



P.A.Hilton Ltd

# LABORATORY PROPOSAL

# CHEMICAL ENGINEERING

*P.A.Hilton Ltd.*

*'Engineered to enthuse, educate and endure'*



*Lab Planning Guide  
Prepared for*

*Bestech Pty*

*By*

*Hazel Lambert*

*Sales Engineer*

*P.A.Hilton Ltd.*

*sales@p-a-hilton.co.uk*

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## Introduction to P.A.Hilton Ltd.

P.A.Hilton Ltd is a leading brand name in the provision of educational teaching equipment for engineering. Founded in 1959, we offer customers the reassurance of our knowledge and experience in the field. We are committed to our customers and continue to support units supplied years and indeed decades ago with on-going sales and aftersales support. The longevity and reliability of our products speaks volumes about our high quality standards of production. We manufacture all products in the UK and test each item on our premises to ensure our high quality standards are adhered to before sending out each item. Our research and development team continue to further enhance our product range with the latest ideas and innovations. Unlike other manufacturers we do not simply scale-down industrial equipment for the lab, but start from the perspective of an engineering question or theorem which we then devise custom equipment to suit in a robust format. This lends itself to our motto:

*'Engineered to enthuse, educate and endure'*

We **enthuse** students by making engineering theorems come to life in the lab by our equipment

We solely focus on products that **educate** meaning our range is focused on learning outcomes with the student at the centre of the process

We build robust products to **endure** class after class of inquisitive students

## Customer References -British Isles

P.A.Hilton Ltd. has helped to set up numerous Chemical Engineering Labs around the world over the last half century. We can supply customer lists by country or by product on request. Relevant reference sites in the British Isles for P.A.Hilton Ltd equipment related to **Chemical Engineering** include:

### Scotland

Robert Gordons University, Aberdeen

Strathclyde University, Glasgow

University of Abertay, Dundee

University of Edinburgh

### Northern England

Manchester University

Nottingham University

Northumbria University, Newcastle-Upon-Tyne

University of Newcastle-Upon Tyne



### Republic of Ireland

Cork Institute of Technology

### Southern England & Wales

Bath University

Imperial College London

London South Bank University

Swansea University

# Chemical Engineering Laboratory Proposal

P.A.Hilton Ltd.

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Relevant reference sites for P.A.Hilton Ltd equipment worldwide include:

## Europe

Athlone Institute of Technology, Ireland

Cordoba University, Spain

Hertfordshire University, England

Pierre & Marie Curie University, France

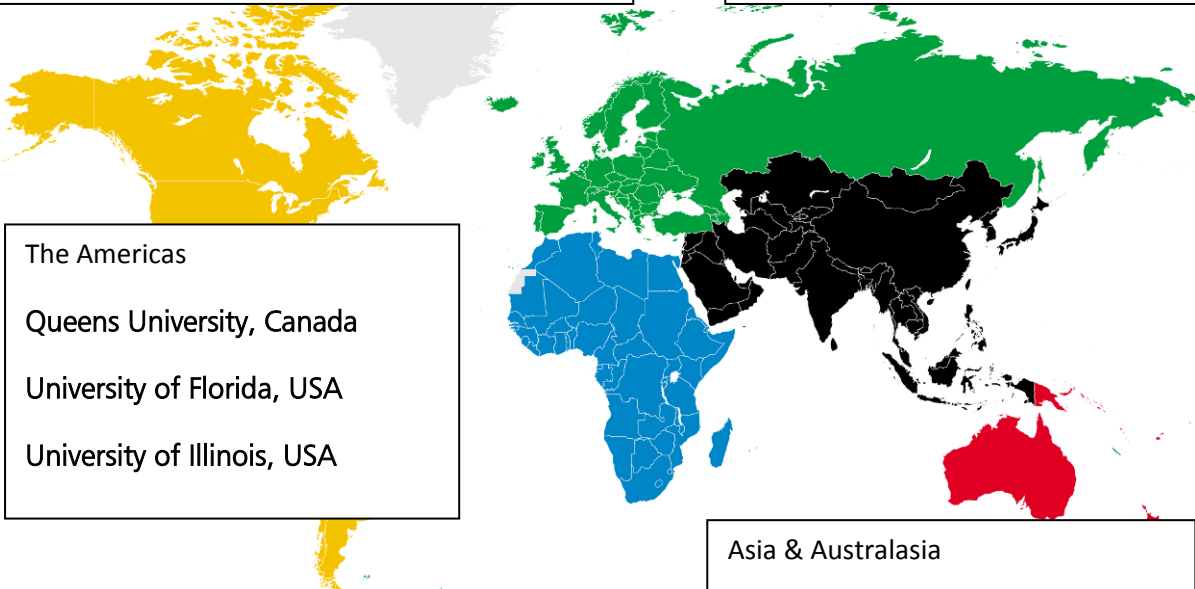
Strathclyde University, Scotland

## Middle East

College of the North Atlantic, Qatar

Ministry of Manpower, Oman

Zamil Training Centre, Saudi Arabia



## The Americas

Queens University, Canada

University of Florida, USA

University of Illinois, USA

## Africa

Air Force Training Centre  
Marrakech (ERA), Morocco

Covenant University, Nigeria

Ministry of Education, Egypt

Zawiyah University, Libya

## Asia & Australasia

Indian Institute of Technology,  
Madras, India

Nanyang Polytechnic, Singapore

Turkmenistan Polytechnic Institute,  
Turkmenistan

University of Technology, Malaysia

University of Queensland, Australia

Furthermore, individual Product Distribution Lists are available on request, demonstrating the wide range of institutions to which P.A.Hilton Ltd equipment has been supplied.

We consider all of our customer sites references, so if you would like us to arrange to speak to an existing customer or visit a lab site, please let us know and we can facilitate this at a mutually convenient time.



## Example Laboratory

A recent example of a complete Chemical Engineering Laboratory refurbishment with P.A.Hilton Ltd equipment is at Strathclyde University in Glasgow. (*University of the Year 2012-2013*)

which included the following items:

### Strathclyde University, Glasgow



#### A660 Air Conditioning Laboratory Unit

plus A661A Digital Temperature Upgrade and data acquisition.

<http://www.p-a-hilton.co.uk/products/A660-Air-Conditioning-Laboratory-Unit>



#### R833 Air and Water Heat Pump

plus data acquisition

<http://www.p-a-hilton.co.uk/products/R832-Air-and-Water-Heat-Pump>



#### H102 Heat Exchanger Service Unit

plus options A, B, C and data acquisition

<http://www.p-a-hilton.co.uk/products/H102-Heat-Exchanger-Service-Unit>

 A laboratory unit consisting of a vertical glass column with two circular bases, connected to a control panel with various gauges and switches.	<p><b>H112 Heat Transfer Service Unit</b></p> <p>plus H112J Perfect Gas Laws Demonstration Unit and data acquisition</p> <p><a href="http://www.p-a-hilton.co.uk/products/H112J-Perfect-Gas-Laws-Demonstration-Unit">http://www.p-a-hilton.co.uk/products/H112J-Perfect-Gas-Laws-Demonstration-Unit</a></p>
 A benchtop unit with a vertical column of cooling towers, a pump, and a control panel with a digital display and several buttons.	<p><b>H893 Bench Top Cooling Tower</b></p> <p>plus column A and C</p> <p><a href="http://www.p-a-hilton.co.uk/products/H893-Bench-Top-Cooling-Tower">http://www.p-a-hilton.co.uk/products/H893-Bench-Top-Cooling-Tower</a></p>
 A benchtop unit featuring a vertical glass column with a heating coil, a pressure gauge, and a control panel with a digital display and several buttons.	<p><b>H656 Boiling Heat Transfer Unit</b></p> <p><a href="http://www.p-a-hilton.co.uk/products/H656-Boiling-Heat-Transfer-Unit">http://www.p-a-hilton.co.uk/products/H656-Boiling-Heat-Transfer-Unit</a></p>
 A large, industrial-looking unit with a control panel on the left and a glass-enclosed chamber on the right, containing a fuel cell.	<p><b>RE510 PEM Fuel Cell</b></p> <p><a href="http://www.p-a-hilton.co.uk/products/RE510-Educational-PEM-Fuel-Cell">http://www.p-a-hilton.co.uk/products/RE510-Educational-PEM-Fuel-Cell</a></p>

## Product Range Overview

We would be pleased to assist with laboratory planning based on syllabus requirements, budget and space available. We recommend the following products for Chemical Engineering, divided for clarity into three academic levels, introductory, intermediate and advanced:

### Level 1: Introductory

#### Measurement Fundamentals:

<a href="#">H813</a>	Dew Point Hygrometer
<a href="#">H814</a>	Humidity Measurement Bench
<a href="#">F110</a>	Pressure Measurement Bench
<i>Optional Extras</i>	
F110A	Deadweight Tester
F110B	Pressure Transducer and Digital Display
<a href="#">H981</a>	Temperature Measurement Methods & Calibration Unit

#### Combustion:

C200	Bomb Calorimeter
<a href="#">C552</a>	Flame Propagation & Stability Unit

#### Compressible Fluid Flow

<a href="#">F100</a>	Air Flow System
<i>Optional Extras</i>	
F100A	Multi-tube Manometer
F100B	Bernoulli's Equation
F100C	Boundary Layer Investigation
F100D	Round Turbulent Jet Investigation
F100G	Drag Force Investigation
F100H	Flow Visualisation Investigation

#### Steam & Rankine Cycle

<a href="#">H931</a>	Steam to Water Heat Exchanger
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#### Refrigeration & Heat Pumps

<a href="#">R634</a>	Refrigeration Cycle Demonstration Unit
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#### Incompressible Fluid Flow

HB100	Hydraulics Bench
<i>Optional Extras</i>	
HB100B	Bernoulli's Theorem Demonstrator
HB100C	Flow Meter Demonstrator (Includes Venturi Meter and Orifice Plate)
HB100D	Pressure Losses In Bends And Fittings
HB100E	Stability Of A Floating Body
HB100F	Centre of Pressure
HB100G	Impact of a Jet
HB100J	Osborne Reynolds Apparatus
HB100K	High Flow Flowmeter
HB100L	Twin Pump (Series or Parallel)

#### Heat Transfer

<a href="#">H102</a>	Heat Transfer Service Unit
<i>Optional Extras</i>	
H102A	Concentric Tube Heat Exchanger
H102B	Plate Heat Exchanger
H102C	Shell & tube Heat Exchanger
H102D	Jacketed Vessel with Coil and Stirrer
<a href="#">H112</a>	Heat Transfer Service Unit
<i>Optional Extras</i>	
H112A	Linear Heat Conduction
H112B	Radial Heat Conduction
H112C	Laws of Radiant Heat Transfer/Exchange
H112D	Combined Convection & Radiation
<a href="#">H411</a>	Flow Boiling Demonstration Unit



## Level 2: Intermediate

### Air Conditioning:

[A660](#) Air Conditioning Laboratory Unit

### Combustion:

[C492](#) Combustion Laboratory Unit

#### *Optional Extras*

C492A Gas Burner

C492B Oil Burner

C492C Flue Installation Package

CC493A Data Acquisition Upgrade

### Compressible Fluid Flow

[F100](#) Air Flow System

#### *Optional Extras*

F100J Principles of Airflow, Pressure And Velocity Distribution

F100K Principles of Airflow, Friction Losses In Bends And Pipe Elements

F100M Principles of Airflow, Fan Test And Flow Measurement

[F300](#) Compressible Flow System

#### *Optional Extras*

F300A Nozzle Performance Test Unit

F300B Nozzle Pressure Distribution Unit

F300C Experimental Impulse Turbine

F300D Experimental Reaction Turbine

F300E Fluidisation and Fluid Bed Heat Transfer Module

F300G Compressible Flow, Pipe Friction Module

FC301A Data Acquisition Upgrade

[F860](#) Single Stage Compressor Test Unit

[F865](#) Two Stage Compressor Test Set

### Incompressible Fluid Flow

HB100 Hydraulics Bench

#### *Optional Extras*

HB100B Bernoulli's Theorem Demonstrator

HB100C Flow Meter Demonstrator (Includes Venturi Meter and Orifice Plate)

HB100D Pressure Losses In Bends And Fittings

HB100E Stability Of A Floating Body

HB100F Centre of Pressure

HB100G Impact of a Jet

HB100J Osborne Reynolds Apparatus

HB100K High Flow Flowmeter

HB100L Twin Pump (Series or Parallel)

### Heat Transfer

[H050](#) Boyles Law Demonstrator

[H102](#) Heat Transfer Service Unit

#### *Optional Extras*

H102E Extended Concentric Tube Heat Exchanger

H102F Extended Plate Heat Exchanger

H102G Water Water Turbulent Flow Heat Exchanger

H102H Coiled Concentric Tube Heat Exchanger

H102J Recycle Loops

H102K Film and Dropwise Condensation

HC103A Data Acquisition Upgrade

[H112](#) Heat Transfer Service Unit

#### *Optional Extras*

H112E Extended Surface Heat Transfer

H112F Radiation Errors in Temperature Measurement

H112G Unsteady State Heat Transfer

H112H Thermal Conductivity of Liquids & Gases

H112J Perfect Gas Laws Demonstration Unit

H112S Boiling Heat Transfer

HC113A Data Acquisition Upgrade

[H656](#) Boiling Heat Transfer Unit

### Cooling Tower

[H893](#) Bench Top Cooling Tower

### Fluid Bed

[H694](#) Fluid Bed Heat Transfer Unit

### Refrigeration & Heat Pumps

[R515](#) Mechanical Heat Pump

[R560](#) Water Water Heat Pump

[R833](#) Air And Water Heat Pump

### Steam & Rankine Cycle

[S200](#) Steam Generator and Service Module

S211 Steam Turbine Module

[S220](#) Rankine Cycle Steam Turbine

### Renewable Energy

[RE510](#) Educational PEM Fuel Cell

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## Level 3: Advanced

### Air Conditioning:

[A660](#) Air Conditioning Laboratory Unit

#### *Optional Extras*

A661A Digital Temperature Upgrade  
A661B Recirculation Duct Upgrade  
A660C PID Control Upgrade  
A660D Environmental Chamber  
AC661A Data Acquisition Upgrade  
R100 Pressure Enthalpy Software

### Combustion:

[C492](#) Combustion Laboratory Unit

#### *Optional Extras*

C492A Gas Burner  
C492B Oil Burner  
C492C Flue Installation Package  
CC493A Data Acquisition Upgrade

### Compressible Fluid Flow

[F300](#) Compressible Flow System

#### *Optional Extras*

F300A Nozzle Performance Test Unit  
F300B Nozzle Pressure Distribution Unit  
F300C Experimental Impulse Turbine  
F300D Experimental Reaction Turbine  
F300E Fluidisation And Fluid Bed Heat Transfer Module  
F300F Vortex Tube Refrigerator Module  
F300G Compressible Flow, Pipe Friction Module  
FC301A Data Acquisition Upgrade

### Heat Transfer

[H112](#) Heat Transfer Service Unit

#### *Optional Extras*

H112M Marcet Boiler  
H112P Free and Forced Convection from Flat Pinned and Finned Plates  
H112Q Thermoelectric Heat Pump  
H112R Closed Cycle Hot Air Engine (Sterling Engine)  
H112S Boiling Heat Transfer  
HC113A Data Acquisition Upgrade

### Cross Flow Heat Exchanger

[H352](#) Cross Flow Heat Exchanger

#### *Optional Extras*

H352A Plain Tube and Tube Bundle in Cross Flow  
H352B Local Heat Transfer Element  
H352C Finned Tube Bundle in Cross Flow  
H352D Free and Forced Convection from Flat Pinned and Finned Plates  
H352E Heat Pipe Investigation Accessory  
H352F Pitot Static Traverse Plate

### Cooling Tower

[H893](#) Bench Top Cooling Tower

#### *Optional Extras*

H893A Column A - 7 Plates  
H893C Column C - 18 Plates  
H893D Column D - Empty Column  
H893E Packing Characteristics Column  
HC894A Data Acquisition Upgrade

### Refrigeration & Heat Pumps

[R833](#) Air and Water Heat Pump

[R715](#) Refrigeration Laboratory Unit

R100 Optional Pressure-Enthalpy Software Upgrade

H060 Laboratory Cooling Plant with Ice Store

[816](#) Absorption Refrigeration Demonstrator

### Steam & Rankine Cycle

[S200](#) Steam Generator and Service Module

S211 Steam Turbine Module

[S220](#) Rankine Cycle Steam Turbine

#### *Optional Extras*

S220A Generator Demonstrator Module

SC221A Data Acquisition Upgrade

## Laboratory Layout & Design

Whether a fully new laboratory is being constructed or an existing laboratory is being refurbished, it is crucial to ensure physical laboratory space is of optimum design to contain the units. If modifications are required, it is best to plan these in advance of receiving equipment on-site.

### Services Required:

- Once you have selected the units of interest, refer to the technical leaflets or website for more information on the services required, which may include:
  - Water
  - Drain
  - Electricity
  - Peripherals such as computers/laptops/tablets
- Lab furnishing and layout - consider:
  - Weights and dimensions of units
  - Storage of peripherals
  - Access for loading and transporting units
  - Working areas for students and technicians

### How we can help:

- Pre-purchase – we can assist with:
  - Lab planning
  - Selection of appropriate products against syllabus requirements
  - Site visits and advice on layout and services required.
- Post-purchase – we can assist with:
  - Installation
  - Commissioning
  - Training of Technical and Teaching staff on-site

## Next Steps



*Above: The Opening Ceremony Newcrest Mining Laboratory at the University of Queensland, Australia, the culmination of many months of planning at the University with the assistance of P.A.Hilton Ltd.*

We would be pleased to assist with helping you take the next steps towards completing your new Chemical Engineering Laboratory.

We have provided information within this guide as a general overview, so do get in touch so we can put together a package suited to your individual requirements.

Contact:



**P.A.Hilton Ltd**

P.A.Hilton Limited  
Horsebridge Mill  
King's Somborne  
Stockbridge  
Hampshire SO20 6PX  
England  
F: +44 (0)1794 388129  
T: +44 (0)1794 388382  
Email: [sales@p-a-hilton.co.uk](mailto:sales@p-a-hilton.co.uk)  
Web: [www.p-a-hilton.co.uk](http://www.p-a-hilton.co.uk)

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