

PICA - Pipe Internal Carrier

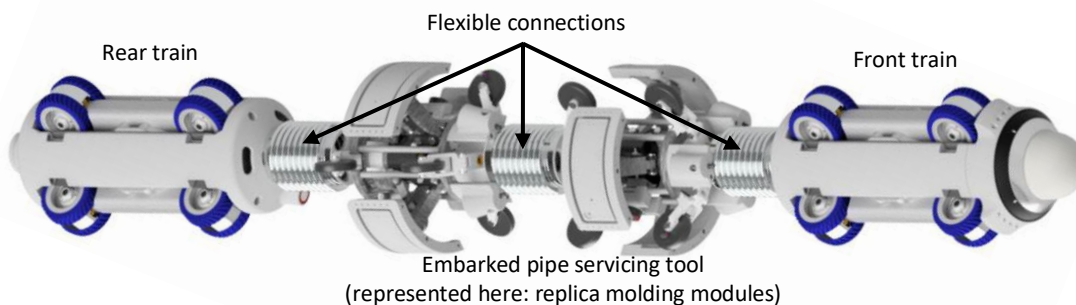
The Problem

Pipe inspection and repair is a major challenge for the global fleet of nuclear power plants, especially for plants looking at extending LTO (Long-Term Operations).

While utilities can proceed with replacements for many pipes affected by corrosion, a replacement strategy is not always possible or preferable. Other maintenance solutions are required for inaccessible or embedded pipes. Moreover, for those pipes which are expensive or unable to be replaced, internal inspection and repair become an even greater technical challenge if the pipe's diameter, length or inclination is variable and when the remote access to the zone of interest requires tooling to travel through bended sections and elbows.

The Westinghouse Solution

The Westinghouse PICA tool carrier presents a solution to common pipe inspection and repair challenges, with controlled disengagement of the wheels, and an ability to traverse conical pipes and pass elbows at any angle between 45° and 180°. This technology, which has been submitted for patent, is the best option for inspection and repair of piping of internal diameters ≥ 195 mm (7.68 in) and is sure to provide the technical support needed for safe plant operations.



Model of the tool carrier with replica molding tool attachment

PICA Tool Carrier Design Benefits

- Pipe sections (vertical and horizontal) with small diameters (> 10 inches) can be examined.
- Allows for bends and turns with a bending radius of twice the pipe diameter to be easily taken.
- Long sections of pipe (approx. 20 m) can be travelled.
- Insertion through a valve is possible.
- Tilting bogie allows the carrier to move through a conical pipe.
- Each wheel can be independently operated or disengaged, facilitating movement and pulling the tool carrier out of the pipe.
- **Versatile tool compartment** can house:
 - Mechanical tools for machining, milling, grinding, levelling and flapping
 - NDT inspection tools such as an ultrasonic testing unit, eddy current testing unit, 3D scanner, or replica molding unit
 - FME-retrieval solutions, for example pliers, a hook, or even a vacuum system
- Weight of 25 kg per motorized train allows for easy manual handling.

Customer Benefits

- Westinghouse can perform an integrated service, including inspection of the as-found conditions, reparation and final inspection.
- Modular tool compartment allows for a wide variety of applications, from machining to NDT.
- Provides high-definition video that allows operators to easily inspect piping.
- The tools are remotely-operated and the control stations can be installed at an ALARA area.
- Very low risk of tool carrier getting stuck even with a loss of electricity, due to the fail-safe disengagement systems for the wheels and umbilical system.
- Customers are no longer limited to cylindrical and straight pipes, as this tool carrier can traverse through conical pipes and sharp 45° bends.



Description

1. Standalone PICA Tool Carrier

The autonomous carrier consists of several sub-assemblies including the motorized trains, flexible connections, and modular tool attachments. Each motorized train features 6 motorized wheels. Each wheel can be engaged or disengaged, independently from one another.

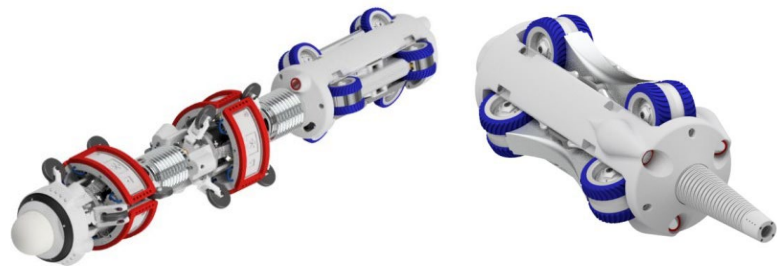
The figure below depicts an example tool carrier with two mold modules installed.



Example of the tool carrier with molding tool attachment

To visualize the movement of the tooling in the pipework, each motorized train has 2 cameras, with their own LED lighting. The carrier features a front (PTZ) camera, which is surrounded by a ring of LEDs with variable brightness.

Depending on the tooling to be embarked and on the piping line to be gone through, it is also possible to use a single-train version to the tool carrier.



Example of tool carriers with a single motorized train (left: with molding module; right: with FME-retrieval module)

2. Control Bay

The control bay can be placed in an area which allows for the remote control of the various actuators.

This control bay, includes:

- A main control unit
- A pneumatic bay
- A video bay

The control bay allows:

- to deploy/fold the motorized individual trains
- to monitor the motorization
- to pilot the embarked tool
- to record videos
- etc.