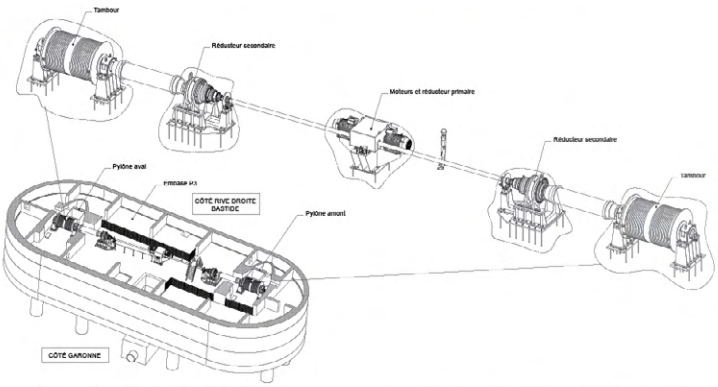

LE PONT

ORIGINE FRANCE GARANTIE

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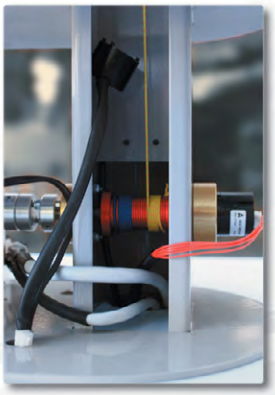
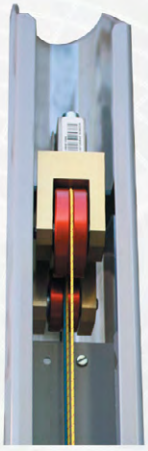
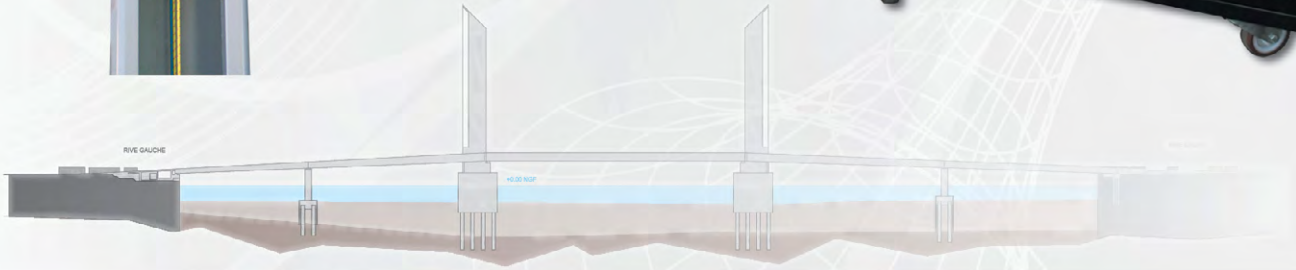






No contractual Pictures

• DIDACTIC APPROACH FOR ENGINEERING SCIENCE •

1 • THE ORIGINAL BRIDGE

The famous "Chaban-Delmas bridge" was inaugurated in 2013 in Bordeaux, a well-known town in Southwestern France.

The aim of the bridge was to join the urban boulevards of Bordeaux, by connecting two districts called Bacalan and Bastide

With a length of 433 m, the bridge has 2 lanes for public transport, 4 lanes for road vehicles, and 2 gateways for cyclists and pedestrians.

The fixed spans are made from metal beams on concrete piles.

Four concrete towers of 75 m high allow the central lift span (length 117 m) to provide 50 m clearance for boats sailing towards the historical centre.

The central lift span, weighing 2700 tons and produced in metal housing, is balanced by 4 counterweights of 640 tons each.

Ilt is powered by 2 synchronized 132 kW engines, and can be lifted on load in 12 min.
The lift span's height is controlled by a sensor inside each tower.

The control panel, located on the left river bank, allows monitoring traffic, activating the engines and controlling the passage of boats.

2 • THE CIVIL ENGINEERING MOCK-UP

STRUCTURE :

- Mock-up at 1/100th scale
- Structure of the bridge piles made of lacquered steel with thickness 1.5 mm closed by polycarbonate for visualization of the cables and counterweights
- Pulleys and counterweights on each pile with Kevlar cable
- Identification of the cables by color: yellow for lifting, blue for return
- Bases of the bridge's piles composed of motor and gear-motor power 25 W
- Cables winding winch with spooling groove
- Box-type bridge deck made of steel thickness 0.5 mm
- Complete bridge mock-up mounted on a cabinet equipped with wheels
- Electronics and control boards placed on a drawer inside the cabinet for easy access and adjustments

INSTRUMENTATION :

- Gauges supplied on the upper and lower fibers in central section with conditioner
- 1 displacement sensor for measuring the deformation of the bridge deck
- 4 load cells on lifting pulleyss
- 3 incremental encoders
- 4 bridge deck load cells
- 2 displacement sensors for bridge deck's height (cable sensors)

LE PONT

3 • PROPOSED ACTIVITIES

A) "MATERIAL" :

Geometry of the lifting span: :

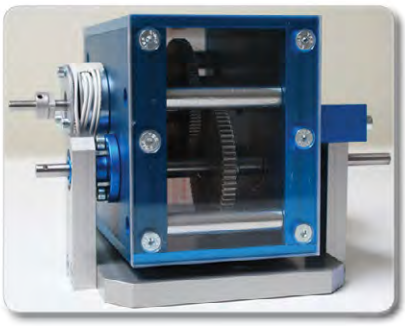
- Study of the geometrical characteristics of the central box of the bridge deck through modeling

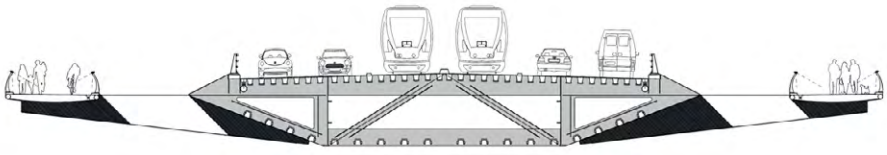
Resistance of the lifting deck :

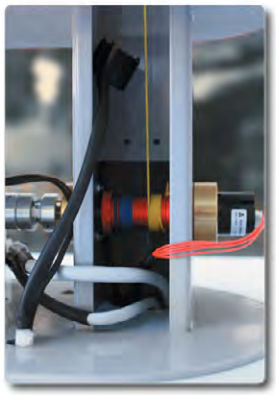
- Study of the deformation of the bridge deck under load, with different masses.
- Measurement of the bending, the bridge deck stress under load

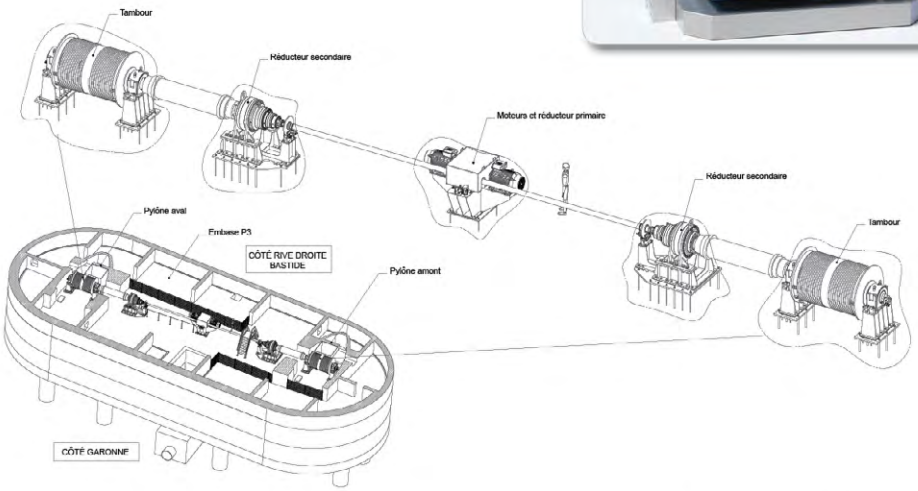
Resistance of the lifting cables :

- Study of the cables resistance allowing the lifting of the bridge deck









B) "ENERGY" :

Kinematics of transmission :

- Study of movements of lifting the bridge deck: cables, pulleys, drive drum rotation, bridge deck's movement...

Simple dynamics :

- Study of simplified balance of the span lifting power under load.

Efforts at constant speed :

- Study of detailed balance of the span lifting power under load.

Efforts in accelerated motion :

- Dynamic study of the span lifting under load.

BLDC motor :

- Study of electronic switching of a brushless motor depending on the encoder information.

Friction :

- Power balance of the gearbox in the presence of dry and viscous frictions.

C) "INFORMATION" :

Incremental encoder :

- Study of a digital measuring device for position and speed rotation.

Gauges sensor :

- Study of an analog device for measuring short displacements

Absolute encoder :

- Study of a synchronous serial link.

Fieldbus :

- Study of an asynchronous serial link.

Synchronization :

- Programming of the piles speed control to synchronize the movements of the two banks..

Deck lighting control:

- Programming of the colors and intensity of the LED lighting

Reading of encoder :

- Programming of the decoding of the coders signal on a micro controller.

Tachometer sensor :

- Synthesis of the filter of a tachometer sensor and study of the characteristics of the signal obtained.