

GRAYS HARBOR PAPER COMPANY
HOQUIAM, WASHINGTON

CELLECO CLEANPAC 350 CLEANER SYSTEM

FOR NO. 2 PAPER MACHINE

CUSTOMER P.O. NO. GHP 36961/CELLECO S.O. NO. 105-A-0740



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GENERAL INSTALLATION INSTRUCTION

## Cleaner Equipment

The cleaner system can be located on any elevation in relation to the white water level. However, there is a lower limit given by the maximum allowed reject pressure. Maximum reject pressure for each type of cleaner is indicated in their specific manual.

#### NOTE:

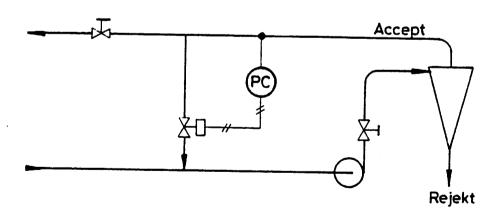
By locating the fiber recovery stages below the white water level, energy may be saved. Final stage with RCC-unit has to be located above the white water level.

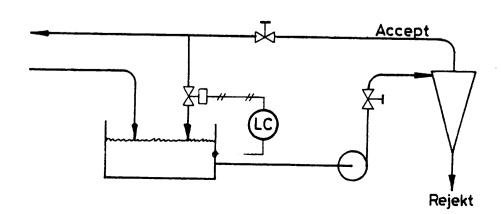
The cleaner system must not be located within the system so that back pressure from succeeding equipment like screens, valves, head box or static head exceeds maximum accept pressure.

The cleaner system should be operated at a constant feed flow. If the flow varies, part of the system should be shut down or part of the accept flow recirculated back to the feed pump. (See fig. below.)

Fig. 1 shows recirculation required when the flow from the system varies.

Fig. 2 when the flow to the system varies.







#### Pumps

Pumps should be located well below the white water level (dilution water) to avoid air entrainment and cavitation.

## Pipes

Due to energy prices and investment cost no general recommendation can be made regarding the most economic velocity in the pipes. However, normal velocity in feed and accept lines are  $2.5-3.5\,\text{m/s}$  (8 - 12 ft/s), in reject lines 2 m/s (6.5 ft/s). Dilution lines (suction lines) should be sized for a velocity of  $1-1.5\,\text{m/s}$  (3 - 5 ft/s), calculated on the total cleaner feed flow.

All pipes should be supported so that no vibrations or forces are transmitted to the cleaner system.

Check valves in the suction lines should be avoided as they can create pulsations.

All suction lines should have  $\emptyset$  100 (4") dump valves.

Before start-up the whole system including pumps and chests should be flushed out. At this time all feed, accept, reject and dump valves should be fully opened.

## <u>Valves</u>

All feed, accept and reject pipes should be equipped with valves for pressure control of the cleaner system. If the fiber recovery stages (stages 2, 3 and 4) are located below the white water level, no reject valves are required.

The accept and reject valves should be located below the white water level.

The feed valve can be located anywhere between the pump and the cleaner, and should be equipped with a slow-opening actuator, interlocked to the pump, if there is risk for a pressure shock (big flow and difference in elevation between cleaner and white water level).



All valves should be of continuously adjustable type.

If the cleaner system is located below or on the same elevation as the white water level, the accept and reject valves in the fiber recovery stages (stages 2, 3 and 4) can be sized for a velocity of 4.5 m/s (14.5 ft/s) and 3.5 m/s (11.5 ft/s) respectively, to give a proper pressure drop and valve opening. Too big valve gives an improper flow area, which could cause plugging of the valve.

## Pressure Transmitters

All stages in a system should be equipped with pressure transmitters on feed, accept and reject. If the final stage is equipped with an RCC-unit, or lack a reject control valve, transmitters are required on feed and accept only.

The locations of the pressure transmitters are specified on the certified drawings.

## Pressure Gauges

The pressure gauges should be remote panel-mounted, easy accessible for service. To simplify operation of the cleaner system, a local pressure gauge close to each control valve is recommended. The gauges on feed, accept and reject should have following ranges: 0 - 400 kPa (0 - 60 psi), 0 - 250 kPa (0 - 20 psi) and

0 - 100 kPa (0 - 10 psi) respectively.

## Sampling Valves

Sampling valves should be installed on all feed, accept and reject pipes. (See drwg. 6088 0148.)

Sampling valves on the feed pipes are a minimum requirement.

The valves should be located in a straight piece of pipe, preferably 5 to 6 times the pipe diameter from any elbows or valves.



The sampling valves should have a minimum diameter of  $\mathbf{1}$  inch and the flow should be directed towards the floor.

The reject outlet from the final stage should be open to permit a flow check with stop-watch/bucket.



#### GENERAL OPERATING INSTRUCTIONS

## Working principle for cleaners (hydrocyclone)

The separation of heavy contaminants from the pulp is caused by the centrifugal force created by feeding the cleaner tangentially. The cleaned pulp concentrates in the center of the cleaner and moves towards the accept outlet on the thick end of the cleaner. The heavy contaminants move in a spiral along the inside wall of the cone towards the reject outlet (tip).

The reject from the primary stage is diluted and pumped to one or more fiber recovery stages to minimize the fiber losses.

## Start-up

1) Before start-up check:

that the piping corresponds to Celleco's flow sheet

that at first start-up all pipes and chests are flushed out

that all cleaners and sight glasses are correctly mounted and in locked position

that isolation valves in the pump suction lines are open

that all cleaner feed valves are at least 70 % closed to avoid pressure shocks

at first start-up are fully open,
after shut-down are in their normal
operating positions.
The reject valve on the final stage
should be kept fully opened until all
junk from the construction is cleaned
out.

that the white water chest is filled up

that dilution water is available for the RCC-unit.

2) Always start the cleaner system with white water only in the following order:

The final stage first and then the next stage and so on up to the primary stage.

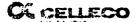
## 3) Coarse tuning of the cleaner system

open the feed valves and adjust the accept und reject valves to obtain required pressure drop,  $\Delta P$  ( $\Delta P = P_{feed} - P_{accept}$ ) and a pressure difference ( $P_{accept} - P_{reject}$ ) between accept and reject of about 30 kPa (4.5 psi).

Normal reject pressure with the cleaner system located above the white water level is 10 kPa (1.5 psi). If the cleaner system is located below the white water level, the reject pressure will be equal to the difference in elevation between the cleaner system and the white water level.

#### NOTE!

Due to air in the system it will take a couple of minutes before the pressures stabilize.



b) Open the stock supply to the cleaner system and, if required, readjust the pressures.

Check that the reject from all cleaners flows from the reject outlet towards the reject header. Wrong pressures are indicated by reversed flow in some cleaners. If this occurs, increase the pressure difference (Pa - Pr) by increasing the accept pressure or/and decreasing the reject pressure.

The difference between the accept pressure  $P_a$  and the reject pressure  $P_r$  gives the reject flow to the next stage. High pressure difference  $(P_a - P_r)$  gives a big reject flow, and a low difference gives a small flow with a risk for unbalance and reversed reject flow in some cleaners.

## 4) Fine tuning of the cleaner system

a) Check the feed consistencies to all stages.

If all cleaners are on-line and the system is operated at design capacity, the feed consistencies should e equal or slightly decreasing from the primary to the final stage. To avoid a too low reject flow giving unbalance and wearing, the feed consistencies should not decrease more than 0.1 % per stage.

#### Example:

If the feed consistency is 0.6% to the primary stage, the feed consistency to the secondary stage should not be below 0.5% and to the tertiary not below 0.4% etc.

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If the feed consistency in a following stage is higher than in the previous, decrease the pressure difference ( $p_a$  -  $p_r$ ) in the previous stage. However, make sure that the reject flow does not stop or reverse in any of the cleaners.

Please note that the pressure difference ( $P_{a}$  -  $P_{r}$ ) 30 kPa (4.5 psi) - see Item 3a - is valid for coarse tuning only.

The pressure difference  $(p_a-p_\gamma)$  varies with the type of pulp and pressure drop  $(p_f-p_a)$  and is normally drop  $(p_f-p_a)$  and is normally between 0.5 and 40 kpa (0.7 to 6 psi). If the pressure drop is increased, the pressure difference has to be increased, too. When the pressure difference is too. When the pressure difference is changed, the feed consistency to the following stage should be checked to see following stage should be checked to see that the right reject flow is obtained.

It is very important that the cleaner system is correctly tuned to minimize wear and to give a trouble-free operation for several years. Therefore, we recommend that the pressures and the cleaner system are checked at least once per shift.

On final stages with stock savers the dilution water to the stock savers should be adjusted so that a minimum of good fiber and a maximum of dirt is rejected. The reject flow is controlled with the accept pressure and the reject consistency with the dilution water volume. (The above is not valid for RCC-units.) (The above is not valid for RCC-units.) the reject and prevent the dirt from being the reject and prevent the dirt from being cleaner system.

If the final stage is equipped with a reject control unit (RCC), see separate instruction.

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## Operating control

- Check feed, accept and reject pressures to all stages.
- 2. Check the feed consistency to all stages, and if required readjust the pressures as per above.
- Check the consistency and reject volume from the final stage.
- 4. Check that all cleaners are in operation.

If the cleaners are plugged or partially plugged, or the dilution water volume to the final stage is too high, impurities will accumulate and circulate on the cleaner system causing wear.

Start-up and fine tuning assistance can be provided by Celleco in accordance with "Conditions for provision of technical personnel outside Scandinavia on current account".

#### Shut-down

- 1. Shut the stock supply to the cleaner system.
- 2. Always run the system with white water for at least 20 minutes to prevent sedimentation causing plugging on restart. If the white water consistency is high (0.3 0.4 %) fresh water flush-out ports are recommended.
- 3. Shut down the pumps and close the cleaner feed valves to about 70 %.

## SPARE PARTS

On the separate spare part list enclosed with the certified drawings are recommended spares specified.

On all spare part orders please specify:

- Item (according to spare part list)
- 2. Item No. (according to spare part list)
- 3. No. of ea. required

If there are any doubts about the item No., please specify this on the order and give original system order No. and delivery date.

Spare parts can have different item No. from the original parts. They are, however, equal or fully interchangeable with the original parts.



## CLEANPAC 350-350C BANK TECHNICAL INSTRUCTIONS

Description	page 1, 2,3
Data	page 1
 Installation instructions	page4
Mounting of cyclones	page <b>5,6,7</b>
Dismounting of cyclones	page <b>8</b> ,9
Maintenance instructions	page 10

Horisontal and vertical bank assemblies are available. The cleaners have sealing O-rings on the accept and feed pipes. The reject outlet is equipped with a sight glass enabling observation of the reject flow. Cleaner equipped with low-weight reject outlet is connected to the low-weight reject pipe with a transparent hose.

#### DATA

Max. accept pressure allowed for a Cleanpac-350 Bank is: 150 kPa

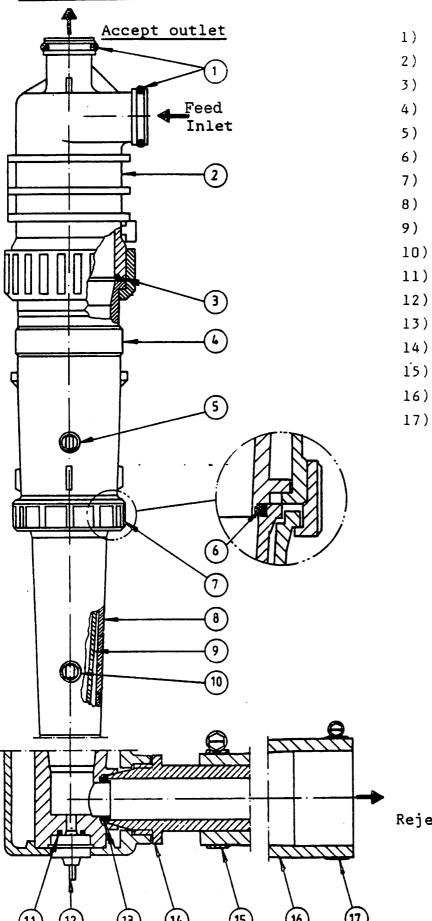
Feed capacity per cleaner at pressure drop:

100 kPa = 365 l/min. 120 kPa = 400 l/min. 150 kPa = 450 l/min. 14 psi = 96 US gpm 17 psi = 106 US gpm 21 psi = 118 US gpm

Feed capacity per cleaner equipped with low-weight reject at pressure drop:

210 kPa = 530 l/min. 250 kPa = 580 l/min. 30 psi = 140 US gpm 36 psi = 153 US gpm

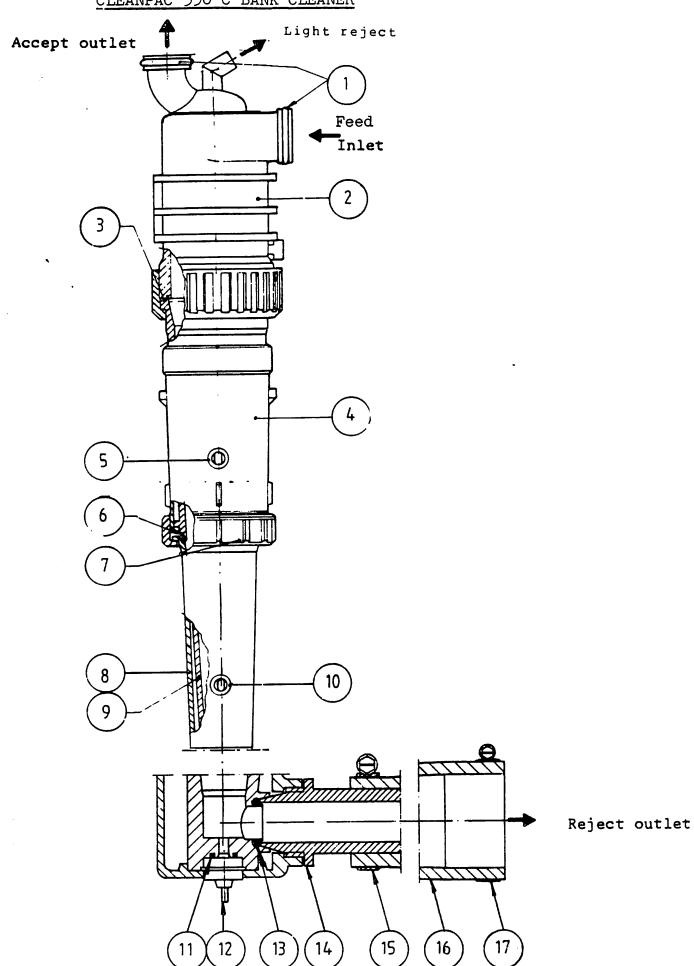
## CLEANPAC 350 BANK CLEANER



- 1) 0-ring
- 2) Inlet head
- 3) 0-ring
- 4) Upper cone bank
- 5) Detection hole
- 6) Seal ring
- 7) Nut
- 8) Lower mantle
- 9) Lower cone
- 10) Detection hole
- 11) 0-ring
- 12) Valve
- 13) 0-ring
- 14) Sight glass
- 15) Hose clamp
- 16) Rubber pipe
- 17) Hose clamp

Reject outlet

## CLEANPAC 350 C BANK CLEANER

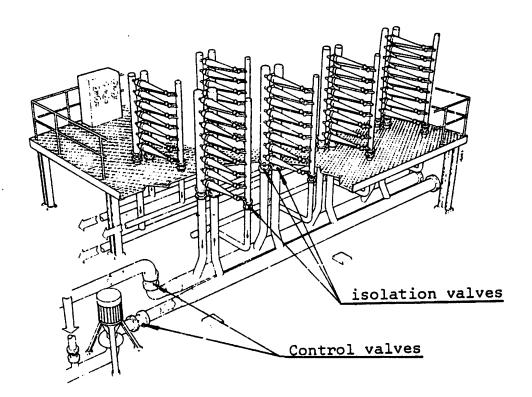




## INSTALLATION INSTRUCTIONS

Plant erection should be done in accordance with instructions stated on the certified drawings. Note that a control valve is to be installed on each header serving several banks apart from possible bank isolation valves.

Pressure transmitters should be installed between the control valve and the isolation valves on the header, or, preferably, at the top of each bank.

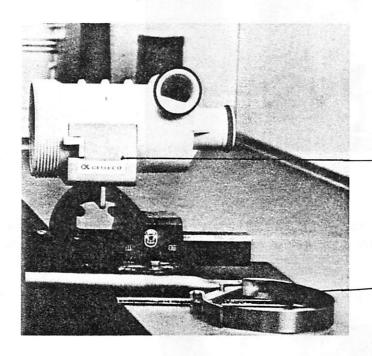


Do not use pipe connections for lifting purposes. For lifting a horizontal bank, use the holes on the framework. For lifting a vertical bank, ropes should be tied to the interconnecting plates.



## MOUNTING OF CLEANPAC 350 CLEANER

The following tools are used for mounting and dismounting.



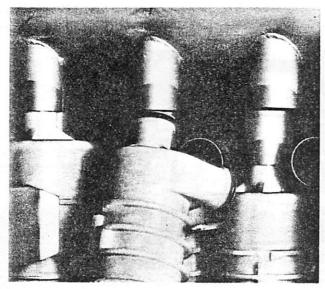
Tool No. 1 (to hold the cleaner head).

Tool No. 2 (for the big and the small nut).

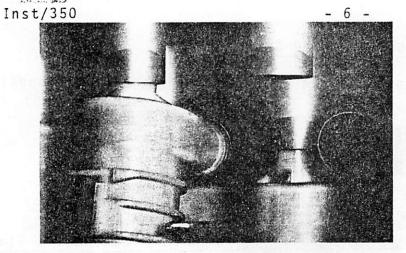
1) Put both the 0-rings in the groove on the feed and accept connections of the cleaner, then lubricate them with a thin layer of silicone grease or soap water.

(Note that other types of oil or grease must not be used, as they may damage the O-rings).

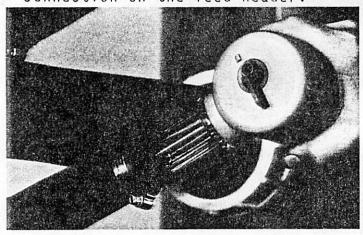
2) Mount the rubber pipes on the reject pipe connections.



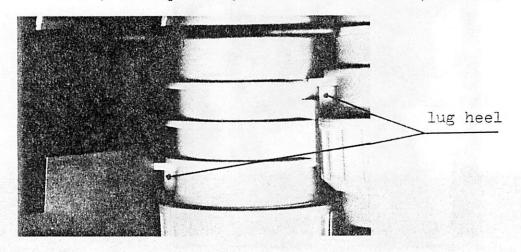
 Insert accept end into the corresponding connection on the accept header.



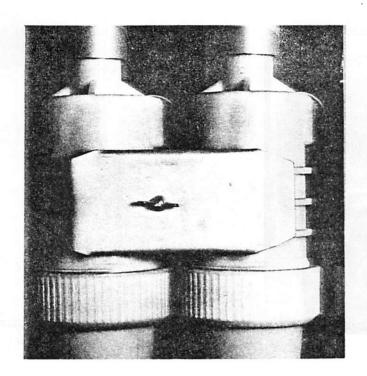
4) Press inlet part of the cleaner into corresponding connection on the feed header.

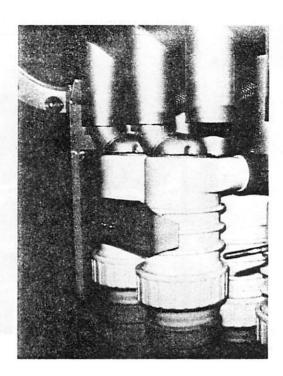


5) The sight glass should be inserted into the rubber pipe before pressing the cyclone into correct position.



6) Press the cleaner into its position, so that the lug heel fits into its notch in the support plate. For types 2 and 4 the lug heel for the outer cleaner should fit into the corresponding slots on the inner cleaner.



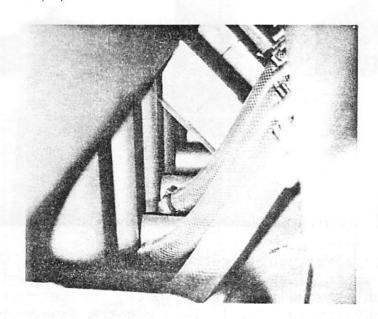


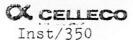
7) The cleaner should be fixed into its correct position by means of the clamp.

NOTE: The wing nut should be turned by hand only.

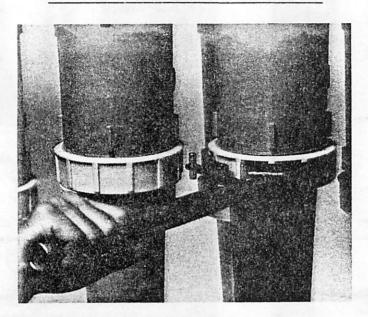
8) Seal the rubber pipes by tightening the clamps.

For combi type: Connect the light reject hose to the light reject pipe.

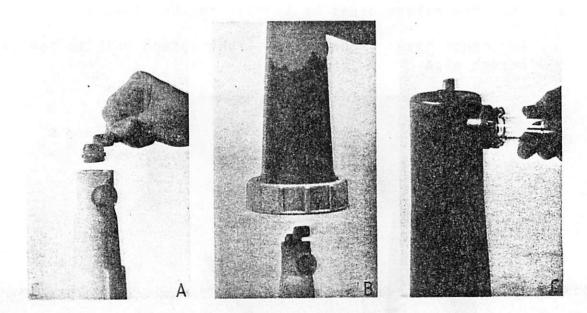




## REPLACEMENT OF THE LOWER CONE



- 1) Loosen the nut on the lower cone by using tool No. 2.
- 2) Loosen the hose clamp on the sight glass.
- 3) Unscrew the sight glass from the lower mantle and remove the lower cone.



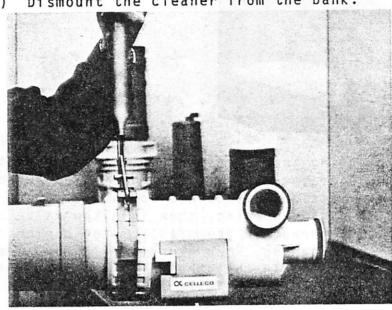
4) Mount the lower cone together with its valve, lower mantle, nut and sight glass. Put the cone vertically on its thick end, mount the valve into its notch in the thin end of the cone according to fig. A. Then put the lower mantle with nut over the cone according to fig. B. Then fix the cone by inserting the sight glass according to fig. C.



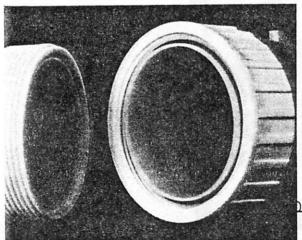
- 5) Mount the lower cone by inserting the sight glass into the rubber pipe, then fit the lower cone to the upper cone and tighten the nut by using tool No. 2.
- 6) Tighten the hose clamp on the sight glass.

## REPLACEMENT OF THE UPPER CONE

1) Dismount the cleaner from the bank.



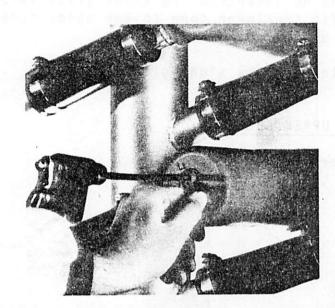
- 2) Fix the cleaner inlet head into tool No. 1 and loosen the nut by using tool No. 2.
- 3) Check the cleaner head and clean it if required.



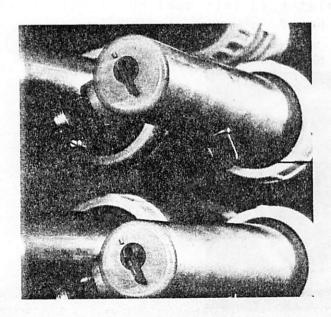
)-ring

4) The new cone should be completed with an O-ring to be applied around the tip of the cone. Press the cone into its position towards the inlet head, then fasten the nut by means of tool No. 2.

## MAINTENANCE INSTRUCTIONS



1) In case of clogging in the reject outlet of any of the cleaners, the operator can remedy it during operation. Insert a 1/4" plastic pipe, connected to compressed air or water, into the valve opening, then turn the valve 180° anti-clockwise, whereafter the plastic pipe can be put into the cleaner for cleaning. When flushing is done, the pipe can be pulled out so far that the valve can be tightened again, then the pipe can be fully removed.



There is a detection hole in the mantles of the upper and the lower cone. When the cone has been exposed to wear, sufficient to damage the cone, leakage from the detection hole will appear. The detection hole should then be sealed with the red plug. The plug then serves as a marking flag that this cone should be changed at a suitable shut-down.



# CLEANPAC 350 FINAL STAGE MODELS 1HRCC-D and 2VRCC-D

## Technical instructions

Funktion	page 1
Process data	page 1
Installation	page 2
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Dummy unit	page 15

#### 1. FUNCTION

The Final Stage consists of three cleaner stages which are integrated into a single unit. The first stage consists of a cyclone cleaner of conventional design. The second and third stages have special cyclone cleaners which are driven by the dilution water. The dilution water is injected tangentially into the upper part of the two special cleaners under a pressure of 21 psi. The inlet zone of these cleaners is so designed that an ejector effect is obtained, thereby eliminating the need of pumps.

In order to obtain a constant accept pressure and consequently a constant reject rate in normal operation, a constant static head at the accept of the special cleaners is arranged by means of overflow pipes.

## 2. PROCESS DATA

Normal feed pressure:

Pressure drop (see the specification)

10 psi

(Pressure drop = pressure difference

between feed and accept)

Capacity per cleaner

at a pressure drop of:

14 psi = 96 USGPM

17 psi = 106 USGPM

21 psi = 118 USGPM

Dilution water (white

water) flow:

120 USGPM

Max. content of fibers and/or fillers in the

dilution water:

0.25% (At higher values please

contact Celleco)

Dilution water pressure: 21 psi

Final reject flow: Approx. 5 USGPM

#### Note

In the case of small plants and/or plants where the content of impurities is low, water may also be injected at the dilution chamber (item 3 on the general drawing). In such cases a fresh water flow of 5 USGPM at a pressure of max.

14 psi is required.

For some applications, the Final Stage can be equipped with a dirt container which is emptied intermittently by means of an on-off valve.

## 3. INSTALLATION

- Fig. 1 shows how the Final Stage normally is connected up to a cleaner plant.

  As shown in fig. 1 (alt. B and D), it is recommended that the accept from the Reject Control Device is delivered to reject treatment if the stock is containing shives.

  In other cases (alt. A and C), the accept is fed to the preceding cleaner stage. At 4-stage plants and when the stock contains fillers it is recommended, however, that
- Note: it is important that the Final Stage is located above the corresponding white water level. Otherwise the white water will give rise to a back-pressure, consequently increasing the reject flow. (If it is not possible to locate the unit above the white water level, please contact Celleco.)

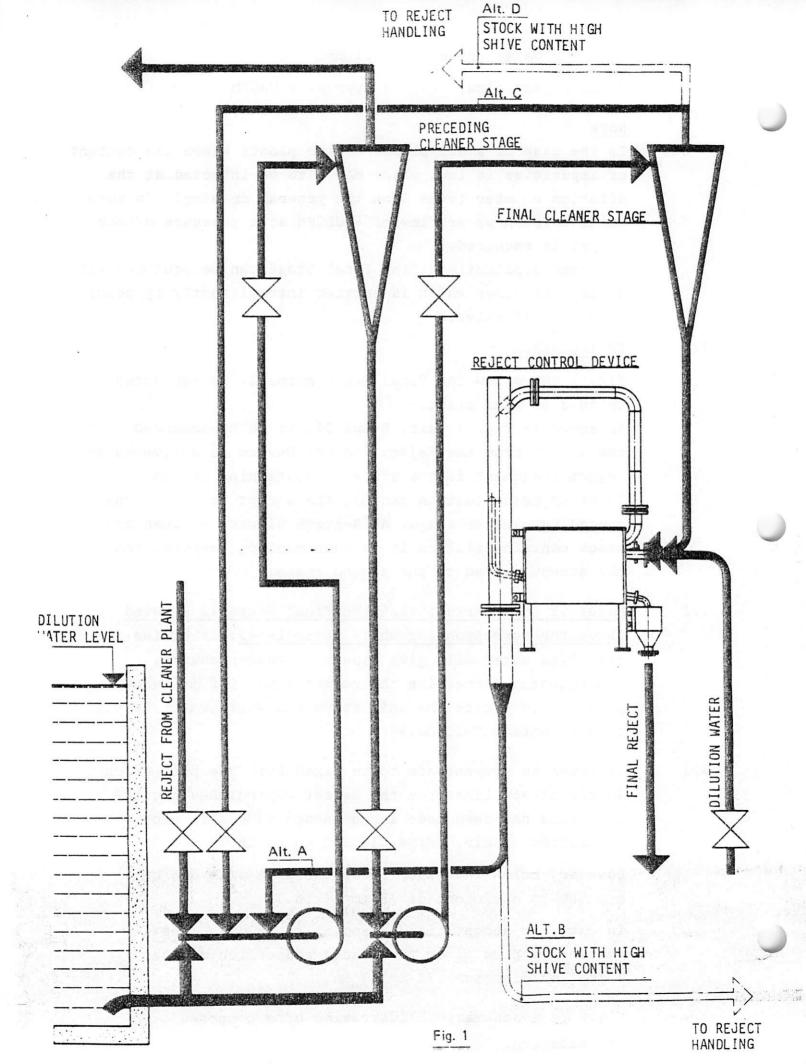
the accept is fed to the second stage.

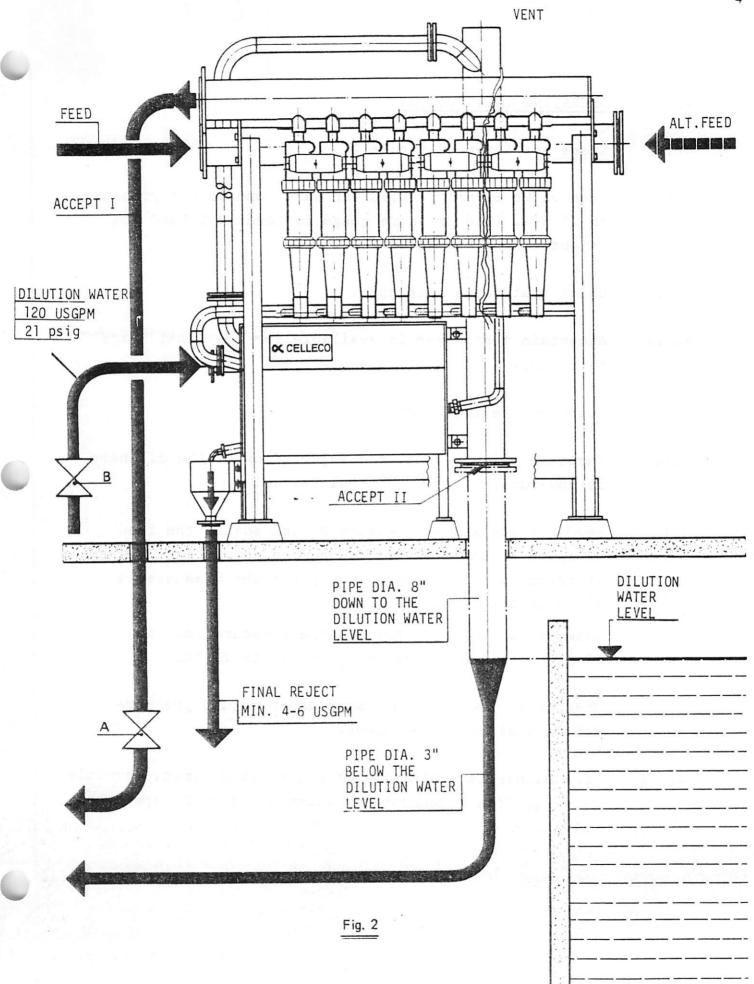
In order to prevent air to be mixed with the pulp stock in the accept line from the Reject Control Device, the pipe size has been made large enough to enable proper separation of air. (Pipe dia 200 mm (3 in.).

However, below the water level the pipe size can be reduced to a minimum of 75 mm (3 in.).

In case the accept line is ending in an open chest, the entire pipe after the flange connection may have a smaller diameter (75 mm, 3 in.).

Fig.2 is a schematic illustration of a proposed installation.





## 4. OPERATING INSTRUCTIONS

- 4.1 Start up: Refer to figure 2.
- 4.1.1 Open valve B for the dilution water and adjust pressure to 21 psi. (The pressure gauge is located behand the Reject Control Device.)
- 4.1.2 Check that valve A is open.
- 4.1.3 Ascertain that water is available for the Final Stage feed pump.
- 4.1.4 Start up the feed pump.
- 4.1.5 Throttle valve A until the reject flow of the cleaners is towards the Reject Control Device.
- 4.1.6 Read off the accept pressure P<sub>a</sub> and adjust the feed pressure P<sub>f</sub> until the pressure drop across the cleaners is obtained. (The pressure drop for the cleaners is given in the specification.)

Example: If  $P_a$  is 10 psi and the pressure drop is 17 psi, the feed pressure  $P_f$  should be 27 psi.

- 4.1.7 Open stock feed to the system and readjust pressure settings as described above.
- 4.1.8 If a higher concentration of reject is desired, throttle valve A. If a lower concentration is desired, open the valve.

## 4.1.9 Ascertain that the reject of each cleaner unit is IMPORTANT flowing towards the Reject Control Device.

If the reject from any cleaner unit has a tendency to stop or flow in the wrong direction, the accept pressure P<sub>a</sub> must be increased.

## 4.1.10 Notes:

a) In cases of small plants and/or plants where the content of impurities is low, the discharge of fibers and fillers can be further reduced by addition of fresh water to the elutriation chamber of the last cleaner in the Reject Control Device.

Care is to be taken when controlling this water flow.

Do not add so much water that the impurities are
trapped in the final cleaner. (Trapped impurities
may cause plugging and wearing problems.) The pressure
of the fresh water should normally not exceed 14 psi.

- b) The Reject Control Device is designed for a final reject rate of approx. 5 USGPM which is obtained in normal operating conditions regardless of the size and capacity of the preceding final stage of the cleaners.
- c) Should a higher reject rate than approx. 5 USGPM be required, the outlet opening of the reject chamber on the second cleaner unit in the Device (item 9 on the general drawing) can be enlarged by drilling.

The nominal size of the reject chamber outlet is 18 mm ID. By drilling this opening up to (22 mm) 7/8 in , a reject rate of appr. 8 USGPM is obtained.

In certain extreme cases it might be necessary to obtain a still higher rate of reject from the unit. this is in principle possible by cutting off a piece of the reject end of the last cleaner unit.

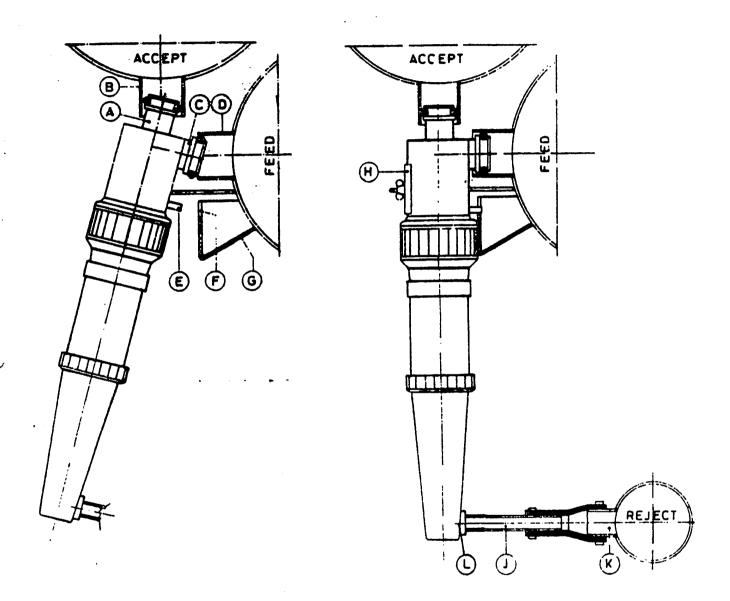
Example: Cutting off a piece of (50 mm) 2 in. will result in a reject rate of 12 USGPM.

In such cases it is, however, recommended to contact Celleco.

## 4.2 Shutdown

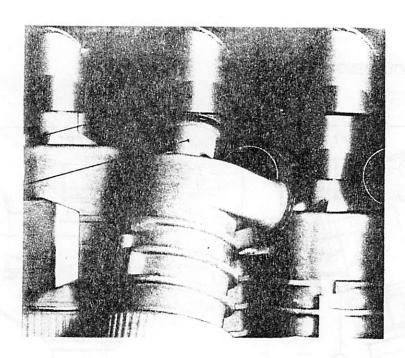
- 4.2.1 Shut off the stock supply to the plant.
- Run the plant with water for about 20 minutes to prevent fibers sedimenting in the piping, causing plugs.

#### MOUNTING OF CLEANER



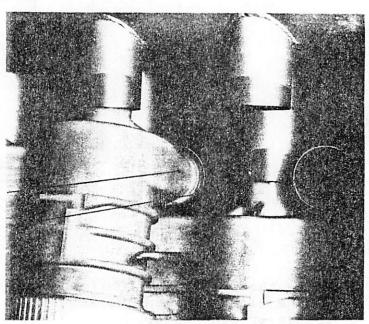
- 1) Place the 0-rings on the feed and accept connections of the cleaner. Then lubricate them with silicon grease or soap water.
  - (Note that other types of oil or grease must not be used as they may damage the 0-rings).
- 2) Check that the 0-ring between the sight glass J and the reject part of the cleaner is placed in its groove. (Symbols corresponding to figure.)
- 3) Screw the sight glass on the reject part of the cleaner.
- 4) Put the reject rubber pipe together with stud K of the reject pipe.

2)



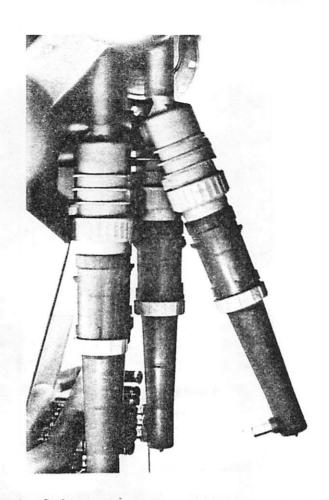
Insert accept outlet connection  ${\tt A}$  into pipe stud  ${\tt B}$  on the accept header.

3)

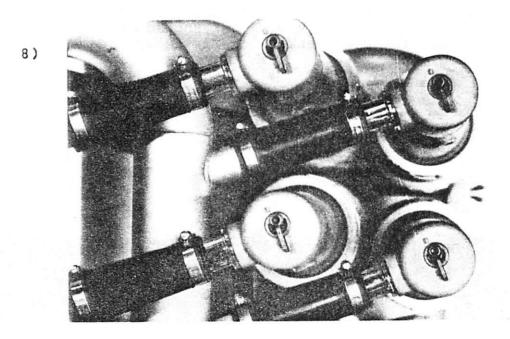


Press feed inlet connection  ${\tt C}$  into pipe connection  ${\tt D}$  on the inject header so that quide  ${\tt E}$  fits into slot  ${\tt F}$  on plate  ${\tt G}$ .

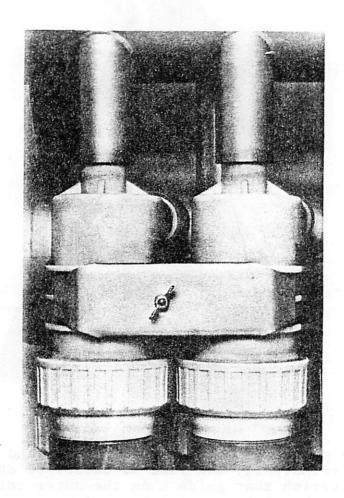
7)



The mounting procedure for types 2 and 4 bank assemblies is principally the same as described above with the exception that guide E on the outer units should fit into the slot on the inner unit.



Insert the sight glass into the reject rubber pipe. Screw on the hose clamp.

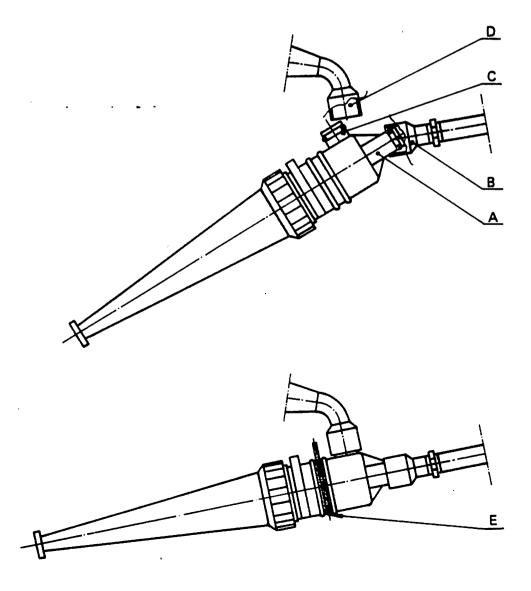


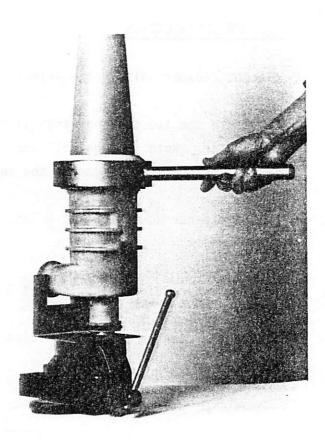
The cleaners are fastened into the correct position by means of a plate H. The wing nut should be turned by hand. Do not use force as leakage on the accept connection may result.

## **CLEANER INSTALLATION**

(Second cleaner unit in the Reject Control Device)

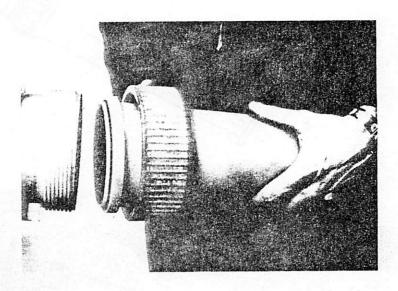
- Lubricate the two sealing rings with silicone grease or soap-water. (Note: mineral oil such as vaseline may not be used, since it will damage the sealing rings).
- .2 Insert cleaner accept outlet A into connection socket B.
- .3 Press cleaner inlet C into socket D.
- 4 Secure the cleaner by means of clamp E.





Loosen the nut on the cleaner by using the special tool. Clean the top of the unit and check it for wear and damage.

2)

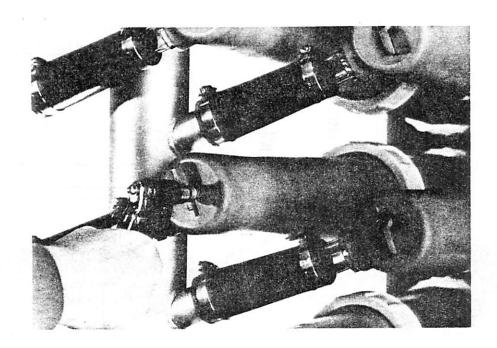


Put 0—ring on the cone and fasten the cone on to the top of the unit which the nut.

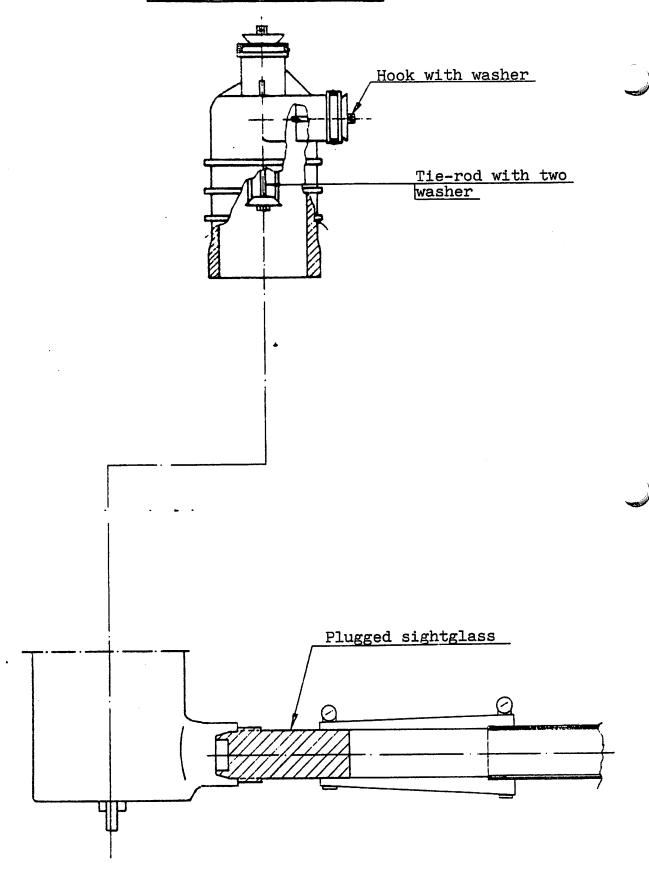
## MAINTENANCE

Plugged reject outlets can be cleaned while the units remain in operation. A 1/4" plastic type (instrument tube) connected with water or compressed air shall be used for rinsing. Rinse as follows:

- a) Connect the plastic type with the reject valve of the cleaner.
- b) Open the valve by turning it 180°.
- c) Connect water or compressed air.
- d) Rinsing is made by putting the plastic tube into the cone.
- e) When the rinsing is finished pull out the plastic tube from the cone exactly so much that the tube is still stuffing while closing the valve by turning it 180.



## DETAILS FOR DUMMY UNIT



Details for dummy unit article no: 6088 5629-05