UOP SERIES

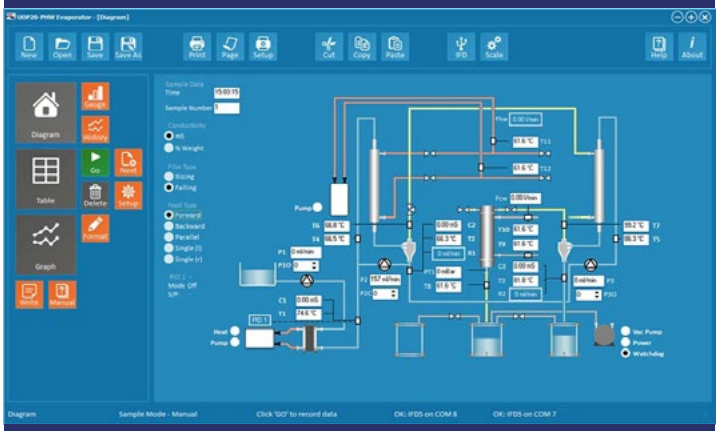
Computer Controlled Modular Evaporator Series – UOP20X

The UOP20X is a modular system of evaporators for teaching chemical engineering. Using the various modules a wide range of configurations can be implemented: rising or falling film; single or double effect; forward, backward or parallel feed.

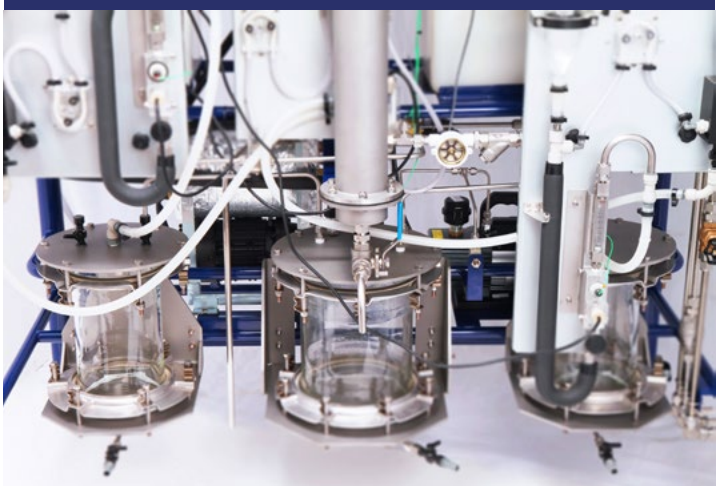
The evaporators are fully computer controlled, supplied with educational software including process control and data logging facility.

RISING OR FALLING FILM
DOUBLE OR SINGLE EFFECT
STEAM OR ELECTRIC HEATING
COMPUTER DATA LOGGING AND CONTROL

Software Screen



Product and Condensate Tanks



Features

- Service unit capable of housing one or two evaporator columns
- Either a rising or falling film column may be installed in each position
- Two service units are available, one incorporating an internal electric powered pressurised hot water system and another that requires externally supplied steam as the heating medium
- Controllable recirculation on each evaporator
- High vacuum capability for low temperature evaporation
- Built in USB interface for data logging on user supplied PC
- All functions are controllable by software or manual control
- Educational software is included with the UOP20X, giving details of the equipment, evaporation theory, laboratory worksheets, logging and analysis of results
- Process control investigations may be performed using a PC to control the equipment. The software includes fully configurable PID controllers
- Fully instrumented to indicate product concentration (directly displayed by the software)

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URL: http://www.armfield.co.uk/uop20
Applications ChE IP

Description

Evaporator Service Unit (UOP20X)

The Evaporator Service Unit **(UOP20X)** contains all the services and facilities to implement a laboratory evaporation system. It comprises a feed pump and preheat system, vacuum pump, condenser, collection vessels and control console containing a full set of instrumentation, all mounted in a sturdy steel framework.

Two mounting positions are provided for the modular evaporation columns.

Two basic variants of the **UOP20X** are available, dependent on whether it is required to use steam as the process heating source or pressurised hot water.

The **UOP20X-STM** includes a steam control valve and steam pressure gauge. It is powered from an external steam source, such as the Armfield UOP10 or any other suitable laboratory steam supply.

The **UOP20X-PHW** includes a pumped recirculating pressurised hot water system complete with integral three term temperature controller. Therefore service requirements are simply an appropriate electrical supply and a cooling water supply.

Each UOP20X includes a control console, containing all of the electrical components, controls and displays for the evaporator. Twelve process temperatures, three conductivity readings and the vacuum level can be displayed.

It also includes preheat temperature controller, speed controls for the feed pump and recirculation pumps, the computer interface and electric mains switching controls.

All important electronic sensors used on the unit provide outputs for data logging and analysis. The data loggers, provided with the unit, interface between the unit and the user's computer using two USB ports.

The educational software package enables data recording, graph plotting and provides full instructions for setting up the equipment and performing the experiments.

The unit can also be operated in remote control mode, whereby the majority of the control panel functions can be implemented directly from the PC.

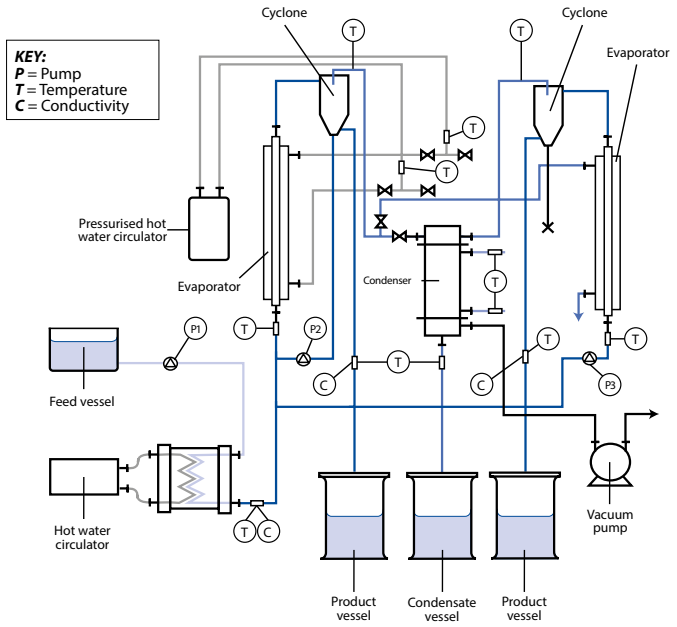
All related theory and help texts are provided. The software requires a computer (not supplied) running Windows 7 or later with a USB port.

Although a wide range of products may be concentrated in the evaporator, the software includes algorithms so that when potassium chloride is used, the computer display indicates the product concentrations directly. These are calculated in real-time from the temperature and conductivity readings.

The computer software also includes a fully configurable controller for performing process control experiments.

The effect of a vacuum on evaporation temperature can be demonstrated, a vacuum pump is incorporated and a display indicates the level of vacuum. In a double effect system the vacuum is applied to the second stage.

Process flow diagram UOP20-PHW double effect rising film - parallel feed



Experimental Capabilities

- Mass balances
- Energy balances
- Comparison of economies for single effect and double effect evaporation
- Comparison of economies for forward, backward and parallel feed
- Variation of evaporation rate with heating medium temperature
- Variation of evaporation rate with system pressure
- Dependence of heat transfer coefficient on circulation rate
- Dependence of heat transfer coefficient of condenser on flow rate
- Process control exercises

Evaporator Columns

Each evaporator column contains a stainless steel evaporation tube, within an insulated heated jacket for the hot water or steam. These are mounted on a back plate together with a glass cyclone to separate the concentrated product from the evaporated steam.

Also included on the back plate of each evaporation column is a recirculation pump and associated pipework, together with thermocouples to measure the temperatures of the product and heating fluid at a number of points. Two basic types of evaporation column are available:

UOP22 - Rising Film Evaporation Column
UOP23 - Falling Film Evaporation Column

A number of variants are defined for each column type, dependent on whether it is a first or second effect unit, and whether it is located in the first or the second position on the UOP20X service unit.

- **UOP22-11** Rising Film Evaporation Column (1st effect, 1st position)
- **UOP22-22** Rising Film Evaporation Column (2nd effect, 2nd position)
- **UOP23-11** Falling Film Evaporation Column (1st effect, 1st position)
- **UOP23-22** Falling Film Evaporation Column (2nd effect, 2nd position)
- **UOP23-12** Falling Film Evaporation Column (1st effect, 2nd position)

The choice of the evaporator service unit is dependent on whether steam or pressurised hot water is required as the primary heating medium.

The steam powered unit requires an external supply of steam (eg the Armfield UOP10), whereas the hot water unit is fully self-contained, using an electrically heated recirculating pressurised water system.

In addition to the service unit, at least one evaporator column is required, dependent on the required configuration. The following table defines, which modules are required in order to implement each configuration.

Configuration	Modules Required				
	UOP22-11	UOP22-22	UOP23-11	UOP23-12	UOP23-22
Single effect rising film	✓				
Double effect rising film	✓	✓			
Single effect falling film			✓		
Double effect falling film			✓		✓
Single effect rising film and single effect falling film mounted in the same chassis	✓			✓	
Reconfigurable, single/double effect rising film or single/double effect falling film	✓	✓	✓		✓

Requirements

Scale

Electrical supply:

UOP20X-PHW-A:	220-240V/1ph/50Hz, 35A
UOP20X-PHW-G:	220-240V/1ph/60Hz, 35A
UOP20X-STM-A:	220-240V/1ph/50Hz, 25A **Steam:** 10kg/hr at 2 bar
UOP20X-STM-G:	220-240V/1ph/60Hz, 25A **Steam:** 25kg/hr at 2 bar

All units require cooling water flow at up to10 l/min

Computer:
A PC (not supplied) running Windows 7 or later, with two USB ports is required if running the data logging software

UOP10 Laboratory Steam Generator:
If the UOP20X-STM is ordered an external steam supply is required. Armfield can provide a Laboratory Steam Generator UOP10 with a heat output of 30kW.

Optional accessories

- **UOP10 Laboratory Steam Generator:**
  If the UOP20X-STM is ordered an external steam supply is required. Armfield can provide a Laboratory Steam Generator UOP10 with a heat output of 30kW.
- **Computer:**
  A PC (not supplied) running Windows 7 or later, with two USB ports is required if running the data logging software

Ordering specification

- A laboratory evaporation system capable of being configured as rising or falling film, single or double effect
- Temperature controlled preheat stage
- Adjustable recirculation on each evaporation stage
- Manual control console
- Integral USB interface for computer data logging and control
- Contains vacuum pump, condenser and condensate vessel
- Options to operate from external steam supply, or integral electrically heated pressurised hot water circulator

Overall dimensions

Length	1.5m
Width	0.9m
Height	2.5m
Packed and crated shipping specifications	
UOP20X: Including up to two evaporation columns	
Volume	5.0m^3
Gross weight	450Kg max

Technical specifications

Evaporator column length	1m
Pressurised water heater	4kW
Feed preheater	2kW
Conductivity displays	0-100mS

Armfield standard warranty applies with this product

Knowledge base

> 28 years' expertise in research & development technology
> 50 years' providing engaging engineering teaching equipment

Benefit from our experience, just call or email to discuss your laboratory needs, latest project or application.

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CE
Products CE certified

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Aftercare

Installation
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Training
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