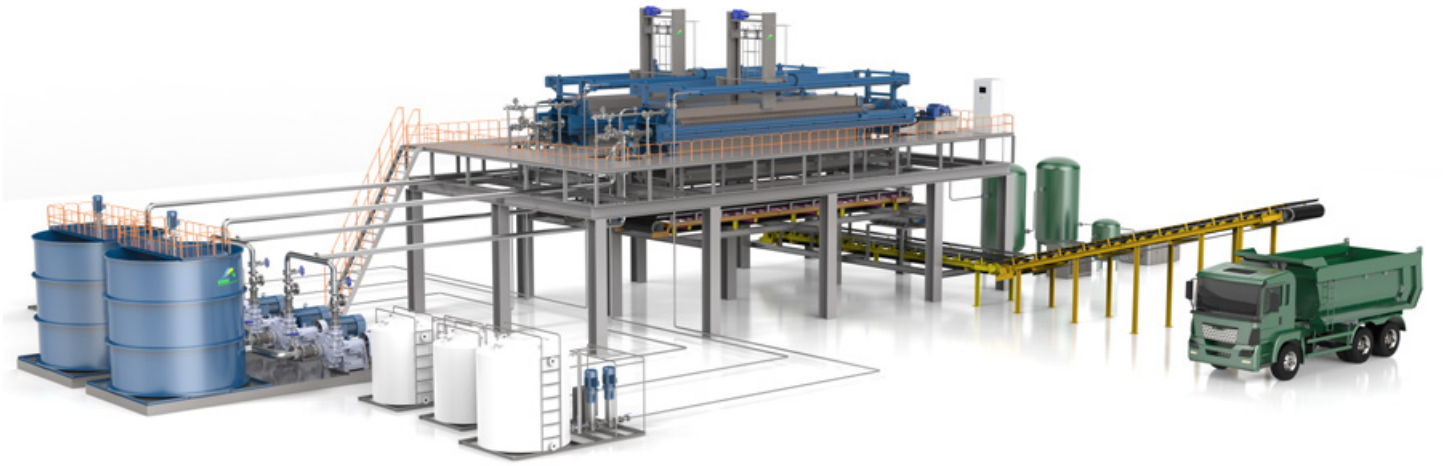
XUDA MACHINERY



FILTER PRESS

DEZHOU XUDA MACHINERY CO., LTD.

Filter the World, Filter the Future!

CONTENTS

COMPANY PROFILE

Xuda Machinery is subordinate to Dezhou Xuda Enviro-Tech Co., Ltd. It is a factory which can produce filter press of all standard size and categories to meet the needs of various application industries. Over the years, our filter press product is proved to be stable and reliable in both quality and performance. With strong R&D ability and rich site application experience, we continuously innovate and strive to improve the automation level of our product, at the same time reduce maintenance cost. Our excellent quality and considerate service have been recognized by clients, especially in chemical production, mineral processing and water recycling.

FILTER PRESS INTRODUCTION

Plate type filter press is an intermittent pressure filtration equipment. Multiple filter plates are put together to form dozens or hundreds of neatly arranged filter chambers. Slurry is injected into the chambers by feeding pump, from which the continuous feeding pressure and intercepting of filter medium create a pressure difference inside and outside the chambers. This pressure difference forces the separation of solid and liquid, solid is trapped in the chambers to form filter cakes, liquid is discharged through the filter medium to achieve the purpose of filtration or dewatering.

FILTER PRESS MODEL AND SIGNIFICANCE

FILTER PRESS MODEL AND SIGNIFICANCE

X Y 1000 C 8 U 30-74 C F S Z

- X=chamber filter press
G=membrane filter press
Y=round plate filter press
B=plate & frame filter press
- S=manual filter press
Y=hydraulic filter press
Z=automatic filter press
D=quick operation filter press
K=high efficient filter press
- Plate size
- C=operation temp 0°C ~60°C
G=operation temp 60°C ~95°C
- Feeding pressure (bar)
- U=PP plate
E=PE plate
X=rubber plate
Z=cast iron plate
B=SS304 plate
- Chamber depth
- Chamber number
- C=carbon steel+painting
S=carbon steel+SS304
L=carbon steel+SS316
G=carbon steel+GFRP
P=carbon steel+PU
- Automatic drip tray
- Automatic cloth washing
- Automatic shaking

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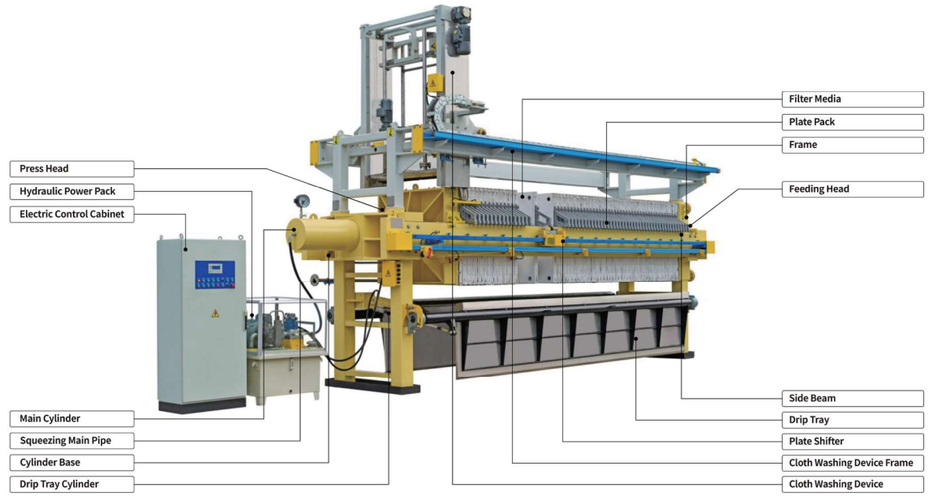
FILTER PRESS MAIN STRUCTURE



01 Plate Pack

The plate pack is the core component of the filter press, which is composed of filter plates arranged on the side beams at intervals. The size, material, structure, and chamber qty of plate pack can be selected based on different production capacities or filtration process. At the beginning of the filtration, driven by the feeding pump, the slurry enters into filter chambers through the feeding head. After that, with the help of pressure generated by the feeding pump, solid and liquid is forced to be separated. Solid is trapped by filter medium in the filter chambers to form filter cakes, while the filtrate pass through the filter medium and is discharged through open water nozzles or closed outlet pipes, thus completing the most basic filtration process.

In order to further reduce the moisture content of the filter cake, a combination of membrane filter plates can be selected, and inject the squeezing medium (high-pressure water or compressed air) into the membrane plates for the secondary or even tertiary pressing of the filter cake. Compressed air can also be directly introduced into the filter chambers to blow the moisture out from the filter cake layer. If cake washing is required, the washing solution can be introduced into the filter chambers to wash and remove the impurities out from the filter cake layer.

02 Frame

The frame is the foundation of the filter press, which is mainly composed of side beams, feeding head, pressing end, main cylinder, cylinder base, plate shifting system. matching pipes and ports. According to the various needs of end users, drip tray system, vibrating system, and filter cloth regeneration system can also be optionally equipped.

The plate pack is suspended on the frame slide rail,and can be opened or closed driven by the main cylinder. Before the filtration starts, its pressing end will be pushed by the main cylinder to compress the plate pack and filter medium to form the closed filter chambers. At the same time, the drip tray cylinder (if any) will close the drip tray doors. By this way, the filter press completes the feeding preparation; After the filtration process is completed, the main cylinder is depressurized and waits for next steps, while the drip tray cylinder (if any) contracts and opens the drip tray doors. Then the main cylinder moves back and releases the pressing end. By this way, the filter press completes the cake discharge preparation. Under the control of PLC, the plate shifting motor drives the plate shifter with chain to open the filter plates one by one or group by group. Or to manually operate the plate shifter button to complete the above process. During the process of opening the plate pack, filter cakes fall from the filter chambers due to their own gravity. Or a plate vibration system can also be configured to assist the cake drop. The filter press pressing end is equipped with four limit switches to ensure that its movement range can not exceed the limit position.

03 Hydraulic Station

The hydraulic station works as the powerhouse of the filter press, which is mainly composed of hydraulic pump, motor, electromagnetic directional valve, overflow valve, check valve, etc. Under the control of the electrical system, the motor drives the hydraulic pump to supply oil to the cylinder. With the cooperation of the electric contact pressure gauge and hydraulic valves, the filter press can achieve the action such as press, pressure keep, automatic pressure compensation, decompress and release.

The hydraulic work of the filter press can be simply described as the following steps:

- **Close the press head**
- **Close the drip tray**
- **Compress the plate pack and keep the pressure**
- **Decompress**
- **Open the drip tray**
- **Open the press head**

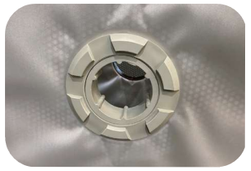
04 Electric Control Cabinet

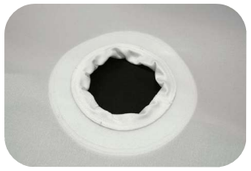
The electrical control cabinet is the control center of the filter press, which is mainly composed of PLC, touch screen, power switch, contactor, circuit breaker, relay, frequency converter, function button and indicator. The control logic of the filter press action as well as its process flow is all executed by PLC and communicated with the SCADA system of the factory through Modbus TCP protocol. The touch screen can be used to display process progress, parameter settings, data statistics, alarm processing, etc.

05 Filter Cloth

The filter cloth is the key component of the filter press, the performance of which will directly affects the filtration effect and production capacity. In order to choose the ideal filter cloth, it is necessary to comprehensively consider the slurry temperature, viscosity, chemical properties, solid particle size, wear resistance and filtration process design. The most convenient and commonly used method is to select the filter cloth through pilot filtration test.

Filter cloth can be designed to barrel neck type. Two single cloths are connected together by the barrel neck, one of which is passed through the filter plate feeding hole, then the two cloths are unfolded and wrapped on both sides of the plate. Alternatively, an overhang design filter cloth is also common, which directly wrapped on both sides of the filter plate with a whole piece, but fixed with a cloth clamping ring at the feeding hole.

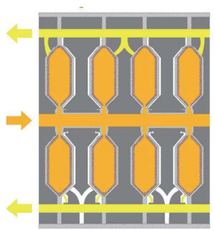




FILTER PRESS PROCESS FLOW

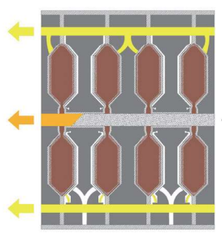
1.1 Feeding and Filtration

Slurry is pumped into the filter chambers continuously through the feeding port. Solid particles are trapped by the filter cloth on both sides of the chamber to form a cake with the filtrate pass through the cloth and discharged out of the filter. During filtration, filter cake thickness increases until the desired solids concentration is reached.



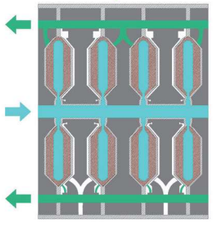
1.2 Back blow

Compressed air is introduced into feeding channel through the back blowing port of pressing end, from where the remaining slurry is blow in the opposite direction back into the feeding tank to achieve the purpose of channel cleaning.



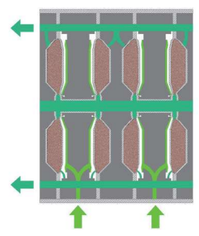
1.3 Cake washing (optional)

Washing solution is pumped into the filter chambers through the feeding port to surround and immerse the cakes inside. Under pressure, the washing solution penetrates the filter cake to replace the residual filtrate and discharge it out. Due to the uniform size and thickness of filter cake, the washing process can be carried out at a constant speed throughout the the entire filter chamber.



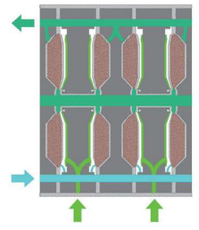
1.4 Pre-squeezing

Squeezing medium is injected into the membrane plates though the squeezing port. Under pressure, the membrane simultaneously squeeze the filter chambers on both sides to force the residual washing solution out from the filter cake.



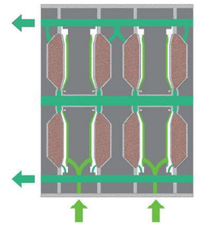
1.5 Back washing (optional)

The washing solution is pumped into the filter chambers in reverse through the filtrate drainage hole to flush the filter cakes. During the back washing, membrane maintains the pre-squeezing status to prevent filter cake cracks and ensure that the washing solution can penetrate the cakes.



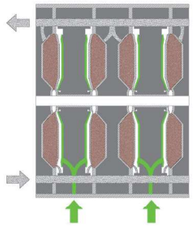
1.6 Squeezing

Squeezing medium is injected into the membrane plate again and increase squeezing pressure meanwhile to ensure the maximum mechanical dewatering. In addition, this step lays the foundation for cake blow.



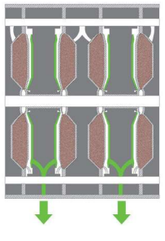
1.7 Cake blow

Compressed air is introduced into the filter chambers through the filtrate drainage hole. Under pressure, it penetrates the filter cake and carries out the moisture from the cakes to further reduce their moisture content. During the cake blow, membrane maintains the squeezing status to prevent the short circuits of airflow and enhance the drying effect.



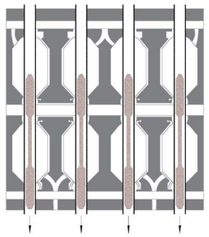
1.8 Squeezing discharge

Squeezing medium is discharged from the membrane plate and the pressure inside is released at the same time. Do NOT force the plate pack open until the pressure is fully released.



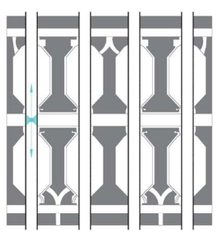
1.9 Cake discharge

After the above process comes the cake discharge. Open the plate pack, filter cake will then drop down from the chambers due to gravity.



1.10 Cloth washing

The cloth washing pump increases the pressure of clean water to 4.0-5.0 Mpa, then injects water into the cloth washing device through a hose and sprays it onto the filter cloth through multiple nozzles. By this way, filter cloth is regenerated and its filtration performance is maintained to the maximum extent.



Slurry　Squeezing medium　Filter Cloth　Washing solution

Filtrate　Air　Washing Filtrate　Cake

FILTER PRESS TYPES

Compared with other types of filters, filter press has the following characteristics:

Advantages

- Simple structure, easy to operate and maintain.
- Safe and reliable, the equipment is in a static state during filtration process, with low noise and low energy consumption.
- Diverse process design, which can meet different process requirements.
- Wide application, it still has strong separation ability for slurry with small particle size and high viscosity.

Disadvantages

- Intermittent work, small production capacity and relatively large footprint.
- Low degree of automation, requiring human intervention during cake unloading process.

According to the type of filter plate configured for the filter press, we can roughly divide the types of filter press into:

Chamber Filter Press　Membrane Filter Press　Round Plate Filter Press　Plate & Frame Filter Press

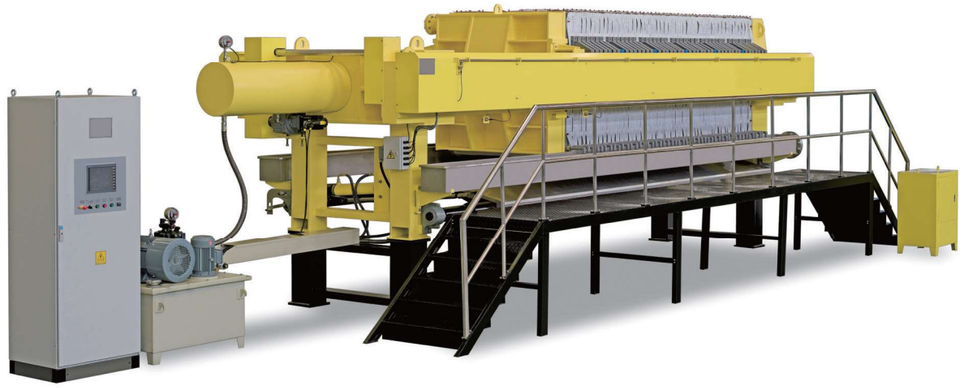
According to the different plate open design, we can roughly divide the types of filter press into:

Manual Filter Press　Automatic Filter Press　Quick Operation Filter Press　High Efficient Filter Press

Based on the above filter press type classification method , we have subdivided all filter press categories into different product series:

Series	Plate Pack	Open & Close	Plate Open Method	Plate Open Design
XY Series:	Chamber	Hydraulic Station	Hand	One by One
XZ Series:	Chamber	Hydraulic Station	Plate Shifter	One by One
XD Series:	Chamber	Hydraulic Station	Plate Shifter	Group by Group
GY Series:	Mixed Membrane & Recessed	Hydraulic Station	Hand	One by One
GZ Series:	Mixed Membrane & Recessed	Hydraulic Station	Plate Shifter	One by One
GD Series:	Mixed Membrane & Recessed	Hydraulic Station	Plate Shifter	Group by Group
BY Series:	Plate & Frame	Hydraulic Station	Hand	One by One

XY Series Filter Press



- Hydraulic Chamber Filter Press
- Plate Pack: 100% chamber plate pack
- Open & Close: Driven by hydraulic station
- Plate Open: By hand
- Plate Open Design: One by one
- Drip Tray: Optional
- Automatic Cloth Washing: N/A
- Automatic Shaking: N/A
- Size Available: 630/800/1000

XZ Series Filter Press

- Automatic Chamber Filter Press
- Plate Pack: 100% chamber plate pack
- Open & Close: Driven by hydraulic station
- Plate Open: By automatic plate shifter
- Plate Open Design: One by one
- Drip Tray: Optional
- Automatic Cloth Washing: Optional
- Automatic Shaking: Optional
- Size Available: 800/1000/1250/1500/1520/2000

XD Series Filter Press

- Quick Operation Chamber Filter Press
- Plate Pack: 100% chamber plate pack
- Open & Close: Driven by hydraulic station
- Plate Open: By automatic plate shifter
- Plate Open Design: Group by group
- Drip Tray: Optional
- Automatic Cloth Washing: Optional
- Automatic Shaking: Optional
- Size Available: 1500/1520/2000

GY Series Filter Press

- Hydraulic Membrane Filter Press
- Plate Pack: Mixed plate pack of membrane plate and recessed plate
- Open & Close: Driven by hydraulic station
- Plate Open: By hand
- Plate Open Design: One by one
- Drip Tray: Optional
- Automatic Cloth Washing: N/ A
- Automatic Shaking: N/A
- Size Available: 630/800/1000

GZ Series Filter Press

- Automatic Membrane Filter Press
- Plate Pack: Mixed plate pack of membrane plate and recessed plate
- Open & Close: Driven by hydraulic station
- Plate Open: By automatic plate shifter
- Plate Open Design: One by one
- Drip Tray: Optional
- Automatic Cloth Washing: Optional
- Automatic Shaking: Optional
- Size Available: 800/1000/1250/1500/1520/2000

GD Series Filter Press

- Quick Operation Membrane Filter Press
- Plate Pack: Mixed plate pack of membrane plate and recessed plate
- Open & Close: Driven by hydraulic station
- Plate Open: By automatic plate shifter
- Plate Open Design: Group by group
- Drip Tray: Optional
- Automatic Cloth Washing: Optional
- Automatic Shaking: Optional
- Size Available: 1500/1520/2000

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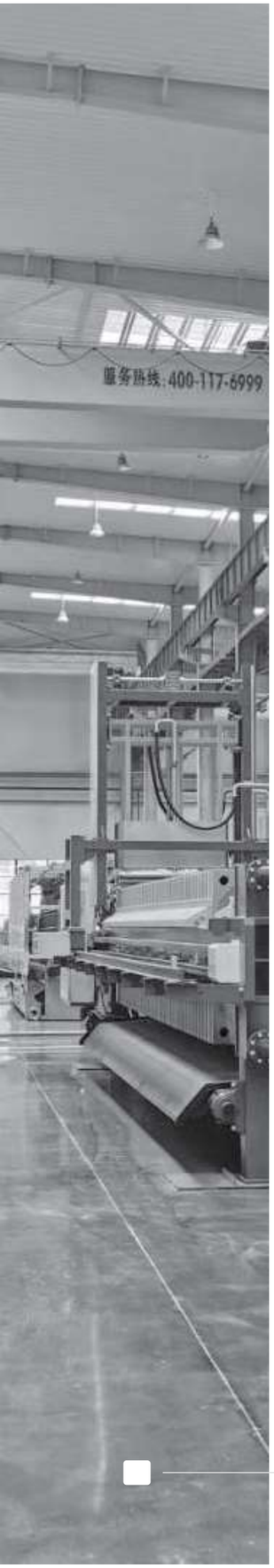
BY Series Filter Press

- Hydraulic Plate & Frame Filter Press
- Plate Pack: Mixed plate pack of frame and recessed plate
- Open & Close: Driven by hydraulic station
- Plate Open: By hand
- Plate Open Design: One by one
- Drip Tray: Optional
- Automatic Cloth Washing: N/A
- Automatic Shaking: N/A
- Size Available: 720/800/1000



FILTER PRESS MODEL SELECTION

At any time, the selection of filter press model requires conducting a pilot filtration test to find out the actual productivity of the product and determine the filtration process design to meet product requirements. Thus, the optimal filter press model and quantity required for the new project can be calculated. Normally, calculating the productivity and model selction requires the following data:

Data	Unit	Before Filtration	After Filtration
Weight	(Ton)	w1	w2
Volume	(m3)	v1	v2
Density	(Ton/m^3)	ρ1	ρ2
Solid content	(%)	m1	m2
Cycle time	(Hr)	T	
Operation time	(Hr)	t1	
Process time	(Hr)	t2	
Chamber depth	(m)	d	
Utilization rate	(%)	f	
Chamber loss	(%)	l	
Chamber volume	(m3)	V	
Filtration area	(m2)	S	

We know that during the pressure filtration process, solids are maximally trapped in the filter press chambers, so the weight of the dry solids before and after filtration is basically the same:

$$w_1=w_2$$
$$v_1 * \rho_1 * m_1=v_2 * \rho_2 * m_2$$

From this, it can be concluded that the volume of the filter cake after filtration is:

$$v_2=v_1 * \rho_1 * m_1/(\rho_2 * m_2)$$

During the filtration process, the filter chamber is not possible to be 100% utilized. If a membrane type filter press is used, the squeezing effect will also make the volume of the filter cake to be much smaller than the theoretical volume of the filter chambers. Therefore, when selecting a filter press model, we have to consider a parameter called "chamber loss rate", which is represented by the letter "l".

In addition, there is a significant difference in the filtration speed of different slurry, and the required filtration process design is also not the same. This results in even using the same filter press to filter different slurry, the required cycle time "T" is different. "T" mainly consists of two parts, one is the operating time "t1", which mainly refers to the time required for the filter press actions such as open, close, cake discharge or cloth regeneration, etc. The other is the process time "t2", which mainly refers to the time required for the filtration process such as feeding, pressing, drying, washing, etc.

Both the chamber loss rate "l" and cycle time "T" mentioned above need to be obtained in the pilot test. Of course, if you are very familiar with the characteristics of this slurry you are going to filter, you can also rely on your experience to determine these two parameters. Accordingly, we can further derive the following equation:

$$V=v_2/l * T$$

So far, we can basically calculate the total required chamber volume of filter press. However, two another points still need to be considered to achieve more accurate model selection . Firstly, the depth of the filter chamber "d" , which needs to be identified in the pilot test. The most common chamber depths are 25mm, 30mm, 32mm, 35mm, 40mm and 50mm. Another point is the utilization rate of the equipment, which needs to be determined by the user according to their maintenance schedule. Generally, we will take 90% as the standard.

$$S=2*V/f/d$$

Note: The reason for multiplying by 2 is because each filter chamber has two filtering surfaces.

By comprehensively calculating all the above equations, we can derive the following formula:

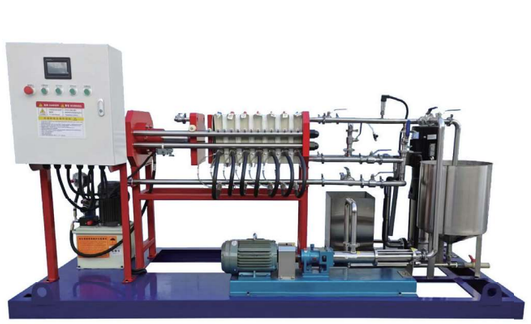
$$S=2*v1*\rho1*m1*T/(\rho2*m2*l*f*d)$$

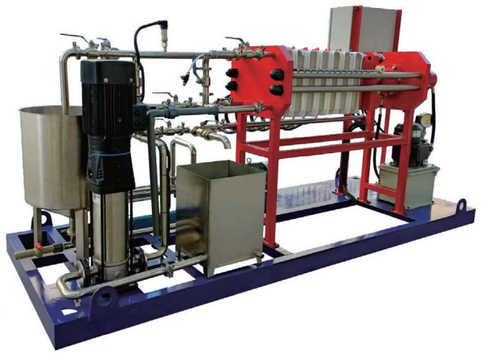
In this way, we have obtained the total required filtration area.
The next step is to find out the optimal filter press model based on the chamber depth we get from pilot test and calculate the minimum possible qty.

FILTER PRESS PILOT TEST

Pilot Filter Press

GY300G8X40-6C is a pilot filter press with excellent performance, the design of which considered the different requirements for pressure, temperature, corrosion resistance and filtration process of various materials. We have equipped all accessory equipment required for the pilot test, and integrate them on a small platform for transportation convenience.





Model No	GY300G8X40-6C
Filtration Area (m2)	0.60
Filter Plate Size (mm)	300x300
Chamber depth (mm)	40
Chamber Volume (L)	7.2
Chamber Quantity (pcs)	6
Max operation temperature (°C)	95
Max Feeding Pressure (bar)	8
Max Squeezing Pressure (bar)	16
Plate Type	Mixed plate pack of membrane plate and frame
Feed Type	Corner feed
Open & Close	Manual hydraulic open and close
Plate Open Type	Manual plate open one by one
Filtrate Discharge	Close discharge from both sides
Unit Weight (Kg)	600
Dimension (mm LxWxH)	2700×1100×1400

Purpose of Pilot Test

- Understand the filtration/dewatering difficulty.
- Find out the filter cloth model.
- Calculate the chamber loss rate “l”.
- Determine the appropriate chamber depth “d”.
- Explore the optimal process flow.
- Record the process time “t2”.
- Test the final cake moisture/filtrate clarity.
- Calculate the area basis and volume basis productivity.

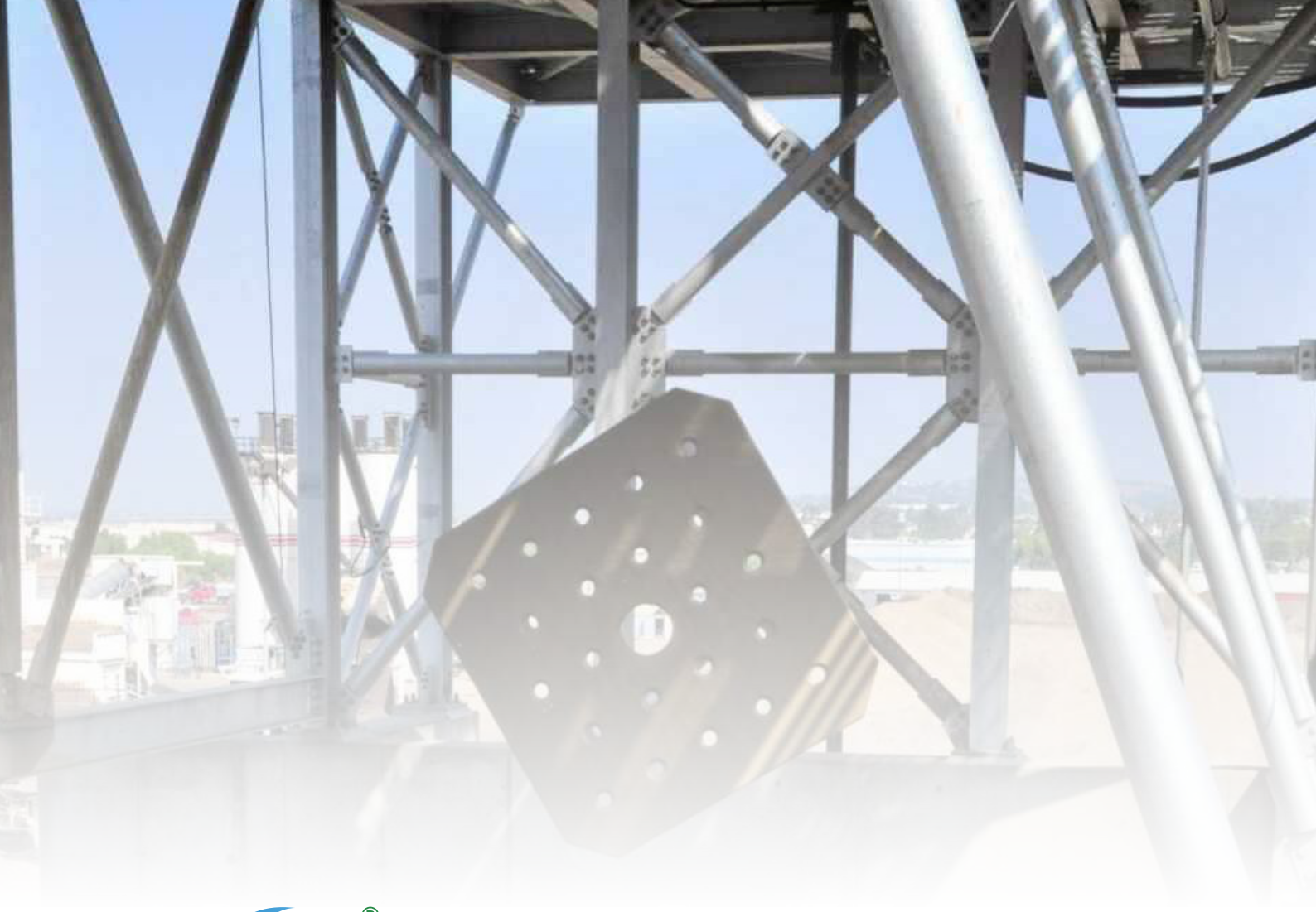
Test Record

Report Items	Test 1#	Test 2#	Test 3#
Average Particle Size (um)			
Feeding Pressure (bar)			
Feeding Time (min)			
Back Blow Pressure (bar)			
Back Blow Time (min)			
Pre-Squeezing Pressure (bar)			
Pre-Squeezing Time (min)			
Back Washing Pressure (bar)			
Back Washing Time (min)			
Squeezing Pressure (bar)			
Squeezing Time (min)			
Cake Blow Pressure (bar)			
Cake Blow Time (min)			
Cake Discharge Difficulty			
Estimated Operation Time (min)			
Estimated Cycle Time (Hr)			
Cake Thickness (mm)			
Cake Weight (kg)			
Cake Moisture (%)			
Filtrate Solid Content (%)			
Area Basis Productivity (KGPH/m2)			
Volumetric Productivity (KGPH/m3)			

KGPH/M2=weight of all filter cakes in the pilot filter /filtration area of the pilot filter/estimated cycle time.
KGPH/M3=1000 * weight of all filter cakes in the pilot filter/chamber volume of the pilot filter/estimated cycle time.

Note: *The method of calculating production capacity based on volumetric productivity is not always accurate, as different chamber depths can affect this result. Only when the chamber depth of the production equipment is same with pilot filter, the calculation results is reasonable and accurate.*

If the chamber depth of the production equipment is thicker than that of the pilot filter, but the cake thickness produced by the pilot filter is greater than 80% of its chamber depth, the production equipment capacity calculated based on volume productivity is relatively accurate then.



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