

TESTING FACILITIES

EPCON PILOT PLANTS



EPCON EVAPORATION TECHNOLOGY AS

EVAPORATORS - DRYERS - DISTILLATION & DEHYDRATION - HEAT RECOVERY SYSTEMS
ENGINEERING AND AFTERSALES SERVICES

EPCON TESTING FACILITIES

INTRODUCTION

Specifying the correct technical separation method is an important and often exacting process. Equally important is to establish confidence in the functionality of the technical solution and to document return on investment for the customer. Consequently, to ensure an optimal solution it is of utmost importance to conduct tests and analyses on fluids using a pilot test rig. Based on the test results the optimal evaporation technique can be defined and the required design specifications will be identified.

It is obvious that the plant must satisfy the customer's expectations and meet all technical challenges and needs. Hence, EPCON has several evaporation test units available in order to clarify all information essential for making the right technical decisions.

EPCON has tested a wide range of fluids including fish ensilage, fish extract, waste water from paper production, fruit juices, marine oils, drilling fluids, chemical fluids, lime slurry, brown cheese and protein extracts. Frequently, the analysis of fluid samples is conducted on the permanent testing equipment at our laboratory in Trondheim. If fluids have to be tested in site, EPCON also has mobile test rigs that can be dispatched anywhere in the world for use at the customer's own plant. Consequently, testing can be carried out under the same conditions as in the full-scale production line.

The pilot plants can also be rented to perform long term tests or for test production of new products.



LABORATORY GLASS EVAPORATION REACTOR

EPCON has a lab glass evaporation reactor located in our test facility in Trondheim which is often used for the initial testing of products. Such a test can be useful for analyzing the quality of the evaporated product related to the boiling temperature. Samples of the condensate can also be analyzed, for instance with regard to COD and BOD.

Based on an initial test EPCON is normally able to find most of the parameters required to do an initial design of the full scale plant.

To do an initial evaporation test only 2 to 5 litre of liquid could be sufficient.

Using a vacuum principle, the boiling temperature can be controlled within a wide range.

Technical specification:

Evap. mass:	0.5 - 1 kg/hour (water)
Temperature:	30-100°C
Reactor volume:	3 L
Capacity reg.:	30-100%



STATIONARY FALLING FILM EVAPORATOR

The test rig in our laboratory comprises a stationary falling film evaporator. This facility consists of vertical heating tubes. The fluid is distributed as a liquid film that falls down the inside of the pipe walls. The liquid film boils on the pipe wall and liquid and vapour flows out of the tube bundle at the bottom. Some of the fluid is pumped out as concentrate, while the remaining is mixed with new liquid and recycled to the top. The vapour is let out via a droplet separator and condensed. Using a vacuum principle, the boiling temperature can be controlled within a wide range.

Technical specification:

Evap. mass, *1):	300 kg/hour
Temperature:	30-100°C
Plant liquid vol.:	50-100 L
Capacity reg.:	30-100%

**1) Max water capacity is specified. The capacity depends on the boiling temperature and allowed temperature difference.*



The test rig is highly automated. Fluid feed, concentration, temperature and pressure are controlled automatically, and values displayed on the operator's monitor.

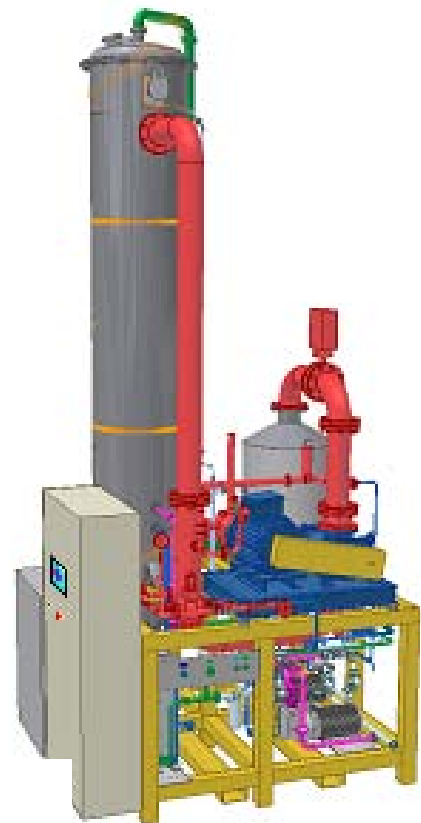
MOBILE FALLING FILM EVAPORATOR

EPCON also has a mobile falling film flow evaporator at our disposal. This evaporator is equipped with MVR energy recovery, resulting in very low energy consumption. However steam is required for start up and cleaning.

The plant is skid mounted and is equipped with full automation including a 12" operating touch panel in full colour.

The installation has the following technical and physical specifications:

Evap. mass at 80°C, *1)	300	kg/h
Evaporation temperature	50-100	°C
Steam temperature	55-110	°C
Installed power	44	kW
Energy consumption	24	kW
Water consumption	1	m ³ /h
Liquid volume in plant	100	L
Electric supply	3x400/440V	50/60
Water supply	Min. 2	Bar G
Steam supply	0.5 - 6	bar G
Steam cons. at operation	< 10	kg/h
Pneumatic air	6	Bar
Dimension LxWxH	2.5 x 2 x 5.5	m



This installation does not have its own steam generation.

*1) *The capacity depend on the temperature. The capacity at 60°C boiling temperature will be approx. 150 kg/h water. At 100°C an evaporation capacity of 400 kg/h water could be achieved.*

All the mobile test rigs are highly automated. Fluid feed, concentration, temperature, and pressure are controlled automatically, and values displayed on the operator's monitor. The test units can be connected to an analogue telephone line to enable remote monitoring and control from EPCON's offices.

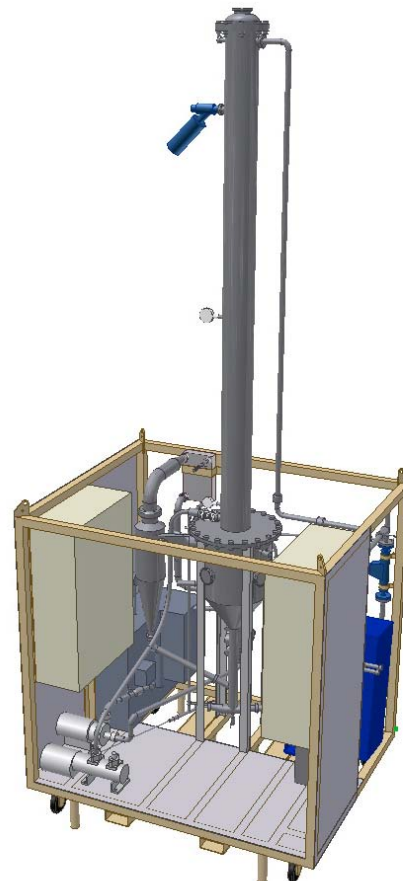
MOBILE FALLING FILM EVAPORATOR

EPCON also has a second mobile falling film flow evaporator at our disposal. This facility is specially designed for continuous testing over time. The installation has a replaceable tube bundle that enables the rig to be adjusted according to the type of fluid to be tested. The longest tube bundle (12 m) gives a capacity of approx. 100 kg of vapour per hour. Shortening the bundle length reduces the capacity. This test rig is also vacuum controllable.

The installation has the following technical and physical specifications:

Base dimensions:	2.2 x 1.8 m
Height:	5.6 – 14.6 m (depending on capacity)
Capacity:	30-100 kg Water vapour per hour (depending on tube bundle)
Evaporation temp:	30 - 100°C
Power supply:	400V/50 Hz, 3-phase
Cooling/sealing water:	1 - 2 m ³ /h

This installation does not have its own steam generator.



All the mobile test rigs are highly automated. Fluid feed, concentration, temperature and pressure are controlled automatically, and values displayed on the operator's monitor. The test units can be connected to an analogue telephone line to enable remote monitoring and control from EPCON's offices.

MOBILE FLASH EVAPORATOR

EPCON also has a mobile unit based on flash evaporation. The flash evaporator is particularly suitable for fluids with a high viscosity and for instances where deposition of solid material in the evaporator could be a problem. The fluid is heated and transported to a chamber that is at a lower pressure than the boiling pressure of the hot fluid. The liquid is distributed in the chamber via nozzles as an even shower. The liquid boils in the chamber immediately (flash evaporation).

The installation has the following technical and physical specifications:

Base dimensions:	1.4 x 1.4 m, + separate tube heat exchanger beside the unit.
Height:	-
Capacity:	max. 50 kg water vapour per hour
Evaporation temp.:	60-100°C
Power supply:	400V/50 Hz, 3-phase
Cooling/sealing water:	1 m ³ /h

This installation does not have its own steam generator.



All the mobile test rigs are highly automated. Fluid feed, concentration, temperature and pressure are controlled automatically, and values displayed on the operator's monitor. The test units can be connected to an analogue telephone line to enable remote monitoring and control from EPCON's offices.

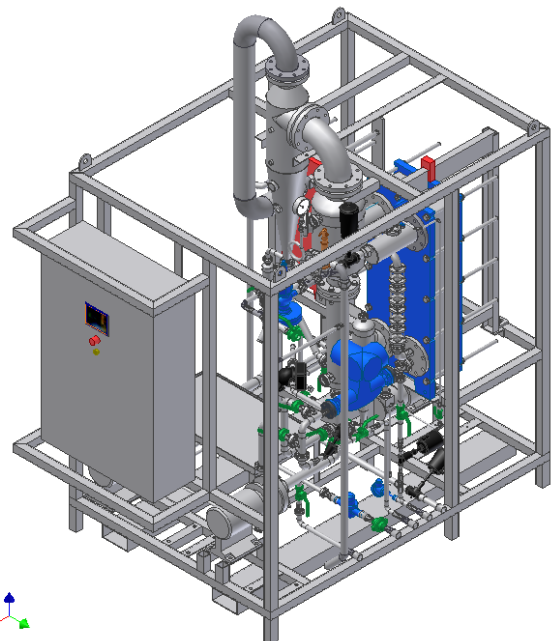
MOBILE EPCOVAP EVAPORATOR (FLASH / CLIMBING FILM)

EPCON also has a mobile unit based on flash / climbing film evaporation.

This unit can operate both as forced circulation or rising film evaporator. Also the unit can operate as a combination of those two technologies allowing some evaporation to take place in the heat exchanger while the remaining boiling occurs in the flash vessel.

The installation has the following technical and physical specifications:

Base dimensions:	1.5 x 2.4 m
Height:	2.8 m
Capacity:	max 150 kg water vapour per hour
Evaporation temp.:	50-100°C
Power supply:	230V/50 Hz, 3 phase
Cooling/sealing water:	5 m ³ /h



This installation does not have its own steam generator.

All the mobile evaporation test rigs are highly automated. Fluid feed, concentration, temperature and pressure are controlled automatically, and values displayed on the operator's monitor. The test units can be connected to an analogue telephone line to enable remote monitoring and control from EPCON's offices.

SHS - SUPERHEATED STEAM DRYER

EPCON also has a pilot superheated steam dryer. The SHS drying technology is based on the principles of direct superheated steam drying. The drying pressure is adjusted by vacuum system.

In the test facility slurry is manually transferred or pumped into the drying chamber. The vapour phase inside the drying chamber is re-circulated from the end of the chamber via an external shell and tube heat exchanger and back into the other end of the drying chamber.

At start-up, the vapour phase is mainly air, but as this is heated up it is gradually replaced by process vapour (water vapour). The circulating vapour is superheated in the heat exchanger and transfers heat to the slurry in the chamber.

The heat exchanger is heated with steam from an external steam generator. Excess vapour from the drying process is condensed in condensing system.

Emptying of the dried product occurs batch-wise.

The test dryer has the following specifications:

Nominal capacity, water: (if ~atm. pressure)	25 kg vapour per hour
Drying pressure:	~100-1000 mbara
Dimension, LxBxH:	2.5x1.9x2.3 m
Weight:	850 kg
Power supply:	400 V/ 3 x 50 Hz
Cooling water:	0.3 m ³ /h

