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.
**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.

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

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

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 $\DeltaSG$
- 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

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.

Typical UOP30 software screenshot

FOR FURTHER INFORMATION ON THE ADVANCED FEATURES OF THE SOPHISTICATED ARMFIELD SOFTWARE PLEASE VISIT:

www.discoverarmfield.co.uk/data/armsoft/
**TECHNICAL SPECIFICATION**

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

**REQUIREMENTS**

- **Single-phase electrical supply:**
  - UOP30-A: 220-240V / 1ph / 50Hz
  - UOP30-B: 120V / 1ph / 60Hz
  - UOP30-G: 220-240V / 1ph / 60Hz
- **Water supply:** 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 XP or later, with a USB port.

**ORDERING CODES**

- UOP30-A
- UOP30-B
- UOP30-G
- ArmBus-LCD -7: Optional LCD touchscreen
- ArmBus-LCD -7-SS: Optional LCD touchscreen
- ArmBus-LCD -15.6: Optional LCD touchscreen
- ArmBus-LCD -15.6-SS: Optional LCD touchscreen

**OPTIONAL ACCESSORIES**

- ArmBus-LCD -7
- ArmBus-LCD -7-SS
- ArmBus-LCD -15.6
- ArmBus-LCD -15.6-SS

LCD touchscreen. Enables full control of the system without the need for a PC. Choice of two sizes, 7" or 15.6", each with a stainless steel option.

**OVERALL DIMENSIONS**

- **Height:** 2.00m
- **Width:** 1.25m
- **Depth:** 0.65m

**SHIPPING SPECIFICATION**

- **UOP30:**
  - Volume: 2.45m³
  - 0.07m³
  - Gross weight: 230kg
  - 2.6kg
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

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
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

For the full oil & gas reference list of research and curriculum-related products, please visit: