



# AERODYNAMICS

The aerodynamics range is used for teaching a vast range of aerodynamic principles – from fundamentals through to advanced theories – with products to suit every space, budget and complexity requirement. The wind tunnels span a variety of sizes and experimentation capabilities, from benchtop models for learning the basics, to versions requiring large laboratories for a more detailed understanding of aerodynamics.

 **YouTube** AERODYNAMICS PLAY LIST



## PRINCIPLES OF AERODYNAMICS

TecEquipment's subsonic wind tunnels teach students the basics of lift, drag and pitching moments, plus high-level topics such as boundary layer and pressure distribution around models. Students can also perform wake investigations.

## ADVANCED THEORY OF AERODYNAMICS

TecEquipment's supersonic wind tunnels are for the more advanced teaching of aerodynamics engineering, with experiments that start with nozzle pressure distribution, on to analysis of Mach numbers, and the measurement and visualisation of pressure and shock waves using Schlieren apparatus.

## KEY FEATURES AND BENEFITS

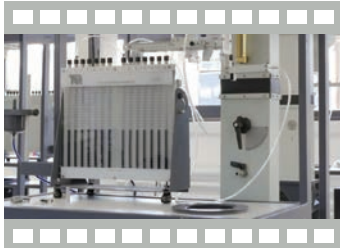
- **MADE FOR TEACHING:** Realistic results yet small enough for laboratories.
- **FLEXIBILITY:** Packages of equipment can be chosen to suit budgets and needs.
- **EASY SET-UP:** It takes only minutes to change and set up an experiment.
- **HANDS ON:** Laboratory-scale parts allow easy fitting and adjustments, for a more practical understanding.

## SUBSONIC WIND TUNNELS

# MODULAR AIR FLOW BENCH

AF10






This is a small-scale wind tunnel with an electric fan and adjustable air flow control, with eight different experiment modules that demonstrate key principles and phenomena of air flow.



EXPERIMENT MODULES POSTER



### EXPERIMENT MODULES:

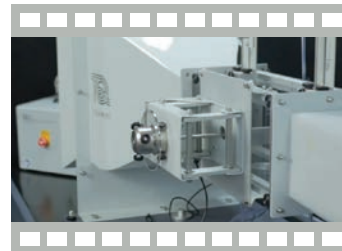
-  Bernoulli's Equation
-  Drag Force
-  Round Turbulent Jet
-  Boundary Layer
-  Flow Around a Bend
-  Coandă Effect and Jet Flow
-  Flow Visualisation
-  Tapped Aerofoil



# BENCHTOP SUBSONIC WIND TUNNEL

AF1125

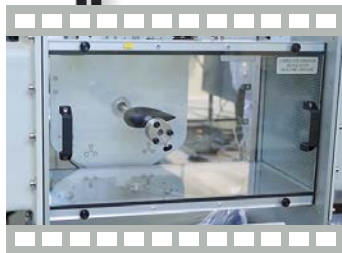
An ultra-compact open circuit, benchtop subsonic wind tunnel that offers a complete system ready for aerodynamic experimentation, suitable for college use, undergraduate study and research projects.



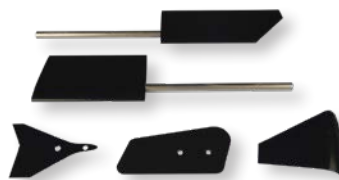
# SUBSONIC WIND TUNNEL 305 MM **VDAS**<sup>®</sup>

AFI300

A compact, free-standing open-circuit suction subsonic wind tunnel with a working section of 305 mm by 305 mm and 600 mm long, allowing students to perform advanced study such as analysing boundary layers, performing flow visualisation and observing velocity in the wake, offering extensive teaching and research functionality.



MODELS AND INSTRUMENTATION POSTER



WINGLETS AND END PLATES

**EXPERIMENT MODULES:**

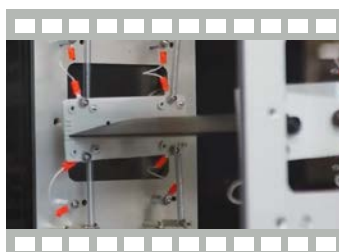
- Cylinder Model with Tapping
- NACA 0012 Aerofoil with Tappings
- NACA 2412 Aerofoil with Flap
- Set of Two NACA 0012 Aerofoils
- Flat Plate Drag Model
- Boundary Layer Model
- Aircraft Model (Low Wing)
- Aircraft Model (High Wing)
- Three-Dimensional Drag Models
- S1210 Aerofoil
- Winglets and End Plates
- Flutter Wing



FLUTTER WING



WINGLETS AND END PLATES



FLUTTER WING

“ We recently purchased a wind tunnel for the training of our aeronautical engineering students from TecEquipment. The product was easy to set up, straightforward to operate and I am confident will continue to be used for many years to come. The service and training that TecEquipment provides makes them a pleasure to work with. SEAN HAINSWORTH, MILTON KEYNES COLLEGE



PRODUCTS ARE DESIGNED AND MANUFACTURED IN THE UK AT TEC-EQUIPMENT'S GLOBAL HEADQUARTERS



## SUBSONIC WIND TUNNELS

# SUBSONIC WIND TUNNEL 450 MM **VDAS**<sup>®</sup>

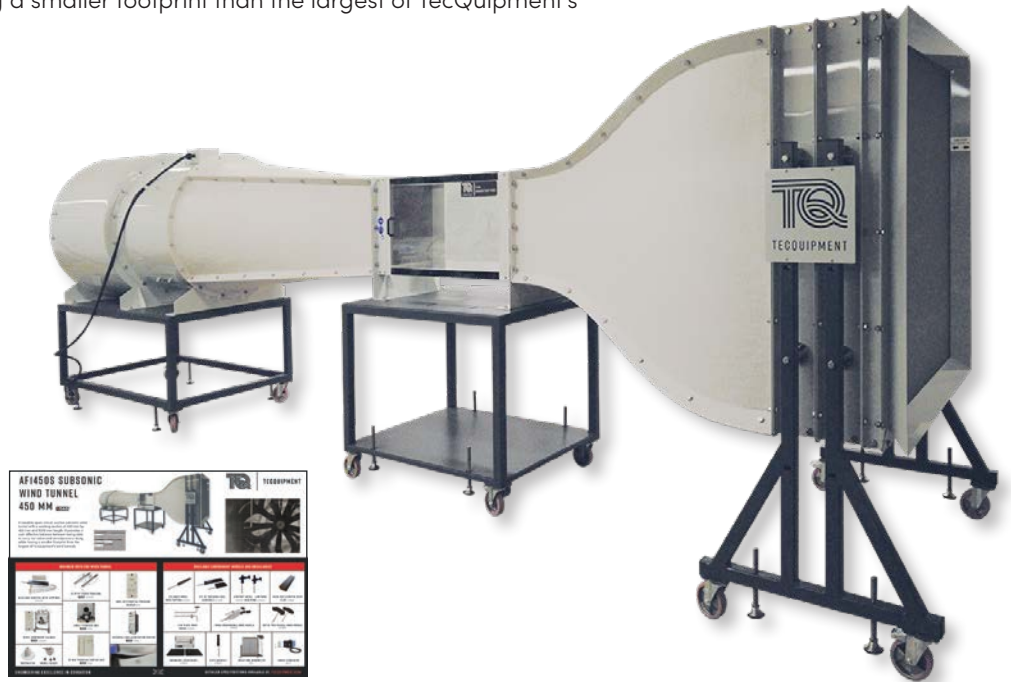
AF1450S



A sizable open circuit, suction subsonic wind tunnel with a working section of 450 mm by 450 mm and 1000 mm length. It provides a cost-effective balance between being able to carry out advanced aerodynamics study, while having a smaller footprint than the largest of TecQuipment's wind tunnels.

### EXPERIMENT MODULES:

- Cylinder Model with Tapping
- NACA 2412 Aerofoil with Flap
- Set of Two NACA 0012 Aerofoils
- Flat Plate Drag Model
- Boundary Layer Model
- Aircraft Model (Low Wing)
- Aircraft Model (High Wing)
- Three-Dimensional Drag Models
- Two Vehicle Drag Models
- S1210 Aerofoil



# SUBSONIC WIND TUNNEL 600 MM **VDAS**<sup>®</sup>

AF1600S



TecQuipment's largest open circuit subsonic wind tunnel, with a working section of 600 mm by 600 mm and 1250 mm long, is for the study of advanced aerodynamics theory and research. With the larger size comes greater visualisation and more accurate results, operating at meaningful Reynolds numbers.

### EXPERIMENT MODULES:

- NACA 0012 Aerofoil with Tappings
- NACA 2412 Aerofoil with Flap
- Set of Two NACA 0012 Aerofoils
- Boundary Layer Model
- Aircraft Model (Low Wing)
- Aircraft Model (High Wing)
- Three-Dimensional Drag Models



MODELS AND INSTRUMENTATION POSTER

# FLIGHT DEMONSTRATION WIND TUNNEL



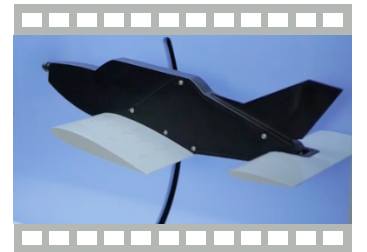
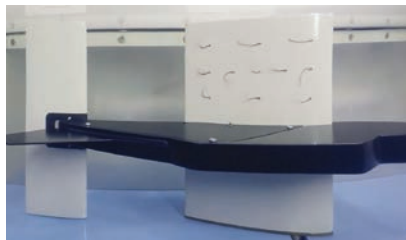
AF41V

An hands-on simulator that consists of a model aircraft suspended in an open circuit wind tunnel that allows students to experience a variety of practical hands-on flight simulations to investigate the behaviour of a fixed-wing aircraft and wing performance using fly-by-wire control.



## NEW FEATURES

- VDAS® Onboard
- Digital flight controls
- Fly-by-wire control



# FLOW VISUALISATION WIND TUNNEL

AF80

A vertical suction-type wind tunnel that uses smoke trails to demonstrate air flow around differently shaped models, for understanding boundary layers, separation and rotational flow.

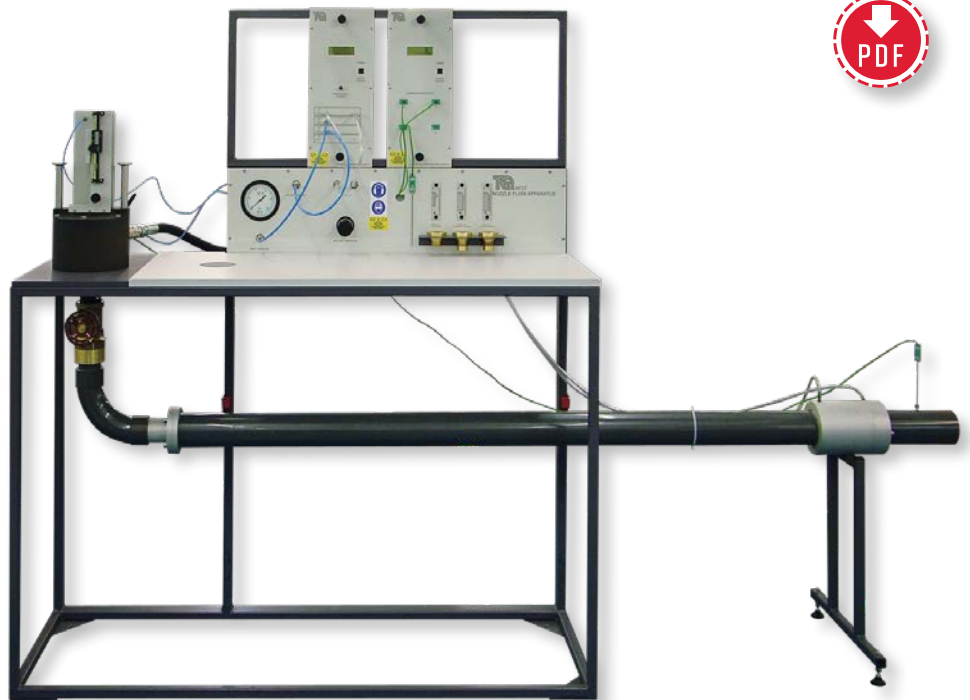


## SUPERSONIC NOZZLE

# LAVAL **VDAS**<sup>®</sup> NOZZLE FLOW APPARATUS

AF27

Demonstrates the thermodynamic and fluid mechanics of the adiabatic expansion of air through subsonic and supersonic nozzles. Includes interchangeable convergent, convergent/divergent Laval nozzles and convergent/parallel nozzle.



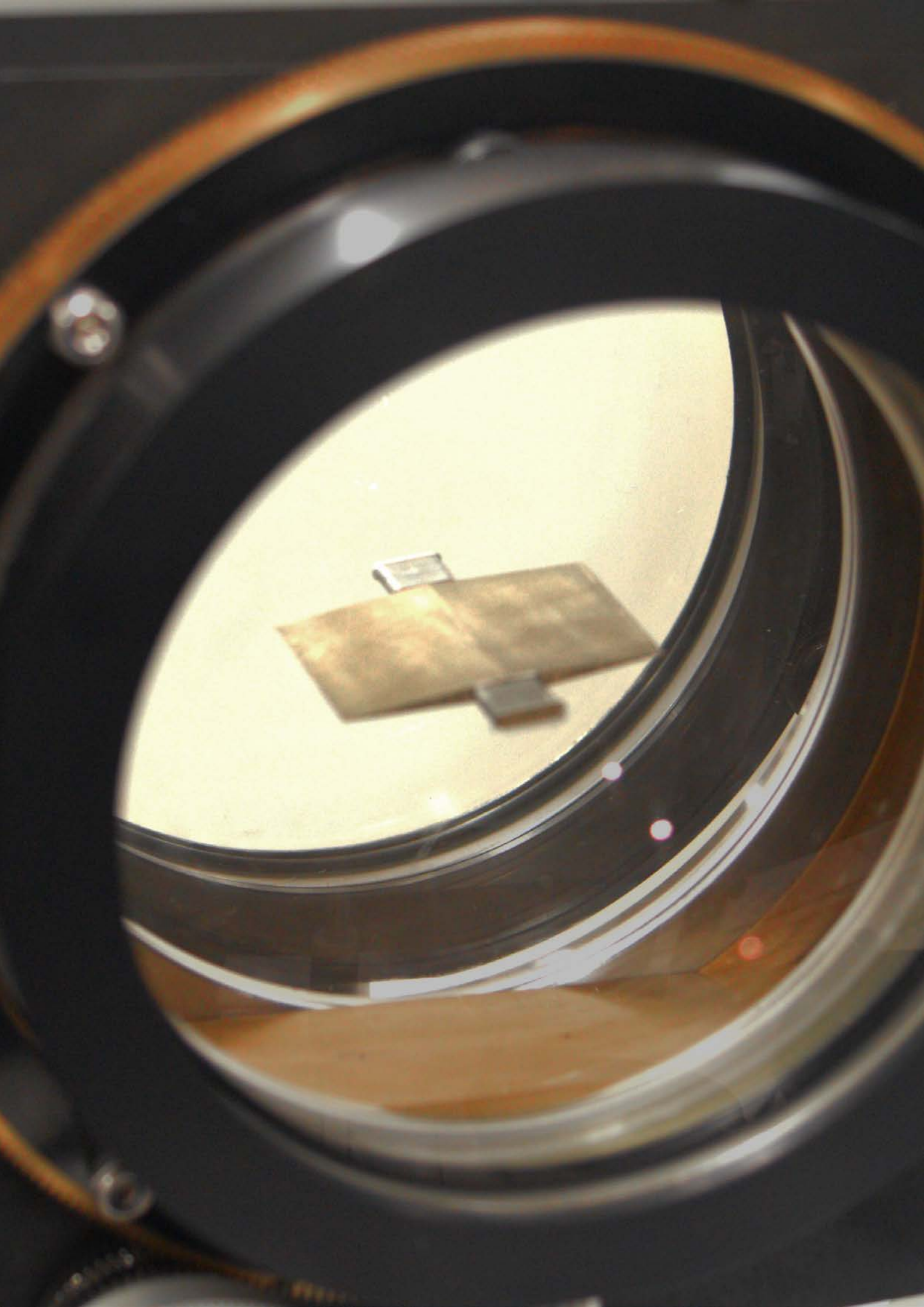
## SUPERSONIC WIND TUNNELS

# INTERMITTENT SUPERSONIC WIND TUNNEL **VDAS**<sup>®</sup>

AF300

An intermittent supersonic (up to Mach 1.8) wind tunnel for investigations into subsonic and supersonic air flow around two-dimensional models. Also for analysis of the profile of the tunnel working section.







## CONTINUOUS SUPERSONIC WIND TUNNEL **VDAS**<sup>®</sup>

AF302

A suction-type, continuous operation supersonic (up to Mach 1.8) wind tunnel for investigations into subsonic and supersonic air flow around two-dimensional models. Also for analysis of the profile of the tunnel working section.



## SCHLIEREN APPARATUS

AF300A / AF302A

The Schlieren apparatus enables students to see air flow (including supersonic shock waves) around two-dimensional models as variations in the intensity of illumination. For use with the Intermittent (AF300) and Continuous (AF302) Supersonic Wind Tunnels.



# TEXAS A&M UNIVERSITY ZACHRY ENGINEERING EDUCATION COMPLEX

Recently one of the USA's largest engineering schools, Texas A&M University, invested in a new engineering education complex that would revolutionise the way they teach their 20,000 engineering students. One element of this new complex was a new model for laboratories that would allow them to fully utilise equipment and space by creating "common laboratories" – shared facilities within Zachry Engineering Education Complex, completed in 2018. The new building was only part of the story; they invested heavily in new teaching equipment to be housed in this facility, including a vast range of practical engineering teaching products from TecQuipment.

Before the new facility, the engineering school's utilisation of laboratory space and equipment was not as efficiently designed. Different departments would have their own laboratory space, that for some courses was underutilised, while in contrast other departments were operating at maximum capacity with no flexibility. The solution was a shared laboratory facility with standardised modular equipment that could be utilised by the Mechanical, Civil, Chemical and Petroleum Engineering departments.



Once the State of Texas had approved the new building in 2016, the next step was to establish what equipment would be required for each department, and the laboratory arrangement that would work to be most effective. Equipment committees that included technicians and faculty members were established. Lists of teaching objectives and a wish list of equipment compiled. During this period, the team pulled in quotes from across the engineering education industry and, despite only having had a few years of experience using TecQuipment products, made the shift to standardise across the board with TecQuipment's teaching equipment.

## TRUST AND LOCAL SUPPORT

"One of the reasons we chose TecQuipment as our equipment provider was that we had trust in what they delivered. Colleagues who had used TecQuipment products vouched for the quality and suitability of the products, and the support and conduct of both TecQuipment and their local representative in the region, Tech Labs," explained Director of Undergraduate Laboratory Instruction Dr David Staack from the J Mike Walker '66 Department of Mechanical Engineering at Texas A&M University.

## THE LABORATORY EQUIPMENT SET-UP

Texas A&M's engineering graduates are among the most highly recruited in the USA, typically receiving two or more job offers with higher-than-average salaries at graduation. This is testament to their teaching and ability to prepare students for the world of work: one key element of this is incorporating practical teaching in the laboratories.

The Zachry Engineering Education Complex has a series of common laboratories that house TecQuipment's teaching equipment, plus a design center.



- **PHILLIPS 66 FLUIDS LABORATORY:**

5m Flow and Sediment Transport Channel (FC80) with cylindrical gate, radial sector gate, crump weir, dam spillway, streamlined hump, parshall flume, bridge piers, roughened bed, siphon spillway, culvert model, flow splitter, plus wave generator and beach.

- **SHELL TRANSPORT PHENOMENA LABORATORY**

Three Heat Exchangers Service Modules (TD360) with VDAS®, along with three experiments (concentric tube heat exchanger, shell and tube heat exchanger, plate heat exchanger) and the Filmwise and dropwise Condensation and Boiling experiment (TE78).

- **VALERA HIGH BAY LABORATORY**

Subsonic Wind Tunnel (AF1300) with three-component balance, balance angle feedback unit, Pitot static traverse, 32-way pressure display, differential pressure unit, NACA 0012 aerofoil with tappings, NACA 2412 aerofoil with flap and cylinder model.

## VIDEO MANUALS

One important delivery element for placing the order with TecQuipment was the ability to deliver instructional videos on how to use the equipment, as well as the written manuals. The team at TecQuipment provided these bespoke, filmed on site using Texas A&M's very own pieces of equipment.

## ACCOMMODATING MODIFICATIONS

As everything is designed and manufactured all under one roof, TecQuipment is, in some cases, able to make modifications to equipment to suit specific requirements from the customer. In the case of Texas A&M, TecQuipment was able to modify a product to feature a closed water supply so that it would not be dependent on building services.

## INSTALLATION AND ONGOING TECHNICAL SUPPORT

A specialist installation engineer from TecQuipment joined the local TecQuipment partner, Tech Labs, to assist with the installation, set-up and training for all the equipment.

Shei Sia Su, Technical Lab Coordinator at the Zachry Building, commented on their technical support experience:

"Warner Brown and the Tech Labs team delivered excellent service. They made sure installation went smoothly and all equipment was ready for students to start experimenting within a timely manner. Our academics and support staff were well trained by Dave Giddings from TecQuipment."

In reference to the manuals, Shei Sia Su explained further:

"The examples of experiments are particularly useful for instructors to design new experiments.

"With multiple courses using the shared facilities, we have not suffered any major equipment downtime and this is impossible without the excellent technical support from Tech Labs team."

## MORE ABOUT TEXAS A&M UNIVERSITY

Texas A&M in the United States is home to more than 69,000 students and has a heritage that dates back to 1876. The College of Engineering itself is one of the largest engineering schools in the USA, ranking first in undergraduate enrolment in the 2019 survey by the American Society of Engineering Education. When it comes to mechanical engineering, they boast the biggest programme on the continent.



