



# CORNCOB II



## DYNAMIC - MEMBRANE FILTRATION SYSTEM

PRODUCT OVERVIEW BROCHURE

INTRODUCING

# CORNCOB HVCF DYNAMIC MEMBRANE FILTRATION



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## SAY GOODBYE to Biological Wastewater Treatment SAY HELLO to Spent-Water Processing

**STOP** wasting space, time, and money treating wastewater biologically.

Why build a big costly wastewater treatment plant that throws away valuable resources? Recover and reuse those resources by installing a small simple spent-water filtration system.

With the CORNCOB technologies, you can create a zero-discharge process and tap into your spent-water resources with only 70% the capital cost, 50% the operational cost, and 20% of the footprint necessary for conventional MBR systems.

“ spent·wa·ter (spent 'wōtər)

the consideration of water used in processes, industrial or otherwise, not as waste, but as a resource. ”





## The CORNCOB II Dynamic-Membrane™ Filtration System — **KEY WORKING PRINCIPLES**

**The CORNCOB II Dynamic-Membrane™ filtration system, with its proprietary high-velocity cross flow (HVCF) disc configuration, is the perfect membrane filtration system!**

Current membrane processes rely on high-energy pumping to recirculate fluid through a series of static membranes to achieve high cross-flow velocity.

The CORNCOB II system's pressure enclosure houses an innovative Dynamic-Membrane™ cartridge. During operation, the double-sided membrane discs rotate in the fluid. The rapid rotational action creates high surface relative velocity, between the fluid and membrane surface, resulting in maximum cross-flow velocity.

The benefits of moving the membranes, not the fluid, are numerous including higher long-term flux, significant cost savings, alongside a 50% plus reduction in energy requirements.

A Smart, Advanced Filtration  
System Based on  
**'HVCF' Dynamic-Membrane™**





# 1-STEP PROCESS

## Supplying Pivotal Solutions to Industries and Municipalities — **VALUE PROPOSITIONS**

A simple one-step process design delivers positive results for concerns including sufficing regulatory requirements, increasing project ROI and promoting global sustainability.

CORNCOB II's innovative membrane technology permits solids to be taken in with minimal need for pretreatment and delivers high undiluted concentrate yields. Also, suspended and dissolved solids are separated down to their smallest molecular degree. The self-cleaning membranes demand notably less energy and need no backwash or process chemicals.

The pressurized system is completely enclosed and requires a small footprint area. A fully automated 'plug-n-play modularized system.



Committed to global **water sustainability**



<b>ENERGY</b>	· OVER 50% ENERGY REDUCTION	
<b>WATER</b>	· REUSABLE WATER · ZERO DISCHARGE	
<b>TREATMENT</b>	· MINIMUM TO NO PRE-TREATMENT OR CHEMICALS NEEDED	
<b>BACKWASH</b>	· NO BACKWASH · NO DOWNTIME	
<b>SOLIDS</b>	· LARGER FEED SOLIDS · HIGHER CONCENTRATIONS · SAME SOLIDS PROPERTIES	
<b>SYSTEM</b>	· SMALL FOOTPRINT · FULLY ENCLOSED · FULLY AUTOMATED	
<b>COSTS</b>	· ROI · REDUCED CAPITAL AND OPERATING COSTS	





# On-Site Testing — THE RESULTS ARE CLEAR



FEED    CCII (UF)    CCN (RO)

## BREWERY

### CHALLENGES

Company plans to expand its manufacturing division and often faces fines/surcharges due to their wastewater discharge.

### OBJECTIVES

Reduce volume of water needed for operations; meet regulations for reuse of non-potable water; reduce TDS, TSS, BOD

### RESULTS

Met regulation levels for re-use of non-potable water, significantly reduced BOD, TDS, TSS, and reduced discharge volume.



FEED    CCII (UF)    CCN (RO)

## COUNTY LANDFILL

### CHALLENGES

The landfill plans to treat its own leachate to reduce the hauling to nearby wastewater treatment plants.

### OBJECTIVES

Separate water from heavy metals and other 140 chemicals and reduce retained concentrate for minimal hauling.

### RESULTS

Produced permeate suitable for discharge/reuse and reduced concentrate for minimal hauling.



FEED    CCII (UF)    CCN (RO)

## INDUSTRIAL LAUNDRY

### CHALLENGES

Company is initiating water reuse and various recycling programs into daily operation to reduce water intake and treatment with the existing DAF.

### OBJECTIVES

Reduce volatile contaminants of concern that negatively affect ability of the washing systems.

### RESULTS

The UF permeate is suitable for reuse towards non-white garments. The RO permeate is suitable for reuse towards white garments.



CCN (RO)    FEED

## MUNICIPAL WASTEWATER

### CHALLENGES

Municipality plans to begin treating its own wastewater to alleviate the load and payment to a neighboring township.

### OBJECTIVES

Meet government EPA compliance regulations to discharge effluent to a nearby river.

### RESULTS

Reduced parameters of concern by 94-100% and produced permeate suitable for discharge/reuse.

# DYNAMIC-MEMBRANE

The standard Dynamic-Membrane shaft assembly includes multiple discs mounted on a rotating shaft. One or more shaft assemblies are then mounted on a removal structural cartridge, which is contained in a pressure housing. The disc cartridge and pressure housing make up the complete membrane module.

Each disc consists of a circular plate with membranes and underlying permeatesheets applied to both sides. Membranes are selected from the full range of pore sizes covering Micro, Ultra, Nano Filtration to RO (Reverse Osmosis). Discs vary in size from 1' to 3' in diameter.

Dynamic-Membrane provides application flexibility with various disc diameters and pore sizes.



Robust shafts create optimal rotational speed which results in effective high-velocity cross flow. This affects efficient, continuous membrane surface cleaning resulting in higher flux and solids concentration.

Unique spacing between the discs allows larger solids and higher concentrations without plugging.



**OVER THE NEXT 20 YEARS WATER CONSUMPTION FOR GENERATING ENERGY WILL NEED TO INCREASE BY 85%.<sup>1</sup>**

<sup>1</sup> <https://www.weforum.org/agenda/2015/01/why-world-water-crises-are-a-top-global-risk/>



## DYNAMIC-MEMBRANE™

### Slide-n-Place Membrane Cartridge.

The state-of-the-art proprietary membrane cartridge supports the Dynamic-Membrane assemblies including discs, membranes, shafts, hubs, gaskets, bearings, and seals. A durable track frame encircles the entire membrane cartridge allowing the cartridge to slide in-and-out of the housing quickly and smoothly.



Membrane cartridge easily slides into place inside the pressure housing.

### ULTIMATE TIME AND COST SAVER

Current day systems demand costly system downtime to replace a single or multiple membranes. Additionally, if system inefficiencies occur, the daisy chain type configuration can result in significant troubleshooting time in tracking down the defective membranes.

Distinctively designed to permit easy replacement, the membrane cartridge is designed to be easily replaced. In virtually less than an hour a new membrane cartridge can be swapped out and the entire system is back up and running.

The used cartridges are recycled and refurbished, saving both money and the environment.



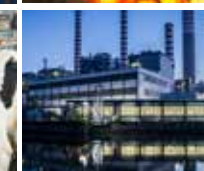
A specially designed roller cart effortlessly tilts and rolls the membrane cartridge directly into the pressure housing to ensure precise placement.

### Broad Applications

Dynamic-Membrane's ability to accommodate a broad range of feed types without plugging generates an open-door for endless applications:

- Water Reuse / Reclamation
- Complete Spentwater Processing
- Potable Water Supply
- Solids / Ingredients Concentrating
- Liquid Purification

**MUNICIPAL • INDUSTRIAL • COMMERCIAL • RESIDENTIAL**

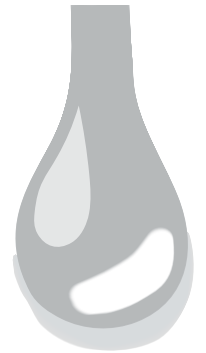


# THE PRESSURE HOUSING

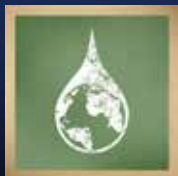


The CORNCOB II pressure housing is a fully enclosed unit that houses the Dynamic-Membrane cartridge and facilitates high transmembrane pressure, resulting in increased filtration rates. Pressure is dependent on the vessel size, which can range from 10-600psi.

The housing is manufactured to withstand a wide range of environments, including highly corrosive fluids. It can be made from 304, 316 Stainless Steel or coated Carbon Steel materials.



The drive end of the housing is penetrated by the permeate discharge pipes, including bearings and seals, which are extensions of the membrane cartridge.



**WATER DEMAND WILL OUTSTRIP SUPPLY BY 40% BY 2030.**<sup>2</sup>

## BELT DRIVEN SHAFTS —

Reinforced rubber belts drive the membrane shafts. The motor/belt alliance generates the rotational speed of the membranes and the high-velocity cross flow.

The belt drive is powered through a VFD to automatically control disc rotation.





## THE PRESSURE HOUSING

### Major Components

**MULTIPLE INLET FEED NOZZLES**

Operator has control over flow patterns.

**PRESSURE TRANSMITTER**

Digital pressure sensor aids in system automation, reduces operator oversight and guards against over-pressurization.

**SWING DOOR CLOSURE**

Easy release, multi-locking mechanisms seal the housing and enable quick access to membrane cartridge.

**VIEWING PORTS (Optional)**

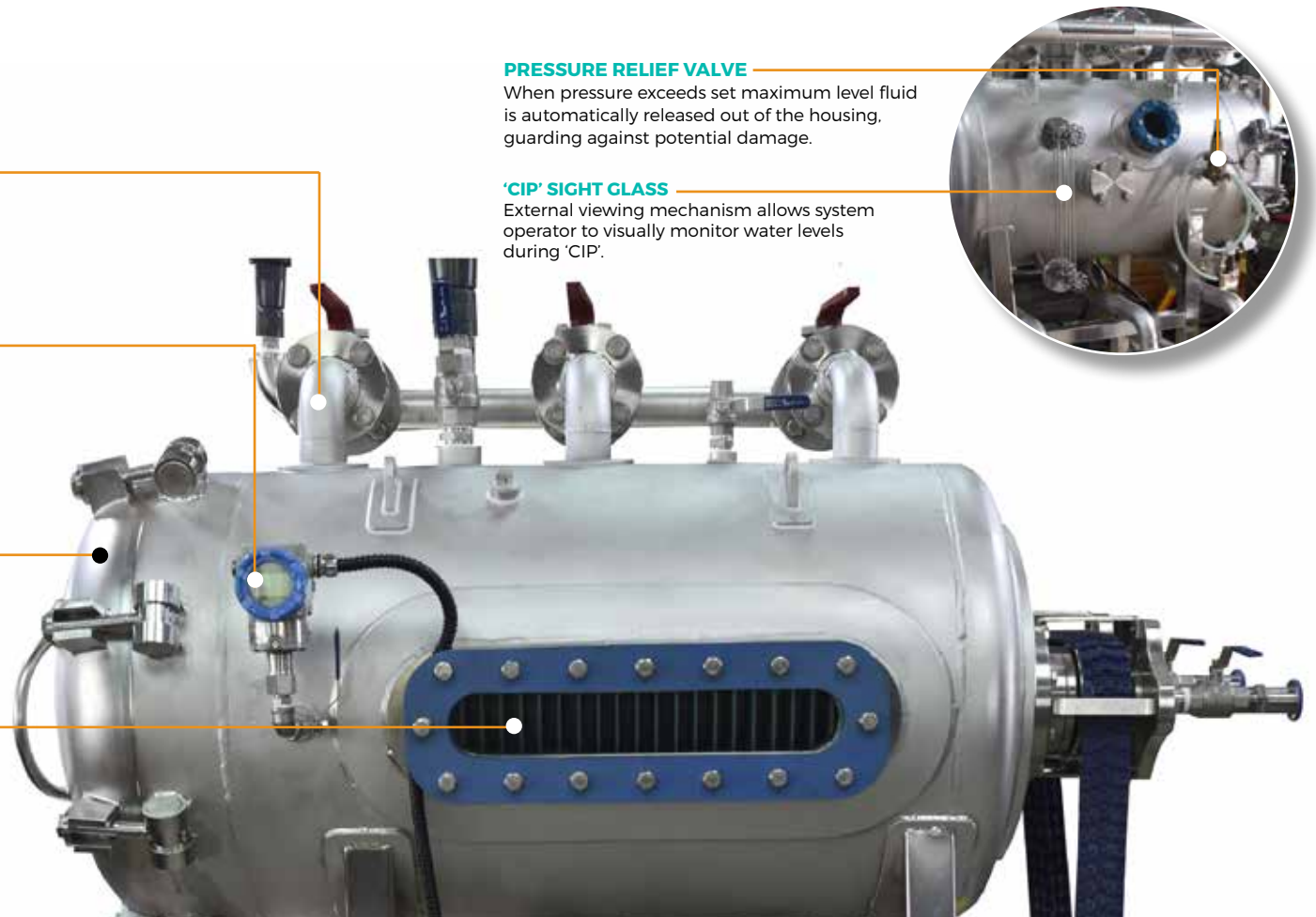
In clean liquid applications, system operator can visually inspect membranes while observing the overall process in operation; allowing for adjustments to both feed and concentrates.

**PRESSURE RELIEF VALVE**

When pressure exceeds set maximum level fluid is automatically released out of the housing, guarding against potential damage.

**'CIP' SIGHT GLASS**

External viewing mechanism allows system operator to visually monitor water levels during 'CIP'.



### Feasibility | Pilot Testing



'Alfie', the CORNCOB mobile pilot unit is on the move conducting field pilot / feasibility tests. 'Alfie' is a flexible pilot unit capable of various tests inside its 20-foot open door freight container. Our expert test team works on-site collecting and analyzing for the particular application in terms of treatment objectives.



# THE SERVICE MODULE



The skid mounted, compact process service module includes all required components for the operation. It includes a feed pump, inlet / outlet piping, isolation valves, flowmeters, flow control valve, VFDs (variable frequency drives) and a control panel.

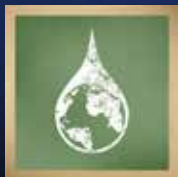
A reliable PLC/HMI interface system provides the operator a user friendly and intuitive method for full system control from the control panel or wireless tablet. The simple user interface uses touch screen control over the entire system and allows the operator to make adjustments and immediately observe the results.

#### CONTROL PANEL FEATURES

- HMI (Human Machine Interface)
- Flowmeters
- Pressure Sensor
- Alarm
- H-O-A
- Clog Indicator
- Emergency Stop Button
- Reset Button
- 4 Additional Power Receptacles



Permeate pipes with ball valves allow for easy sampling during system operation.



**ANALYSIS SHOWS THAT 54% OF COMPANIES ARE EXPOSED TO WATER RISKS.<sup>3</sup>**

Service module skids can be easily enlarged to support the process for larger applications that require multiple membrane modules.

Built-in HMI (human machine interface) gives simple, hands on control to the entire process from either touch screen or wireless tablet, resulting in consistent process control and enhanced monitoring.



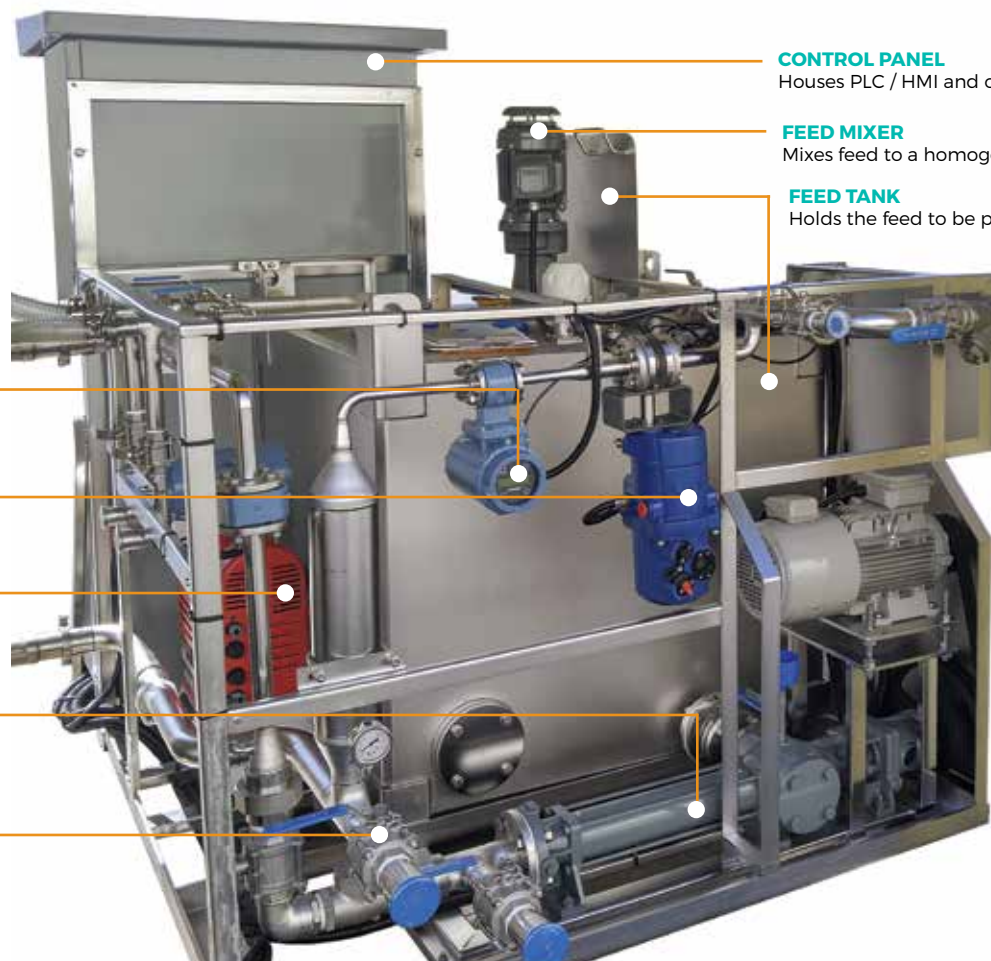
<sup>3</sup> <http://www.eiris.org/files/research%20publications/EIRISWaterRiskReport2011.pdf>



## THE SERVICE MODULE

### Major Components

**PLUG & PLAY** – The service module comprises a complete, fully automated 'Plug & Play' system. All feed, discharge, electrical connections are brought to a convenient location in the service module for easy commissioning.



#### CONTROL PANEL

Houses PLC / HMI and other electrical components.

#### FEED MIXER

Mixes feed to a homogeneous state.

#### FEED TANK

Holds the feed to be processed.

#### FLOW METERS

Senses the rate of fluid flow to the membrane module and from the concentrate discharge.

#### FLOW CONTROL VALVE

Controls pressurized flow of concentrate.

#### AIR COMPRESSOR

Provides pressure during two phase (air / water) 'CIP' cleaning.

#### FEED PUMP

Transfers fluid from the tank into feed lines leading to the membrane module.

#### PRESSURIZED CONCENTRATE LINE

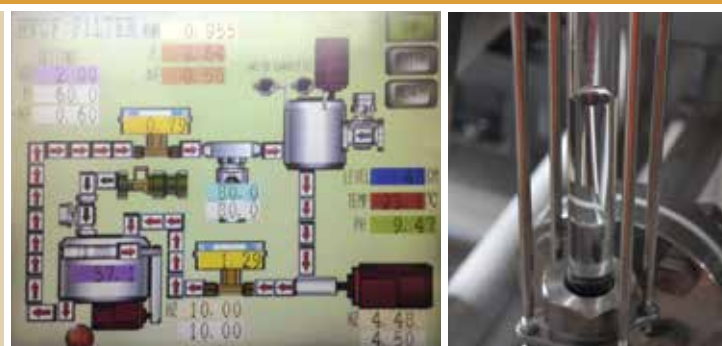
Transfers concentrate from the membrane module.

### Automated 'CIP' Technology

**CROSS FLOW DETECTION | PRE-CIP** – When flux rates decrease, the system increases the disc rotational speed and can change direction, assuring maximum surface cleaning.

CIP is activated only when self-cleaning sequences detect the need, as opposed to using a timer, thus saving chemicals and reducing downtime.

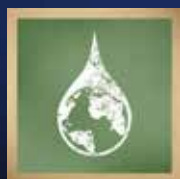
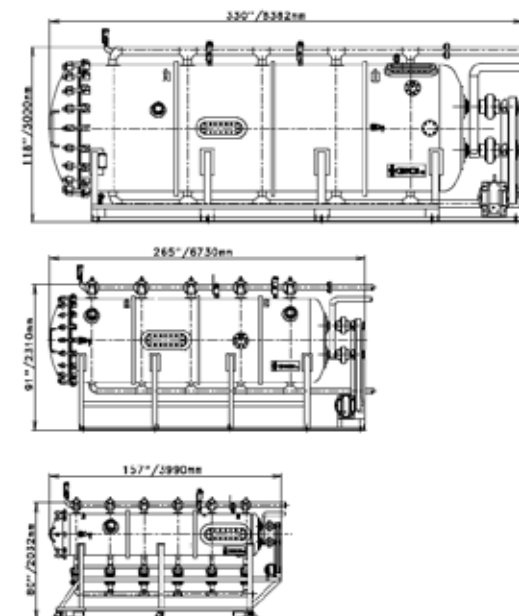
An external viewing sight glass allows operator to visually monitor water levels during 'CIP' cleaning.



## Models and Specifications (US/Imperial)

MODEL NUMBER	DIMENSIONS L x W x H (in)	WEIGHT (kg)	SURFACE AREA (ft <sup>2</sup> )	NUMBER OF DISCS	CAPACITY (GPD)*		
					20**	40**	60**
CCII-3Q / 12000 x 1200	420 x 85 x 109	23,243	12,360	3' x 1200	247,200	494,400	741,600
CCII-3Q / 8000 x 800	332 x 85 x 109	17,400	8,240	3' x 800	164,800	329,600	494,400
CCII-3Q / 6000 x 600	332 x 85 x 109	16,600	6,180	3' x 600	123,600	246,200	370,800
CCII-2Q / 3840 x 840	287 x 68 x 91	11,350	3,840	2' x 840	76,800	153,600	230,400
CCII-2Q / 2560 x 560	227 x 68 x 91	8,550	2,560	2' x 560	51,200	102,400	153,600
CCII-2Q / 1280 x 280	167 x 68 x 91	5,750	1,280	2' x 280	25,600	51,200	76,800
CCII-1Q / 540 x 540	193 x 48 x 71	2,785	558	1' x 540	11,160	22,320	33,480
CCII-1Q / 360 x 360	143 x 48 x 71	2,045	372	1' x 360	7,440	14,880	22,320
CCII-1Q / 180 x 180	117 x 48 x 71	1,375	186	1' x 180	3,720	7,440	11,160

\*1 GPD = 0.0038 CMD    \*\*GFD = 1.7 LMH



**TWO-THIRDS OF THE WORLD POPULATION WILL LIVE IN WATER STRESSED COUNTRIES BY 2025.<sup>4</sup>**

### Application Flexibility

CCII membrane modules are available in a wide variation of sizes and configurations. Modules can be multiple to create a customized filtration system to fit specific applications.

The wide range of models creates a cost-effective solution for new-builds, expansions or standby units.



<sup>4</sup> <https://www.weforum.org/agenda/2015/01/why-world-water-crises-are-a-top-global-risk/>