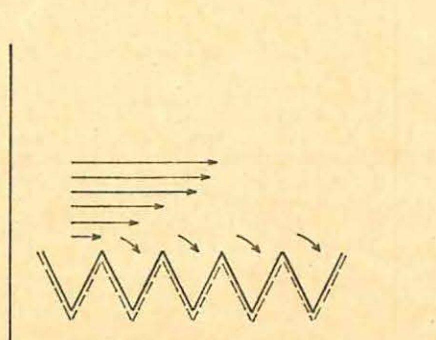


Fig 6. This figure illustrates how the folded design of the filter drum protects the fiber mat against disrupture by axial currents in the drum.

Only, this process must be controlled so that the fiber mat is not disrupted by too high a stock consitsency in the drum. Flocculation of the fibers in the drum is desired since it will give a low filtration resistance, and this effect is achieved by keeping a low level of turbulence—possibly also by adding some flocculation aids.

Conditions inside the drum are conducive to flocculation, high retention of flocculation aids and little disintegration of formed flocs. One design feature contributing to these results is the folded drum. In the folds the fiber mat is protected against disrupture for example by the axial inflow (which, incidentially, has been damped as far as possible). The paddles sitting in the folds also contribute to a dampening of flows. Under suitable operating conditions the folds ought to be filled with a stagnant, coherent fiber network (*Fig 6*).

So far it has been assumed that the fiber content of the feed suffices to form an adequate filter mat on the drum. This is not always the case. *Fig 7,* taken from experiments with a pilot VSF, shows that a dry basis weight of 100 g/m^2 at the end of the cycle is required for a retention of 98 %. A higher basis weight, however,

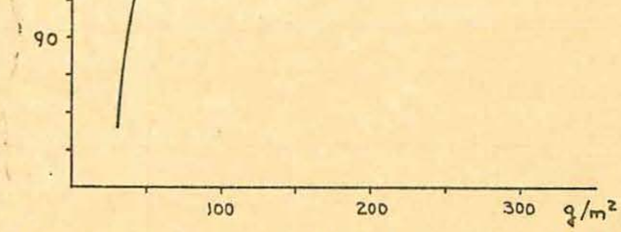


Fig 7. Retention as a function of dry basis weight on the filter drum at the end of the cycle when there is no recirculation of filtrate. (The curve obtained by experimenting with a Vargo Super Filter)

giving maximum capacity. This is generally a wide range —in the VSF about 1:10 at constant drum velocity.

Fig 11—also taken from the cylinder vat studies—shows filter capacity as a function of pressure drop. Apparently, there is little to gain in capacity beyond a certain pressure drop. A high pressure drop would, if applied, give a higher initial filtrate concentration, a higher R_0-value and more trouble with plugging. Therefore, the pressure drop should be optimized for each filter application, which is easily done by setting the level controller in the feed box and reading the level at the filtrate overflow (the latter giving the rate of flow).

If the pressure drop is too low, the fiber mat will not be sufficiently compressed and may drop off with too much thickening in the drum as a result. The folding of the drum, however, makes it possible to lift up a fiber mat much wetter than otherwise possible (see *Fig 12*). The mat is blown off the drum with air jets and falls into a collection tray without further dilution.

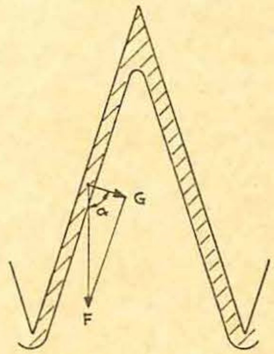


Fig 12. This figure illustrates how the folding of the filter drum makes it easier to lift a wet fiber mat out of the trough.

Instrumentation

As this discussion has illustrated, the performance of a filter is influenced by a number of independent variables, which makes instrumentation useful. *Fig 13* shows some control loops used on the VSF. The drum velocity is automatically controlled to give the desired level in the feed tank. The pressure differential is maintained by control of the feed. There are alarms for low shower pressure and low air pressure, and the valve for precoat pulp addition will automatically close if the feed pump should stop. An instrument is available which gives alarm for high fiber content in the filtrate (the Fiberlog).

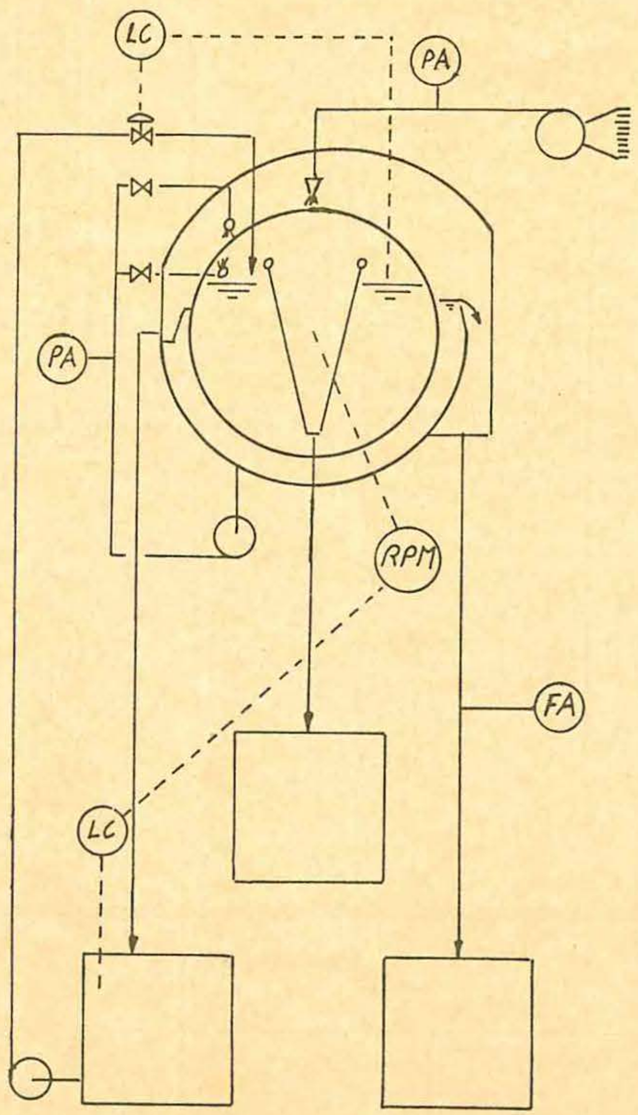


Fig 13. Standard instruments for Vargo Super Filter:
LC: level controller
PA: alarm for low pressure
FA: alarm for high fiber content

Fractionation of recovered stock

The necessity to use precoat pulp is a liability to filters in certain applications. Frequent grade changes or the need for very exact consistency and freeness control can make it difficult to return the used precoat pulp to

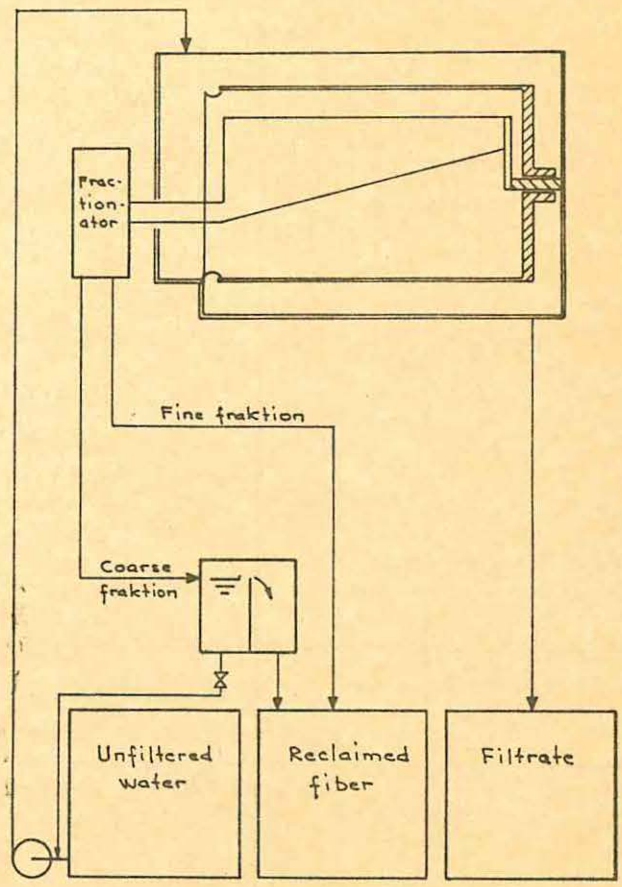


Fig 14. Arrangement for fractionation and recirculation of recovered pulp.

a chest without introducing a disturbance to the system. When mill effluents are filtered, precoat pulp, as a rule, cannot be reused due to contaminations. In such cases the system shown in *Fig 14* can be applied. The reclaimed stock is fractionated into a fine fraction and a long fiber fraction, the latter being returned to the suction side of the feed pump, as a precoat pulp.

The addition is controlled manually by a valve. Independent of the setting of this valve an overflow corresponding to the long fiber content of the feed will recombine with the fine fraction. The composition of the reclaimed stock, therefore, is not influenced by the fractionation. In effluents from pulp and paper mills there is, as a rule, enough long fibers to build up the desired precoat pulp recirculation. Should, in some application, this not be the case, it is feasible to add some suitable filter aid. Also on the largest VSF the precoat pulp circulating in the system need not exceed 10 kgs.

With this system, for which a patent has been applied, VSF filters can compete in applications now reserved for sedimentation of flocculation processes. A clean filtrate and dependable operation without use of chemicals are possible at relatively low capital cost.

References

1. *Lars Österberg, Peder Pihl* and *Gunnar Gavelin.* Measurements of properties of fiber suspensions in cylinder vats. Svensk Papperstidning. 67 (1964): 6, 246.
2. *Lars Österberg, Peder Pihl* and *Otto Brauns:* Studies of sheet forming on cylinder moulds. Svensk Papperstidning. 67 (1964): 7, 265.

CASE STUDIES

POLCON-VARGO SUPER FILTER

POLCON CORPORATION *environmental control systems*

1550 MAISONNEUVE BLVD. W., SUITE 200, MONTREAL 107, P.Q., CANADA TELEX 05-268681 PHONE (514) 931-3876

CASE STUDIES

POLCON-VARGO SUPER FILTER

The following results have been reported to us by customers. These are actual operational results and are not necessarily the best ones obtainable in each case. We look at them as minimum results, which one should always be able to count on for any similar application.

1. Effluent Cleaning - kraft pulp mill

No precoat pulp			
2 Filters Type #3	=	23.0	ft /minute
Clean filtrate per filter	=	10,600	US GPM
	=	14.15	US G/sq.ft.
Cons. Feed	=	80 - 150	ppm
Clean Filtrate	=	15 - 20	ppm
Recovered Stock	=	0.067	lbs /USG

2. White Water Cleaning - magazine paper

1 Filter Type #4	=	26.5	ft /minute
Clean Filtrate	=	925	US GPM
	=	1.01	USG/ sq.ft.
Precoat Pulp		Semibleached kraft 600 CSF 40 lbs/min.	
	=	0.041	lbs /sq.ft.
Cons.Feed	=	2000	ppm (with precoat p.)
Cons. Clean Filtrate	=	160	ppm (only fibre)
Filler in Feed	=	1800	ppm
Filler in Clean Filtrate	=	300	ppm
Furnish to Machine		60%	groundwood
		40%	semibleached kraft

3. White Water Cleaning - newsprint machine

1 Filter Type #4	=	13.25	ft /minute
Clean Filtrate	=	1585	US GPM
	=	1.83	USG /sq.ft.
Precoat pulp		Kraft 720 CSF 33 lbs /min.	
	=	0.067	lb /sq.ft.

Cons.Feed	=	400	ppm
Cons. Clean Filtrate	=	50	ppm
Furnish to Machine		82% 18%	groundwood kraft

4. <u>White Water Cleaning - tissue machine</u>

1 Filter Type #3	=	23.0	ft /minute
Clean Filtrate	= =	1320 1.76	USGPM USG /sq.ft.
Precoat Pulp	 =	Machine chest pulp 540 CSF, 17.8 lb/min. 0.25	 lb /sq.ft.
Cons.Feed	=	700	ppm
Cons. Clean Filtrate	=	20	ppm
Furnish to Machine		Kraft & Sulphite Pulps	

5. <u>White Water Cleaning - greaseproof machine</u>

1 Filter Type #3	=	20.0	ft /minute
Clean Filtrate	= =	792 1.05	USGPM USG /sq.ft.
Precoat Pulp	= =	Sulphite Pulp 720 CSF, 17.8 lbs /min. 0.028	 lbs /sq.ft.
Cons.Feed	=	1500	ppm
Cons.Clean Filtrate	=	20	ppm

6. <u>White Water Cleaning - tissue machine</u>

2 Filters Type #3	=	50	ft /minute
Clean Filtrate	= =	792 1.05	USGPM/Filter USG/sq.ft.
Precoat Pulp		45% 55%	sulphite pulp groundwood
0.51 lbs /min.	=	0.016	lb /sq.ft.
Cons.Feed	=	1800	ppm
Cons.Clean Filtrate	=	100	ppm

7. Effluent Cleaning - hardwood sulphite pulp

1 Filter Type #3

Clean Filtrate	=	2,650	USGPM
Cons.Feed	=	250	ppm
Cons.Clean Filtrate	=	5 - 10	ppm

EFFECT OF VARIABLES ON VOLUMETRIC CAPACITY OF POLCON-VARGO SUPER FILTER

Freeness Precoat Pulp

Freeness °SR	Freeness CSF	Clean Filtrate USGPM
20	600	1,930
25	500	1,820
30	425	1,715
35	365	1,610
40	300	1,530
45	250	1,480
50	210	1,435
55	175	1,375

Level Differential

Level Diff. (Inches)	Clean Filtrate USGPM
4	982
8	1,360
12	1,510
16	1,585

Speed at Constant Feed of Precoat Pulp

Speed ft /min.	Filter Mat lbs/sq.ft.	Clean Filtrate USGPM
10	0.059	740
30	0.028	1,270
50	0.016	1,400
62	0.012	1,585

REPORT

by H. Yoshizaki

Pulp Machinery Dept.

Subject: Polcon Vargo Super Filter

1. Introduction

According to the license agreement with VARGO MACHINERY AB, our sales activity started the 10th of January, 1973, (Japanese patent No. 551226, 625367) and the first Polcon Vargo Super Filter in Japan was delivered to Senju Seishi K.K., Osaka Mill on the end of May, 1973.

This Polcon Vargo Super Filter was installed for fibre recovery from new paper machine and for reduction of fresh water consumption.

2. Specification

Client:	Senju Seishi K.K.
Mill:	Osaka Mill
Kind of product:	Paper stock board (50 ton / day)
Source of effluent:	The major backwater occur on P.M.4
Amount of effluent:	1295 USGPM or 1.85 MUSGPD (926 USGPM from P.M.4 and 369 USGPM from other pit)
Fibre contents in effluent:	about 600 ppm
Quality of filtrate:	70 ppm

3. Description of the Polcon Vargo Super Filter

Type of filter	Polcon Vargo Super Filter type 85
Material	Stainless steel 304 (all wetted parts)
Drum diameter	8 feet
Drum length	16 feet
Filter area	# 4 - (915 sq. ft.)
Filter sections	30
Filter cloth material	Polyester (115 mesh)
Spray water	240 USGPM
Spray pressure	57 PSI
Spray pipes	2 psc

Driving unit: Drum speed - 6 to 60 ft. / min.

a) Drive motor

V8 motor, 3 phase 50/60 c/s, 200V, 4P, 5.5KW, 150 - 1500 rpm

b) Fan

Kawashima high pressure fan type 30 motor 3 phase, 50/60 c/s, 200 V / 220 V, 30 KW, 2325 rpm 4400 CFM at 29.5 w.g.

c) Air cylinder for top cover

Kohnan Denki, CR5IA-BTD50 x 450Y 100 PSI

4. Flow diagram

A flow diagram of the present P.M. 4 backwater system is given. (Fig. 1)

5. Result of Test-running

Test Date	Feed Consistency (ppm)	Drum Speed (ft/min)	Level Differential (in.)	Feed Flow (USGPM)	Pre-Filtrate (ppm)	Clean Filtrate (ppm)
73.06.16	1144	9.85	11.7		176	56
06.20	1171	17.70	15.7		268	91
"	1434	17.70	11.7		263	83
"	1720	25.2	15.7		*226	
06.21	594	8.85	3.9		262	75
"	1916	6.55	15.7		212	65
"	1733	6.55	7.8		196	43
"	1126	28.5	15.7		*119	
06.30	1620	17.7	15.7		*229	

(Fig. 21)

* Pre-filtrate and clean filtrate are mixed.
* We couldn't confirm rate of feed flow because of mis-piping.

6. Comments

6.1. The object of the Polcon Vargo Super Filter (P.V.S.F.) is to relieve the load on the Collid Air Separator for No. 1 and No. 3 paper machine and to recover the fibre in the backwater from No. 4 P.M.
At present, the Collid Air Separator is running with a maximum through-put of 2570 USGPM (the desirable capacity of this separator is 1720 IGPM).

SENJU SEISHI K.K.
OSAKA MILL

FLOW SHEET

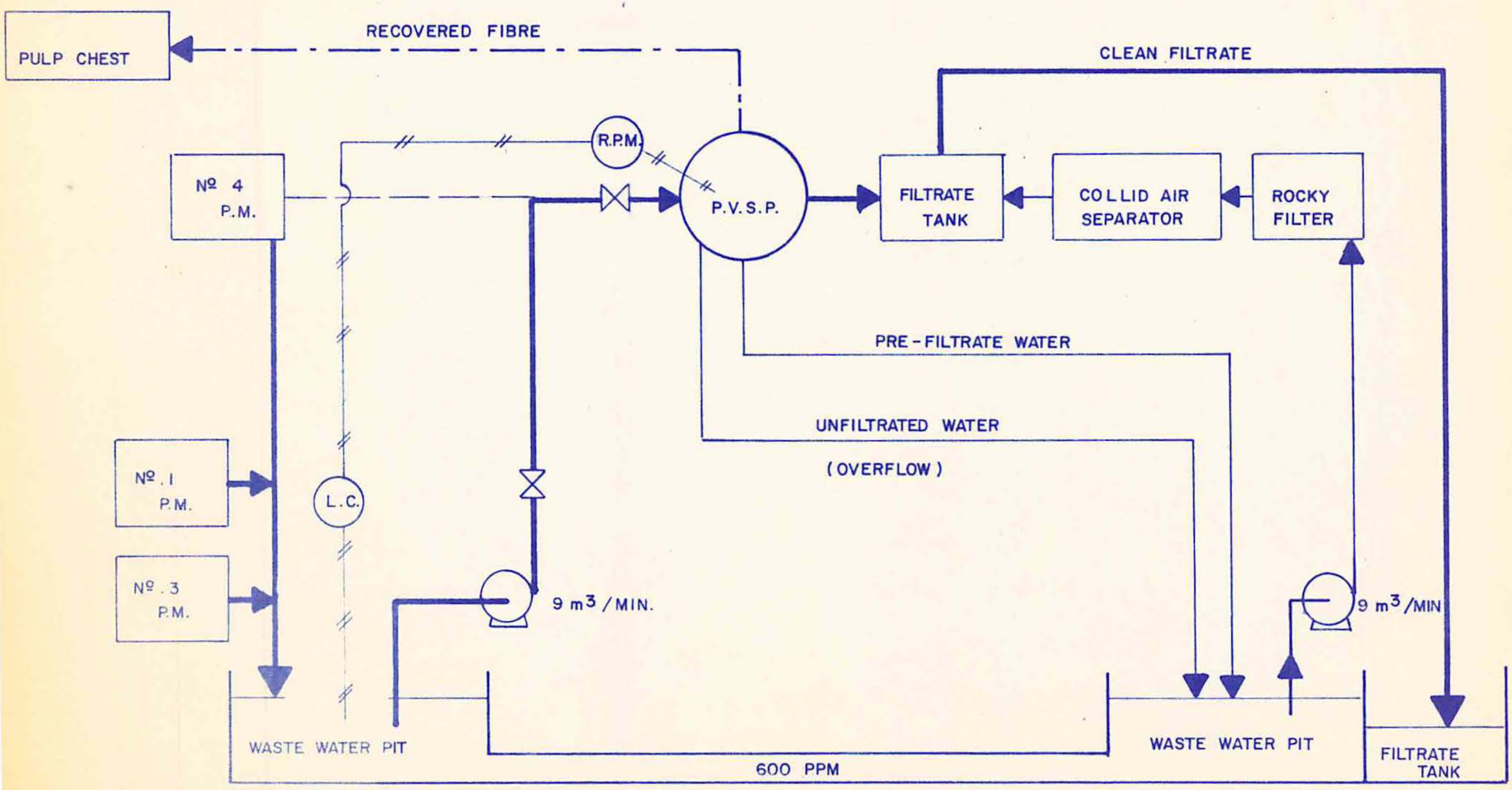


FIG. I

Therefore, capacity of P.V.S.F. required is 1270 - 1665 IGPM, but unfortunately, at this test running, we couldn't confirm rate of feed flow. We will try again to check the feed flow in a further.

6.2 Regarding obtained suspended solid of clean filtrate, we have been very satisfied.

6.3 The fibre mat follows to a centrally positioned collection trough, into which it is blown by air jets.

But, when the level differential is below 150 mm there is a risk that the fibre mat will drop off before the collection trough, which will cause a dangerous thickening of the stock inside drum.

6.4 The recovered fibre is effectively separated from backwater with a good thickkning effect.
The consistency of recovered fibre is about 3%, therefore, these recovered fibres follow directly to the pulp chest.

6.5 The screen is kept clean by two shower pipes, one outside and one inside the drum. The pipes have nozzles, which deliver conical sprays into each fold. They are fed at 57 PSI by a pump sucking clean filtrate from the vat close to the weir. Total shower water consumption is 240 USGPM.

6.6 An instrument package has been installed for the filter, but at present, make no operation.

6.7 The surface of the filter drum consists of sections of each 3.5 sq. yd. surface area bolted on to the drum. They can be exchanged in less than 20 minutes.

7. Result

The Polcon Vargo Super Filter ran well and no operating problem, and had less pre-coat pulp than other filters.

Mill peoples were very satisfied regarding efficiency of the Polcon Vargo Super Filter.

Distribution: BMT PYK TAF
NN
MAC
Vargo Machinery AB

May 2, 1973

POLCON VARGO SUPER FILTER

Domtar Packaging Ltd., P.M. # 1
East Angus, P.Q., Canada.
.................Type # 1 Effluents containing Kraft effluents.

A Polcon Vargo Super Filter Type 30 unit was installed and initially put into operation on April 13th, under the supervision of a Company serviceman from Sweden.

Except for minor modifications, the start-up was trouble free.

A program to evaluate the filter was commenced on April 16th and data until the 1st of May is presented. The unit is presently handling all contaminated flows from No. 1 Machine; the total inflow varying from 150 IGPM is recirculated as "prefiltrate". to 350 IGPM. Approx. 45I The averaged feed suspended solids is approx. 1,000 PPM and the average S.S. level in the clear filtrate is 21 PPM, yielding a recovery efficiency of 97.9%. The prefiltrate volume to clear filtrate ratio is .14 to 1, and the average prefiltrate S.S. level is only 63 PPM.

Two tests to study C.O.D. removal and one test for B.O.D. removal were also conducted during this initial testing period. The average inflow C.O.D. was 1446 PPM and average clear filtrate C.O.D. was 74 PPM indicating a C.O.D. removal of 95.5%. A single B.O.D. test showed a drop of 69.5% between the infeed and the clear filtrate.

The feed to the unit is 100% Kraft but an entire spectrum of colors was produced during the testing period. No "precoat" is used other than trim from the wire falling into the couch pit. Further tests to determine operating variables are planned. All datum are attached.

The unit is operating well below its maximum volumetric capacity. Presently, its drum speed range is the lowest of six possible speeds. (Approx. 1 RPM) No tests to determine its maximum capacity have been undertaken.

Generally, it is felt that the quality of the clear filtrate is adequate for recirculation in showers and vacuum pumps. This recirculation is presently being planned.

A. Sahay

OPERATING DATA								
DATE	APR. 16	APR. 16	APR. 17	APR. 17	APR. 18	APR. 18	APR. 23	APR. 23
TIME	3:40 p.m.	4:00 p.m.	12:45 p.m.	1:15 p.m.	10:55 a.m.	11:15 a.m.	6:15 p.m.	6:55 p.m.
SPEED VALUE OPENING %(level)	5.6-6.4	5.6-7.1	5.0-6.2	5.0-6.9	5.5-7.8	2.5-4.7	3.5	3.5
COUCH PIT LEVEL % (speed)	5.7-6.2	5.8-6.6	6.2-6.8	6.0-7.4	6.0-6.4	3.0-7.0	2.0-4.0	2.0-4.0
FLOW(IGPM) CPAA-Table-0-12								
SPEED	--	--	--	--	--	--	--	--
PREFILTRATE	3/8"-/54	3/8"-/54	1/4"-/24	1/4"-/24	1/4"-/24	1/4"-/24	1/4"-/24	1/4"-/24
CLEAN FILTRATE	1 1/8"-/283	1 1/8"-/283	1 1/4"-/332	1 1/4"-/332	1 1/4"-/332	1 1/4"-/332	5/8"-/118 3/4"-/153	3/4"-/153 1"-/236
STOCK TO FILTER								
PRECOAT	--	--	--	--	--	--	--	--
WET SHAVING NO/HR.	--	--	--	--	--	--	--	--
TEST DATA								
FEED S.S. P.P.M.	1338	1755	680	597	537	484	1294	1656
PREFILTRATE S.S. P.P.M.	41	41	47	48	44	37	178	38
CLEAR FILTRATE S.S. P.P.M.	9	16	20	16	26	26	6	10
" " D.S. P.P.M.	--	--	--	--	--	--	--	--
" " TURBIDITY	--	--	--	--	--	--	--	--
RECOVERED STOCK CONC.	--	--	--	--	3.12%	--	--	--
FEED: FREENESS (DRAINAGE)	--	--	--	--	--	--	--	--
pH / TEMP	-/56°F	-/58°F	-/56°F	-/57°F	-/64°F	-/64°F	-/68°F	-/68°F
MACHINE OPERATING DATA								
GRADE / BW	24-534/40	24-534/40	22-501/40	22-501/40	26-522/58 1/2	26-522/58 1/2	49 -202/50	49-202/52
FURNISH								
FILLER								
SPEED	400	400	400	400	250	250	320	320
TRIM/ WET SHAVING	76 1/4/-	76 1/4/-	83 1/2/-	83 1/2/-	81 7/8/-	81 7/8/-	83"/-	83"/-
REMARKS								
Weir Width - 94 1/2" 7.88'							(30 mins after start-up)	(30 mins after start-up)
FEED BOX PPM	2425	2290	782	848	930	846	3219	2730

EVALUATION OF THE POLCON VARGO SUPER FILTER

OPERATING DATA								
DATE	APR. 25	APR. 26	APR. 27	APR. 27	APR. 30	APR. 30	MAY 1	MAY 1
TIME	10:50 a.m.	8:40 a.m.	10:45 a.m.	1:50 p.m.	9:20 a.m.	1:45 p.m.	9:45 a.m.	1:40 p.m.
FEED VALUE OPENING %(level)	4.4-5.4	4.8-5.8	3.8-5.2	4.6-6.0	2.8-3.8	6.4	5.9-7.0	5.6-6.6
COUCH PIT LEVEL % (speed)	8.6-8.8	7.6-8.2	3.8-6.2	4.7-6.1	2.4-4.8	5.6	5.7-6.4	5.0-5.4
					Lowest Speed	Lowest Speed		
FLOW (IGPM) CPAA-Table-0-12								
FEED	--	--	--	--	--	--	--	--
PREFILTRATE	1/4"-/24	3/8"-/54	1/4"-/24	1/4"-/24	1/4"-/24	1/4"-/24	1/4"-/24	1/4"-/24
CLEAN FILTRATE	1 1/2"-/283	3/4"-/153	7/8"-/191	7/8"-/191	1 1/8"-/283	1"-/236	7/8"-/191	1 1/8"-/283
	1 1/4"-/332	1"-/236	1"-/236				1"/236	
STOCK TO FILTER								
PRECOAT	--	--	--	--	--	--	--	--
WET SHAVING NO/HR.	9 1/2"/228	10 1/2"/210	9"/180	9"/180	7 1/2"/200	7 1/2"/200	10 1/2"/297	9 1/2"/249
TEST DATA								
FEED S.S. P.P.M.	810	1108	1113	992	392	796	1279	1161
PREFILTRATE S.S. P.P.M.	109	116	39	58	35	44	98	38
CLEAR FILTRATE S.S. P.P.M.	28	44	10	28	17	13	51	16
" " D.S. FREENESS	5.8	3105.4	4.5		12.0			
" " TURPIDITY	15 ppm	15 ppm	6 ppm	9 ppm	8 ppm	3 ppm	18 ppm	9 ppm
RECOVERED STOCK CONC.	--	--	--	--	--	--	--	--
FEED: FREENESS (DRAINAGE)	335	285	390	270	660	600	510	560
pH / TEMP	4.55/80°F	4.85/67°F	-/76°F	-/72°F	4.30/60°F	4.50/60°F	6.50/56°F	4.50/66°F
MACHINE OPERATING DATA								
GRADE / BW	47-224/30	44-261/25	44-261/25	44-261/25	24-534/50	24-534/50	44-261/30	44-041/35
FURNISH	--	--	--	--	--	--	--	--
FILLER	--	--	--	--	--	--	--	--
SPEED	480	480	480	480	320	320	475	450
TRIM/WET SHAVING	72"/	79 7/8/"	81 3/4"	81 3/4"	82 1/2"	82 1/2"	80"	80 1/4"

REMARKS

Wet Shaving - No/hr

$\frac{\text{Size}}{12} \times \frac{\text{Speed} \times 60 \text{ min} \times \text{BW}}{3000}$

3000 p^2 → Rame → 24" × 36" × 500F.

FEED -
B.O.D.
C.O.D.
CLEAR FILTR.
B.O.D.
C.O.D.

See Sheet Attached

FEED BOX 1262

POLCON VARGO SUPER FILTER (Special Work)

April 26/73 - 8:30 a.m.

	Susp. (ppm)	C.O.D. (ppm)	B.O.D. (ppm)	PH
FEED	1108	1468	128	4.85
PREFILTRATE	116	345	59	4.95
CLEAR FILTRATE	44	90	39	4.95
SEWER NO. 1 & B.R.	78	175	51	5.25

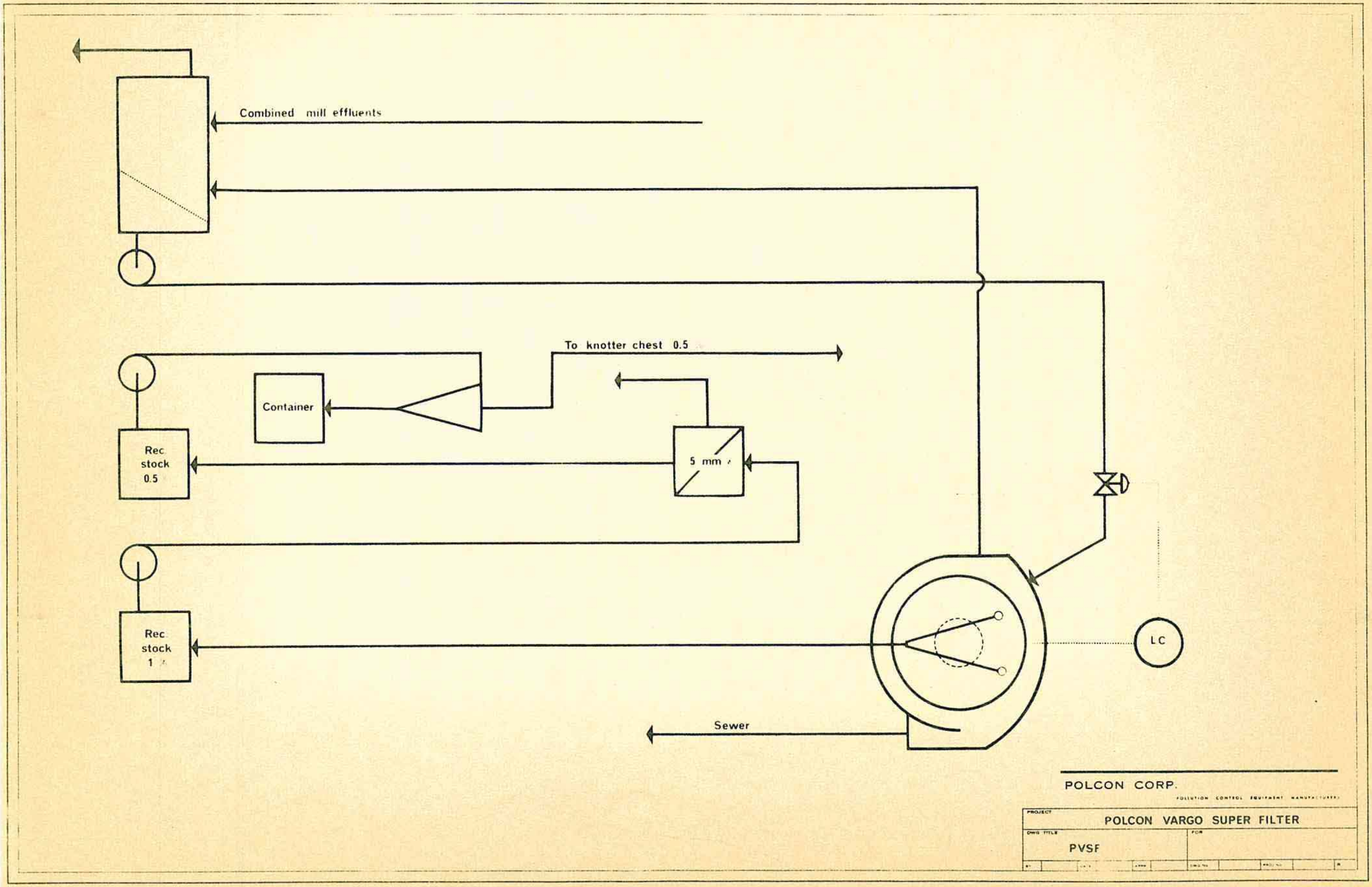
April 27/73 - 1:50 p.m.

	Susp. (ppm)	C.O.D. (ppm)
FEED	992	1425
PREFILTRATE	58	105
CLEAR FILTRATE	28	58
SEWER NO. 1 & P.R.	387	946

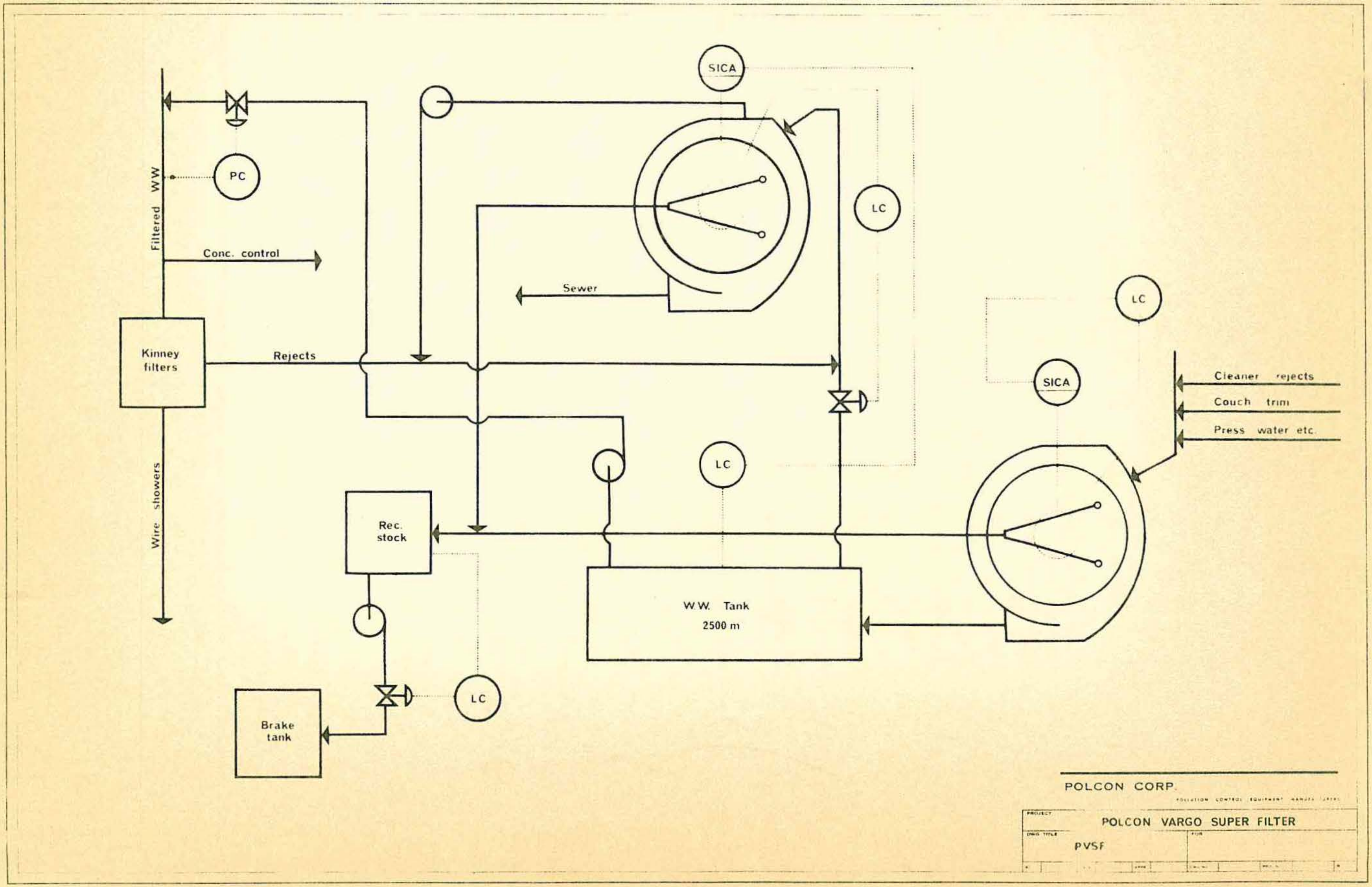
16 Tests Average:

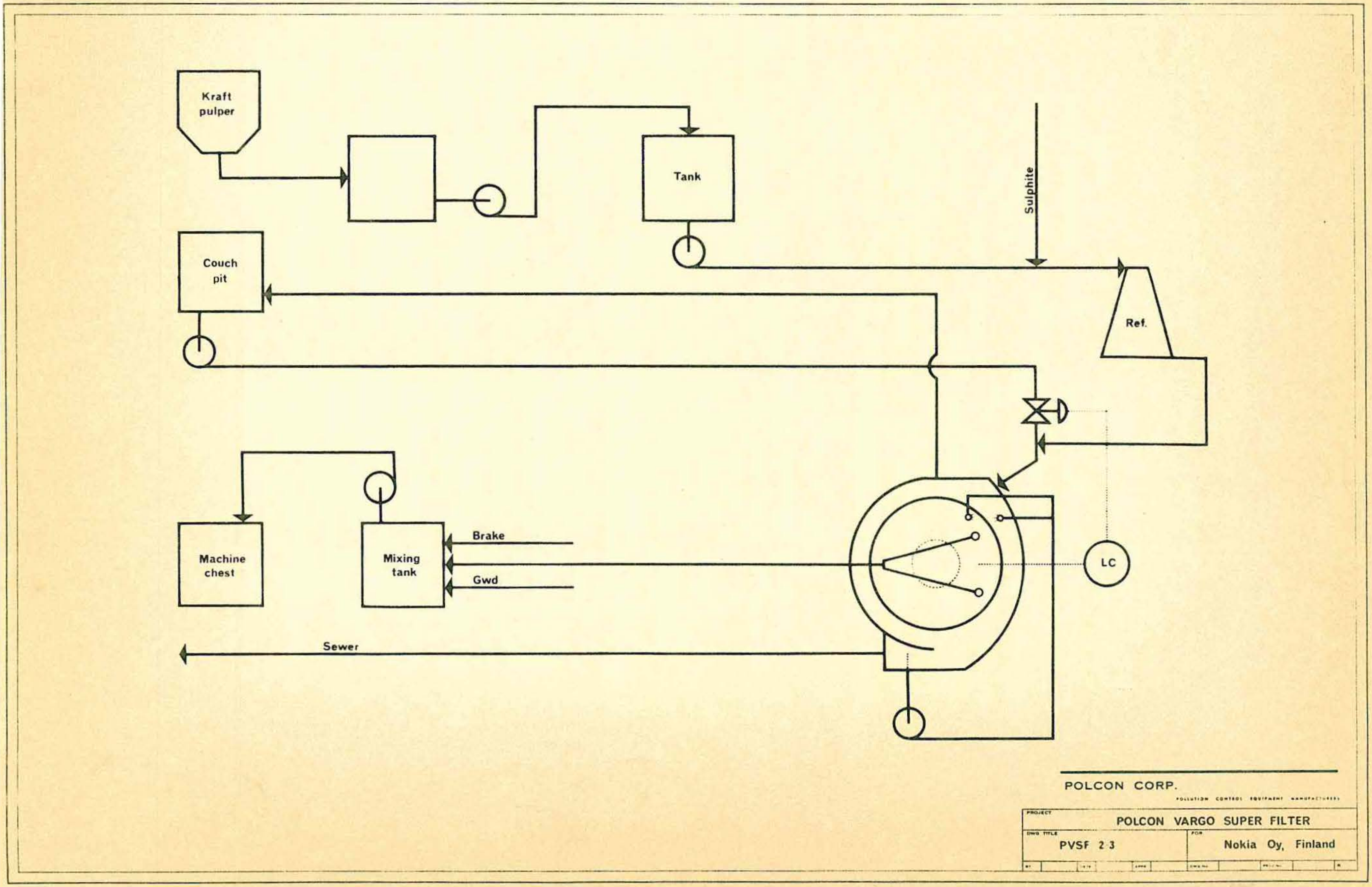
Suspended Solids	PPM	FLOWS
FEED	999.5	320 IGPM
PREFILTRATE	63.2	46.5 IGPM
CLEAR FILTRATE	21.0	270 IGPM
EFFICIENCY	97.9%	

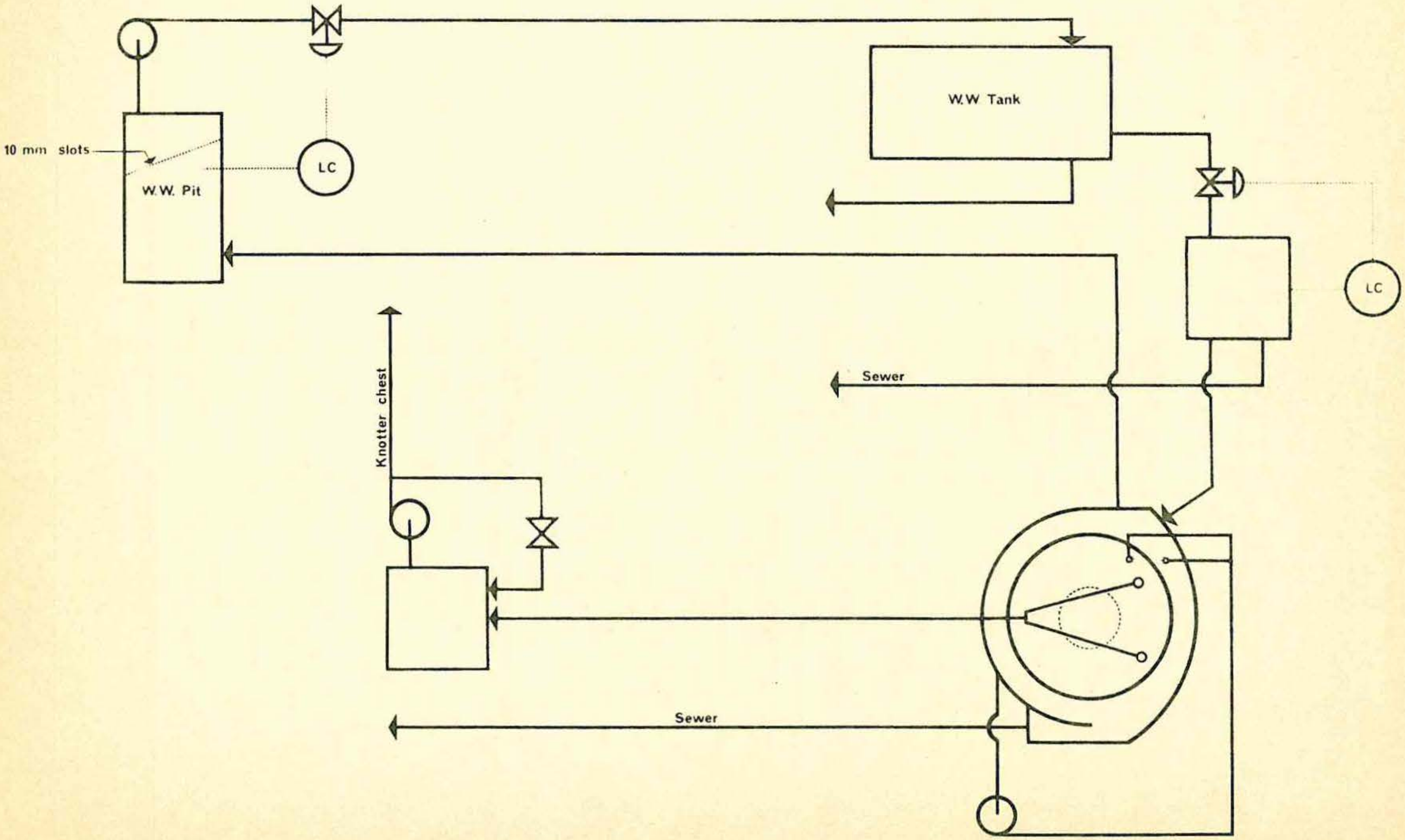
Filter Number	Product	Size m^2	Speed m/min	Precoat SR	Precoat g/m^2	Filtrate 1/min	Filtrate l/m^2	ppm	Total g/m^2	Fiber rec.%	Filler rec.%	Stock g/lit.
1	Sulphite pulp	70				10000		10		96		
2-3	tissue 55% gwd	70	18	40	80	3000	18	100	107	93		
4-5	kraft pulp	70	7	--	--	40000	600	20	60	80		8
6	tissue	70				approx. 5000		20				
7	tissue	70	12	45	200	4000	36	50	230	94-97		50
8	magazine paper	85		20		3500		160		93		
9	newsprint	85	5	20	700	4700	90	70	720	72		30
10	sulphite pulp	70				12000		10				
11	greaseproof	70	7	40	200	3000	44	50	240	95		38
12	tissue effluent	85	4	--	--	4000		40				10
13	tissue effluent	85	4	--	--	4000		40				10
14	tissue	30	7	38	130	1300	46	50	140	99	90	30
15	newsprint	85				5000		50				
16	Fluting	70		40		3000		30				
17	duplex liner	70				3000		40				
18	bleach p. filtrate	30	2	--	--	6500	1100	12	75	63		
19	Fluting	50	9	26	170	2000	33	80	220	95		20
20	tissue	70				3500		50				
21	tissue	30				2000		20				
22	fluting	85				5000		70				
23	ray cells sulphite	85										
24	kraft paper	30	6	--	--	1800	67	12	100	99		35



Combined mill effluents
To knotter chest 0.5
Container
Rec stock 0.5
5 mm
Rec stock 1
LC
Sewer
POLCON CORP.
POLCON VARGO SUPER FILTER
PVSF


SICA
PC
LC
Filtered WW
Conc. control
Sewer
LC
Kinney filters
Rejects
SICA
Cleaner rejects
Couch trim
Press water etc.
LC
Wire showers
Rec. stock
W.W. Tank
2500 m
LC
Brake tank
POLCON CORP.
POLCON VARGO SUPER FILTER
PVSF

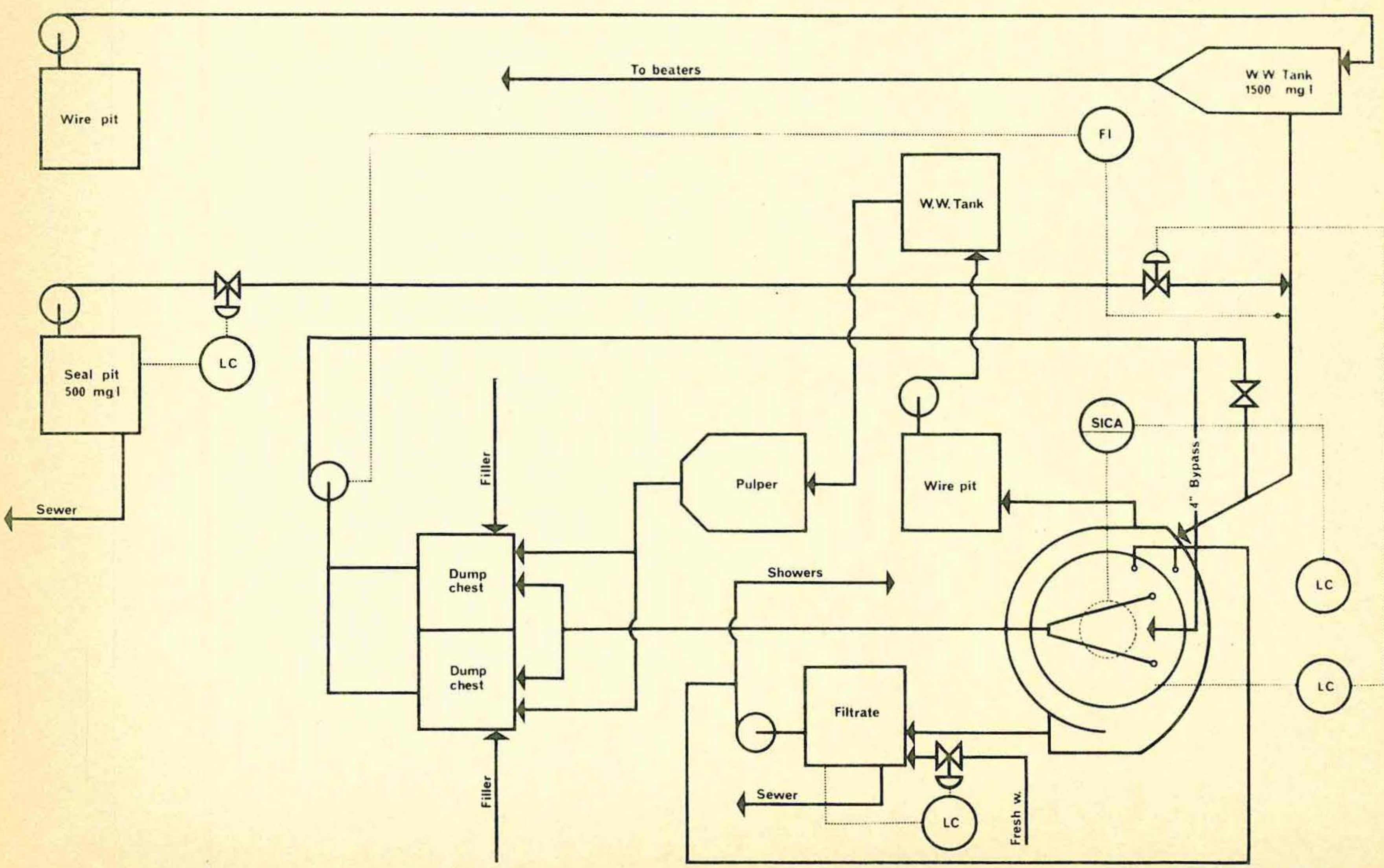

Kraft pulper
Tank
Sulphite
Couch pit
Ref.
Machine chest
Mixing tank
Brake
Gwd
LC
Sewer
POLCON CORP.
PROJECT
POLCON VARGO SUPER FILTER
DWG TITLE
PVSF 2·3
FOR
Nokia Oy, Finland



POLCON CORP.

POLLUTION CONTROL EQUIPMENT MANUFACTURERS

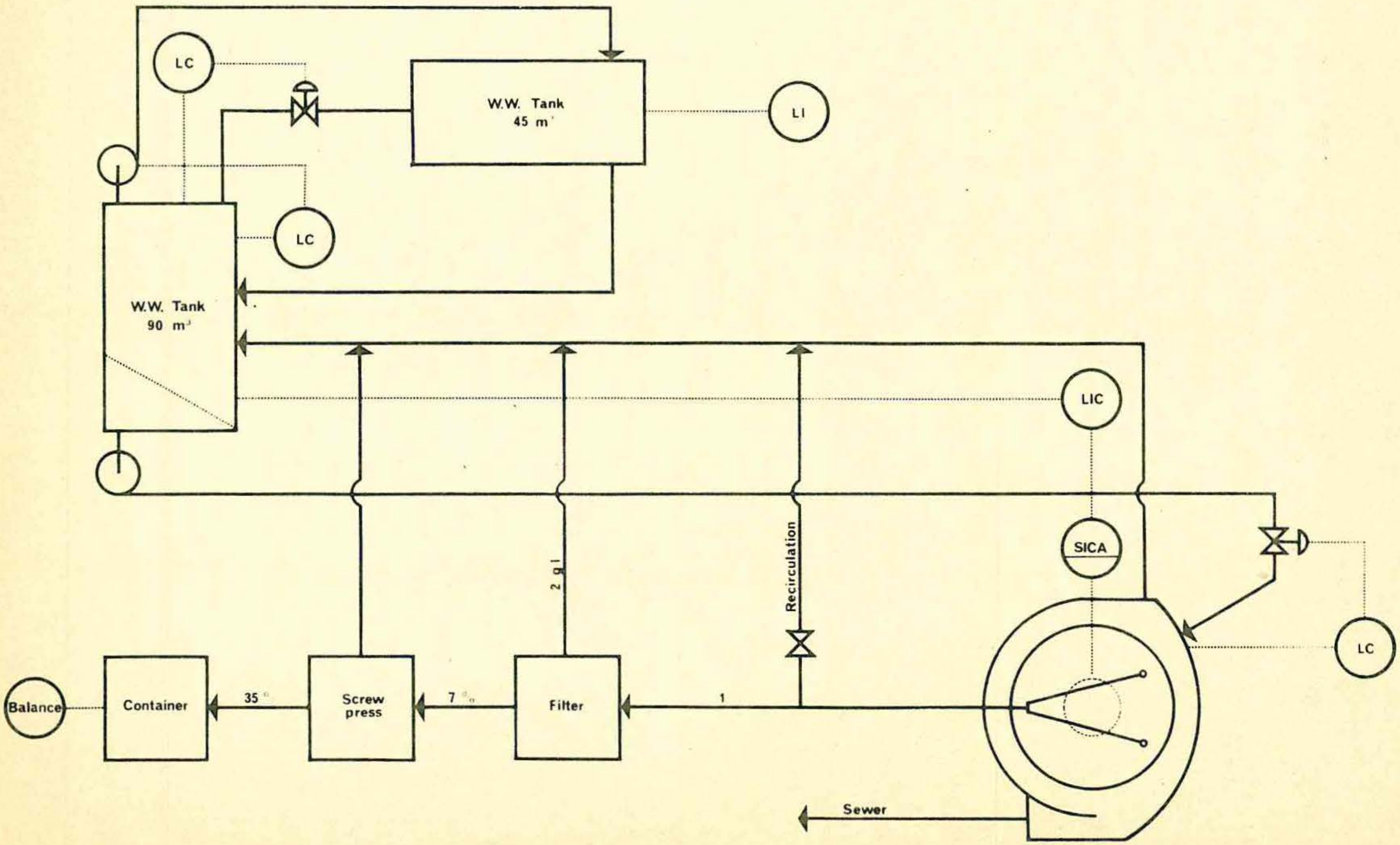
PROJECT: POLCON VARGO SUPER FILTER	
DWG TITLE: PVSF 4 5	FOR: Oulu Oy, Finland



POLCON CORP.

POLLUTION CONTROL EQUIPMENT MANUFACTURERS

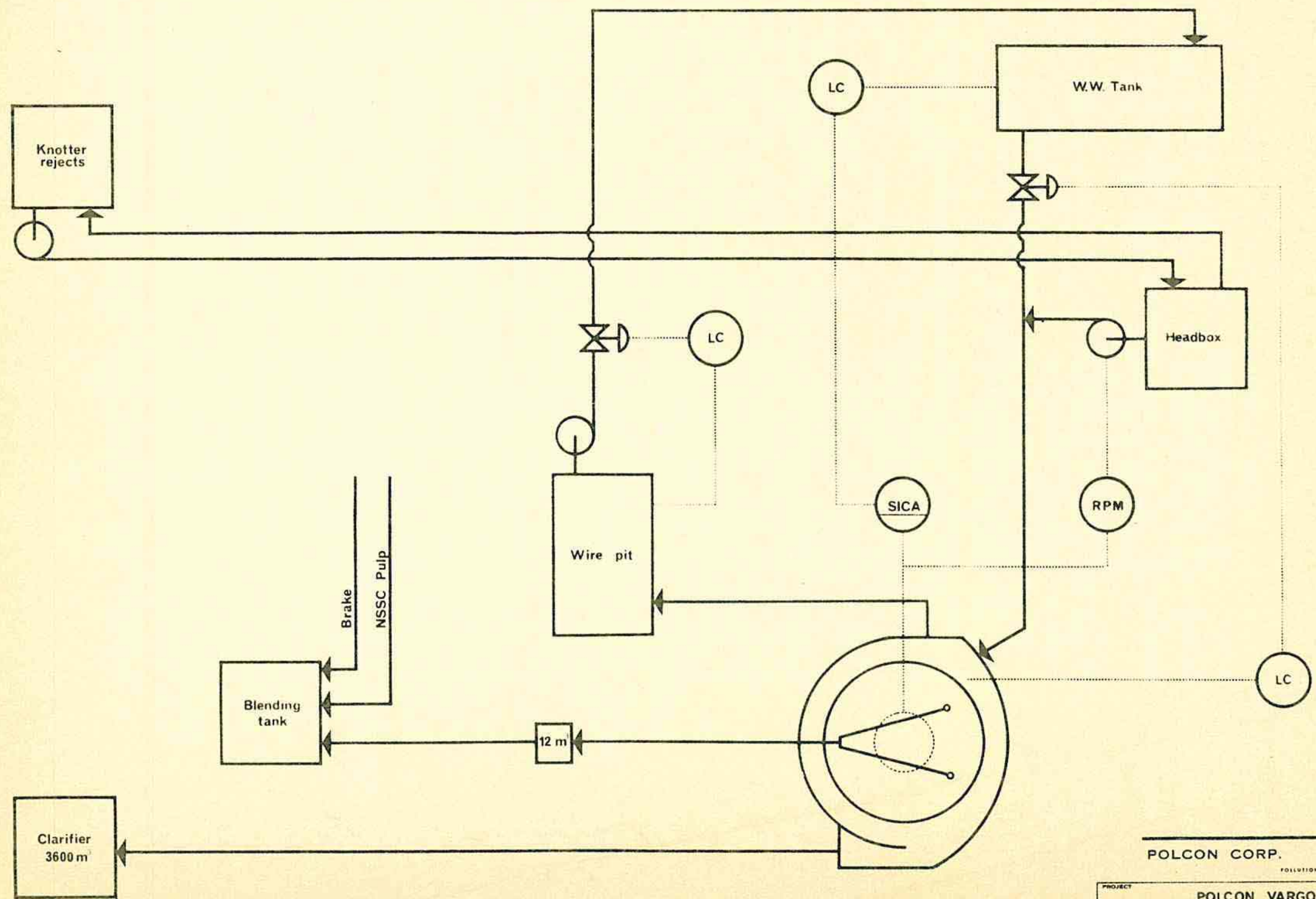
PROJECT: POLCON VARGO SUPER FILTER	
DWG TITLE: PVSF 11	FOR: A/S Drammenselvens Papirfabrikker



POLCON CORP.

POLLUTION CONTROL EQUIPMENT MANUFACTURERS

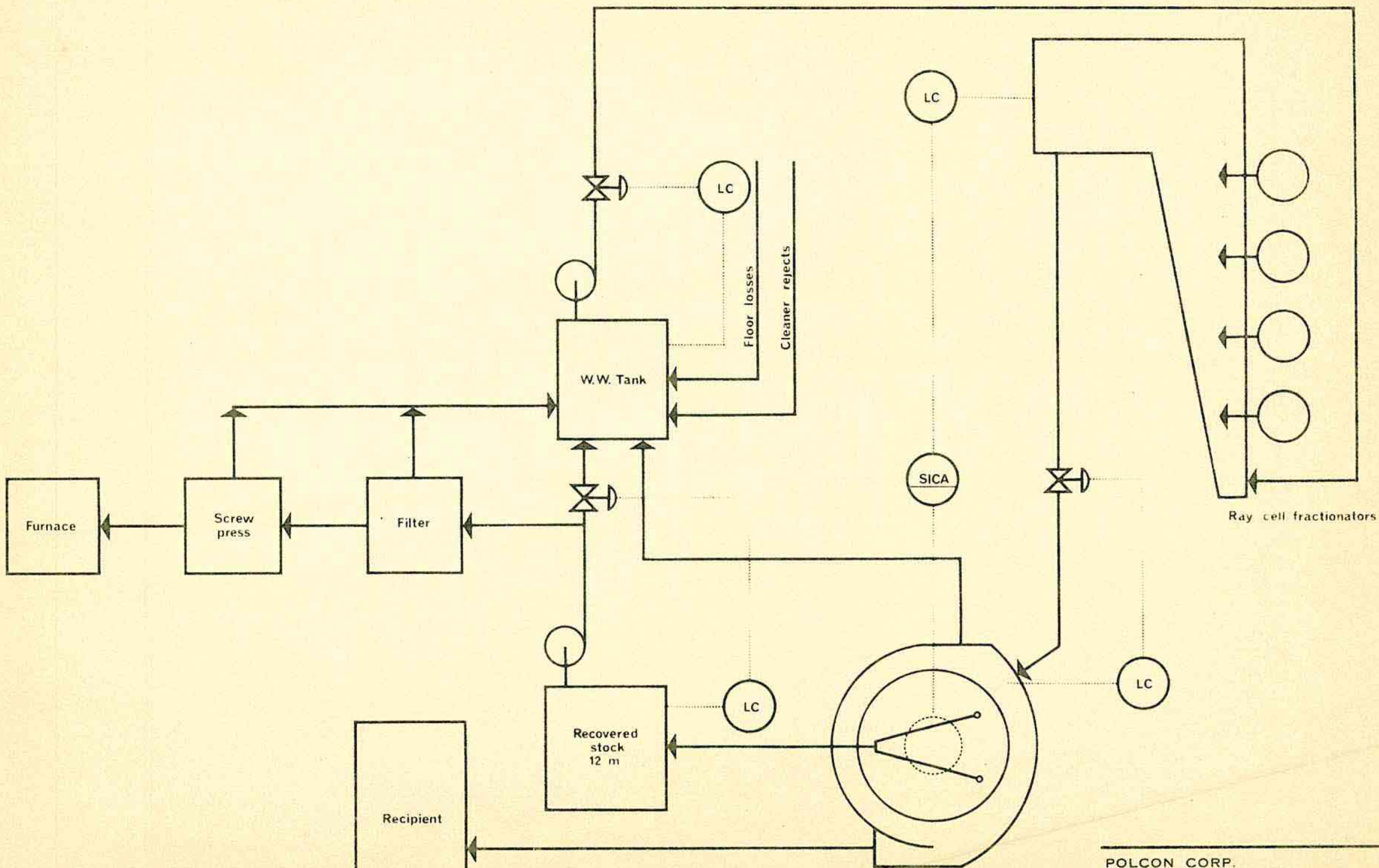
PROJECT	POLCON VARGO SUPER FILTER
DWG TITLE: PVSF 12 13	FOR: Billingsfors AB, Skapafors



POLCON CORP.

POLLUTION CONTROL EQUIPMENT MANUFACTURERS

PROJECT	POLCON VARGO SUPER FILTER
DWG TITLE PVSF 16	FOR Fiskeby AB Ljusfors



POLCON CORP.

POLLUTION CONTROL EQUIPMENT MANUFACTURERS

PROJECT POLCON VARGO SUPER FILTER	
DWG TITLE PVSF 23	FOR MoDoms jö