

3-Phase Horizontal Separator – UOP30

The separation of two immiscible liquids and a gas using density difference is one of the most important process operations in the oil and gas industry. Examples include separation of produced water and condensate from gas and the separation of gas and produced water from crude oil.

The Armfield 3-Phase Horizontal Separator is a small-scale unit capable of demonstrating the principles and operation of gravity separation and the effect of viscosity, flow characteristics and density difference on separation. The Armfield UOP30 comes with two horizontal separator configurations, making the UOP30 a versatile teaching unit.

NEW AND UNIQUE PRODUCT WITH APPLICATIONS IN THE OIL & GAS AND WATER INDUSTRIES
TWO INTERCHANGEABLE SEPARATORS INCLUDED - WEIR AND BUCKET / WEIR COMPACT / SELF-CONTAINED OPERATION WITH TOUCH SCREEN OPTION



Features

- ▶ Computer controlled with integrated data logging
- ▶ Continuous recycling of feed
- ▶ Two separator interchangeable designs supplied as standard (weir and Bucket & Weir design)
- ▶ Visual demonstration of the entire separation process
- ▶ Adjustable interface & level controller
- ▶ Emulsion chemistry possible (stable and unstable emulsion)
- ▶ Compatible with different feed (use of different oils with varied viscosity and density)
- ▶ Compact / self-contained unit*
- ▶ Adjustable weir and bucket weir heights
- ▶ Water and oil non-return valves for safe operation of the unit
- ▶ Optical liquid level sensors
- ▶ Coalescer

Benefits

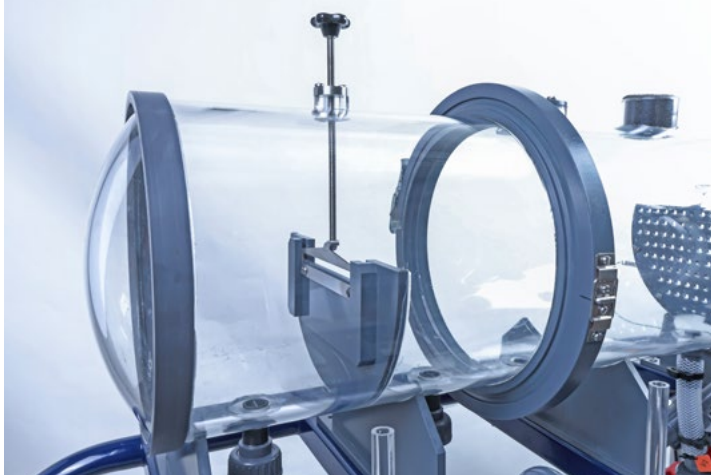
- ▶ Enables the evaluation of the design principles and controlling parameters of three-phase separation
- ▶ Enables study and investigation of the separation of two immiscible liquids
- ▶ Clear acrylic vessel and pipework for visual demonstration of entire process
- ▶ Versatile unit with two separator design configurations supplied as standard
- ▶ Rapid removal of separator design configurations to enable cleaning and quick changes in experimentation
- ▶ User friendly control of flow rates and levels within the vessel
- ▶ Fine control of weir and bucket heights
- ▶ User-friendly adjustment of level and interface heights

Description

A combination of refined oil, water and air enters the vessel, the flow is directed to the spherical end of the vessel where primary separation occurs and then flows through the vessel where it meets the coalescer.

At the secondary separating section, the fluids are allowed to slow down and separate by gravity. The water, being the heaviest in mass, stays at the bottom while the oil floats on top and the gas occupies the void space in the vessel.

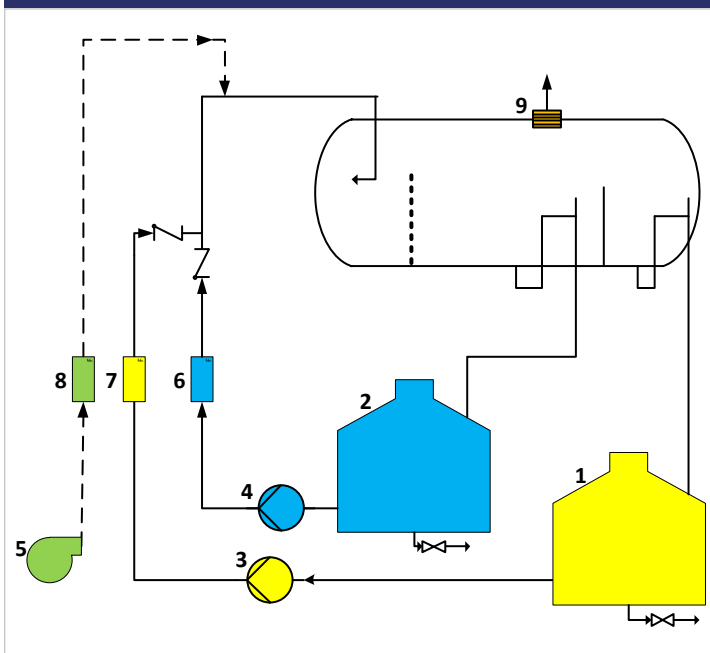
Weir design, supplied as standard – Features adjustable weir height.



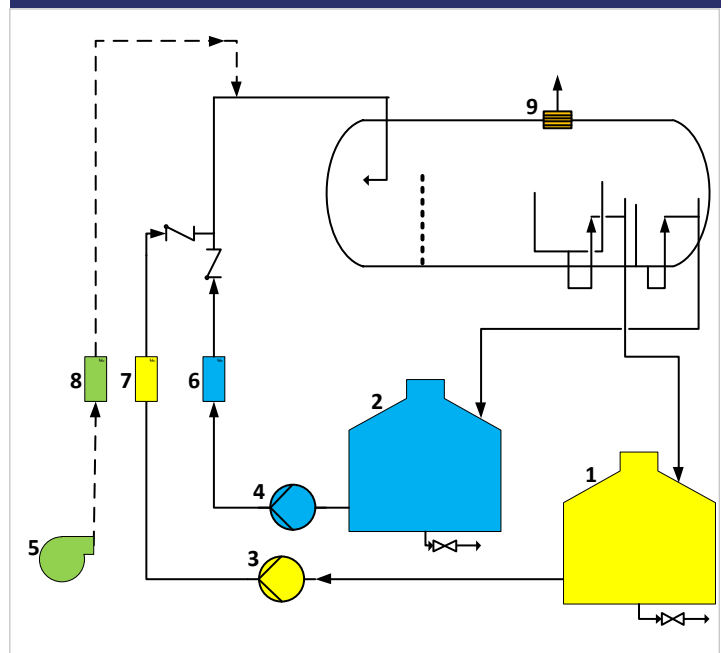
Bucket & Weir design, supplied as standard – Features adjustable bucket and weir height



Process flow weir schematics



Process flow bucket & weir schematics



1: Oil tank 2: Water tank 3: Oil pump 4: Water pump 5: Air pump 6: Water flow meter 7: Oil flow meter 8: Air flow meter 9: Mist extractor 10: Non-return valve

Demonstration / Experimental Capabilities

- ▶ Learn basic principles of control and operation of a three-phase separator
- ▶ Effect of varying operating conditions on separation
- ▶ Effect of step change on overall process
- ▶ Effect of gravity separation on small ΔSG
- ▶ Effect of continuous-phase medium on droplet size and separation
- ▶ Variation of water cut to show the effect on separation and residence time
- ▶ Effect of flow rate on emulsion formation
- ▶ Evaluation of emulsion chemistry possible (stable & unstable emulsion)
- ▶ Effect of water-oil ratio on residence time
- ▶ The effect of density difference on separation

Non return valves & flow meters – Integrated electronics system using industrial connectors



Integrated electronics system using industrial connectors



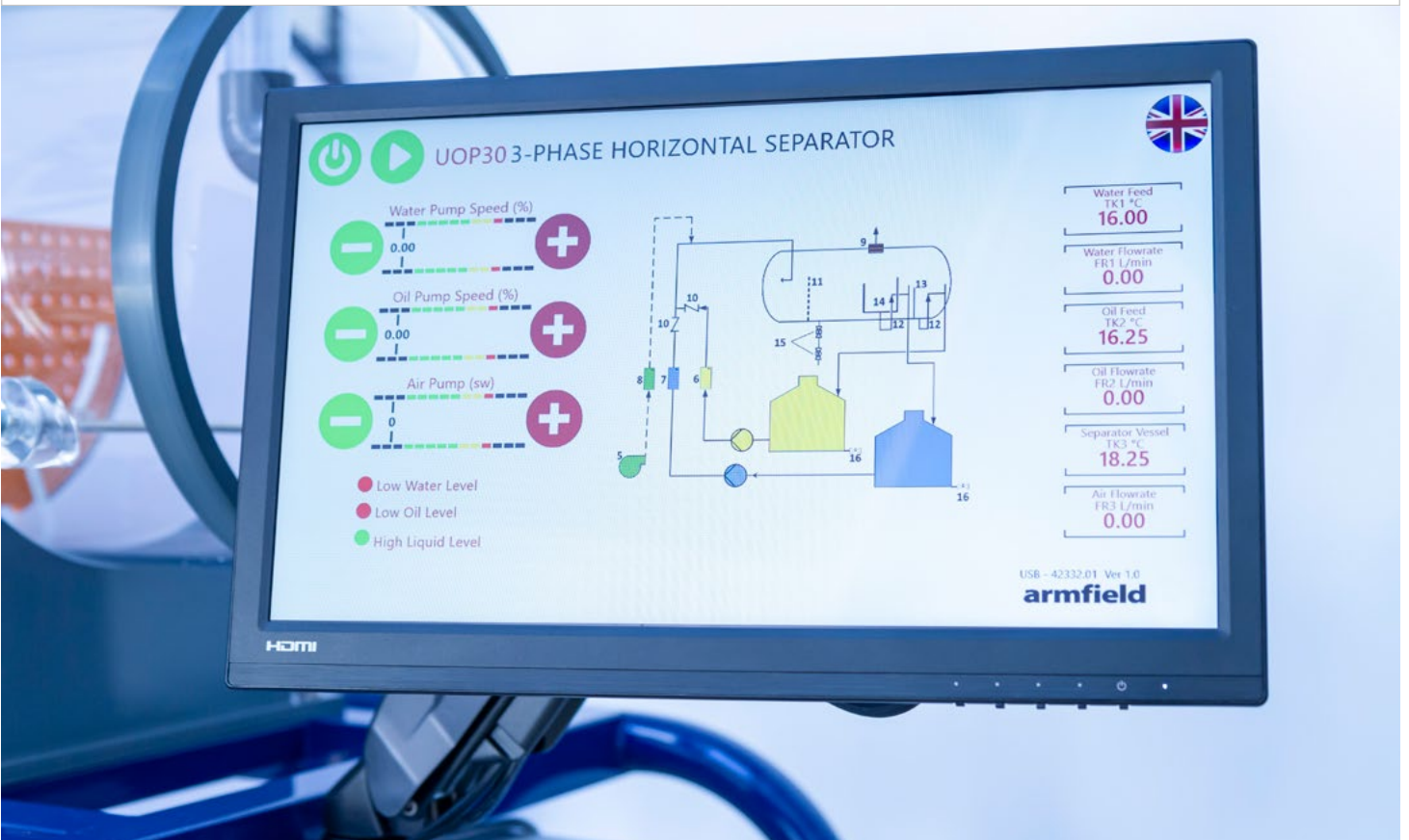
Software

On opening the armSOFT Desktop software, the user is taken to the process screen, which shows a diagram of the equipment/process. The screen shows readings from the equipment, updated in real-time, in engineering units.

This screen will also show any calculated variables and controls the user may need. Users can navigate to the other parts of the software using the tabs at the bottom of the screen. The Data tab offers a number of options for processing and displaying the data from the equipment. Graphs, results table, bar charts, etc. are all available via a second set of tabs to the left of the screen. Users can also select data filtering options.

Results are saved in a log that can be viewed and manipulated with the armSOFT Results Viewer. Results can be printed or exported to a generic spreadsheet format, which can be opened in a wide range of packages for further analysis.

The software also includes facilities for closed-loop control. The software uses a PID control algorithm to adjust an output in response to changes in one of the inputs. For example, the pump speed may be varied in order to regulate a flow rate.



Requirements

Scale



- ▶ **Single phase mains electrical supply:**
 - UOP30-A: 220-240V / 1ph / 50Hz
 - UOP30-B: 120V / 1ph / 60Hz
 - UOP30-G: 220V / 1ph / 60Hz
- ▶ **Cold water:** For initial fill prior to use and as required during the process
- ▶ **Oil:** Refined oil
- ▶ **For UOP30 without optional LCD touchscreen:**
A PC (not supplied) running Windows 7 or later, with a USB port.

Related Products

Oil and gas industrial processes related to specific Armfield teaching and research equipment:

Gas treatment & sweetening:

CES – Wetted Wall Gas Absorption Column
 UOP7 MkII – Gas Absorption Column
 UOP15 – Fixed Bed Adsorption Unit
 UOP20 – Modular Evaporator Series

Oil treatment:

UOP3CC & UOP3BM – Distillation Columns

Water treatment:

W Series

Heavy distillation / Product treatment:

UOP3CC & UOP3BM – Distillation Columns
 UOP4 MkII – Solid / Liquid Extraction Unit
 UOP5 MkII – Liquid / Liquid Extraction Unit
 UOP12 – Filtration Unit

Chemical reactors:

CEXC – Computer Controlled Chemical Reactors

Training Equipment:

CEP MkII – Stirred Tank Reactors in Series
 CEU – Catalytic Reactors

Fixed and fluidised bed:

CEL MkII – Fixed and Fluidised Bed Apparatus

Mass Transfer:

CERA-MkII – Gaseous Diffusion Coefficient Apparatus
 CERB – Liquid Diffusion Coefficients Apparatus

Additional treatments to sub-products:

Mixture:

CEK MkII – Fluid Mixing Studies

Improving purity:

UOP12 – Filtration Unit
 UOP3CC & UOP3BM – Distillation Columns

Overall dimensions

Length	1.25m	
Width	0.65m	
Height	2.00m	

Packed and crated shipping specifications

	UOP30	Armsoft LCD
Volume	2.45m ³	0.07m ³
Gross weight	230Kg	230Kg

Ordering specification

- ▶ Two-design configuration supplied as standard (interface controller & weir and bucket & weir)
- ▶ Compact / self-contained* floor-standing unit
- ▶ Computer controlled via optional LCD touchscreen (or user-supplied PC with USB interface)
- ▶ Integrated data logging
- ▶ Clear acrylic vessel for complete visualisation of the process (300mm x 900mm)
- ▶ Adjustable interface controller to suit different oils
- ▶ Adjustable bucket weir height
- ▶ Adjustable weir height enables compatibility with a variety of oils
- ▶ Mist extractor (demister pad) – Small scale and mounted externally to the main vessel, does not obscure the visibility of the separation process
- ▶ Optical liquid level sensors x3
- ▶ Colaescer x2
- ▶ Feed tanks x2
- ▶ Drain connection with valve for draining / cleaning the unit
- ▶ Electronic flow meters x3
- ▶ Temperature sensors x3
- ▶ Non-return valves x2
- ▶ Feed pumps x3
- ▶ Mains isolating switch
- ▶ Electric control panel in main cabinet with earth leakage circuit breaker
- ▶ Anti-syphon system on the air-stream
- ▶ A comprehensive instruction manual with details of installation, operating procedures and sample experiments

*When used with the optional LCD touchscreen

Optional accessories

- ▶ LCD touchscreen. Enables full control of the system without the need for a PC.

Ordering codes

- ▶ UOP30-A
- ▶ UOP30-B
- ▶ UOP30-G
- ▶ ArmBus-LCD -15.6: Optional LCD touchscreen

Technical specifications

The Armfield 3-Phase Horizontal Separator has been designed in accordance with API 12J and CE requirements.

Clear acrylic vessel	300mm x 900mm
Water flow meter range	0-25 l/min
Refined oil flow meter range	0-25 l/min
Airflow meter	0-10 l/min
Feed tanks capacity	50l
Water pump range	0-15 l/min
Refined oil	0-9 l/min

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.

An ISO 9001:2015 Company



armfield.co.uk

Aftercare

Installation
 Commissioning
 Training
 Service and maintenance
 Support: armfieldassist.com