

The *Long Pipe* facility

La 3^ABCH in visita al Laboratorio Ciclope

In seguito all'effettuazione dell'uscita didattica alle Gallerie Caproni di Predappio, avvenuta in data 27/04/2022, grazie al coordinamento dei proff. Malmesi ed Oliva, la classe ci ha inoltrato le seguenti note che, volentieri pubblichiamo:

“Alle gallerie Caproni siamo stati accolti dal prof. Gabriele Bellani, della Facoltà di Ingegneria Aerospaziale, e condotti in una visita guidata alle strutture del Laboratorio CICLOPE, punto di eccellenza mondiale per quanto concerne lo studio sullo sviluppo della turbolenza.

La struttura, che è parte di un gruppo di siti europei altamente specializzati nelle ricerche di settore, ospita una particolare galleria del vento lunga oltre 100 m, nella quale si compiono studi di avanguardia non solo in campo aeronautico, ma anche ingegneristico, civile (es. il perfezionamento delle maschere per l'ossigenazione dei pazienti colpiti da Covid-19) ed industriale.


In tale occasione siamo stati accompagnati con estrema chiarezza in un itinerario storico, tecnologico e scientifico nel corso del quale abbiamo potuto vedere applicate, in concreto, diverse tematiche affrontate nello studio del corso di Tecnologie Chimiche Industriali nella nostra scuola”.

Nelle foto: il gruppo in visita alle Gallerie Caproni di Predappio, i docenti accompagnatori, il prof. Bellani





CENTRE FOR INTERNATIONAL COOPERATION IN LONG PIPE EXPERIMENTS



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

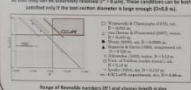
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CICLOPE

THE "LONG PIPE" FACILITY

GOAL

The Long Pipe has been designed to provide optimal flow conditions for steady and unsteady turbulent measurements over a large range of Reynolds. The goal is to create a high Reynolds number flow (Re = 10000) that generates a well-developed boundary layer, while maintaining a long enough axial length so that the flow can be accurately measured (70% pipe). These conditions can be both satisfied only if the test section diameter is large enough (1000 mm).



Range of Reynolds numbers (Re) for various length scales (L) of various pipe flow experiments.

DESCRIPTION

The Long Pipe consists in a closed loop wind tunnel operating with air at atmospheric pressure. The closed loop configuration allows for high Reynolds number and boundary layer stability for aerodynamic use. The internal structure is carefully selected to match the main objectives being that the test section is 100% long.

The closed loop configuration of the long pipe consists of the compressor, the settling chamber, the diffuser, the test section, the axial fan, and the settling chamber.

This long pipe, with its conventional wind tunnel, the largest portion of the pipe has been 100% covered by the test section rather than the conventional. This impacts the design of the aerodynamic components (nozzle, diffuser, screens, etc.). The design of this component is important in the sense that it has been conventional wind tunnels and it is aimed at optimizing the flow quality.

THE PIPE

Main characteristics:


- Material: Carbon Fiber
- Length: 10 m
- Inner diameter: 1000 mm
- Outer diameter: 1050 mm
- Weight: 22 ± 1.0 t (total)
- Properties:
 - High stiffness
 - Smooth inner surface
 - High pressure capability (Re = 10,000)
 - High pressure capability (Pressure up to 10 bar and higher surge capacity)



INLET

CONSTRUCTION: Settling Chamber

The settling chamber consists of a cylindrical section and a conical section. The conical section is used to reduce the turbulence level and to ensure the flow is fully developed before entering the test section.



THE LONG PIPE

Velocity section: $D = 8$ mm

Reynolds number: $Re = 10000$

Aspect ratio (L/D): 124




EXPANDING CORNERS

Main characteristics:

- Material: Carbon Fiber
- Length: 1000 mm
- Inner diameter: 1000 mm
- Outer diameter: 1050 mm

Description: The expanding corners allow the expansion of the flow during the corner with a radius of 1.5, with consequent modification of the flow.




COOLING SYSTEM

Main characteristics:

- Material: Carbon Fiber
- Length: 1000 mm
- Inner diameter: 1000 mm
- Outer diameter: 1050 mm

Description: The cooling system allows the cooling of the flow during the corner with a radius of 1.5, with consequent modification of the flow.




AXIAL FAN

Main characteristics:

- Material: Carbon Fiber
- Length: 1000 mm
- Inner diameter: 1000 mm
- Outer diameter: 1050 mm

Description: The axial fan allows the flow to be accelerated during the corner with a radius of 1.5, with consequent modification of the flow.



COSTRUIAMO INSIEME IL FUTURO

