



P.A.Hilton Ltd

## LABORATORY PROPOSAL

# CHEMICAL ENGINEERING

*P.A.Hilton Ltd.*

*'Engineered to enthuse, educate and endure'*



*Lab Planning Guide  
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## Contents

Introduction to P.A.Hilton	page 2
Customer References	page 3
Example Laboratory	page 5
Product Range Overview	page 7
Laboratory Layout & Design	page 10
Next Steps	page 11

## 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

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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>

# Chemical Engineering Laboratory Proposal

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	<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>
	<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>
	<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>
	<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

#### Optional Extras

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
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#### Optional Extras

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
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#### 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

<a href="#">H102</a>	Heat Transfer Service Unit
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#### Optional Extras

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
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#### Optional Extras

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
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## 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

## 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:



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