



**INTERNATIONAL OPERATIONS & MAINTENANCE CONFERENCE
IN THE ARAB COUNTRIES**

UNDER THE THEME

**"MANAGING MAINTENANCE WITHIN INDUSTRY 4.0"
CONICIDE WITH THE 16TH ARAB MAINTENANCE EXHIBITION**

Trenchless Technology

**The Missing Recipe for Sustainable Infrastructure's Construction
and Maintenance in the Arab Countries**

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4.0



Infrastructure Challenges

Text

Construction & Maintenance

- **Infrastructure services : water and wastewater networks, gas pipes, electric, telecommunication cables**
- **Infrastructure challenges: Population, funding**
- **Aging Infrastructure : Reconstruction, rehabilitation, maintenance**
- **Big cities and Congested street: Infrastructure Utilities construction/ maintenance**
- **Essential Construction and Urgent Maintenance**
- **Traditional Open trenches method in most Arab cities = ?**
- **Many western municipalities are utilizing TT techniques with lack of usage in the majority of the Arabic cities**

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Infrastructure Challenges

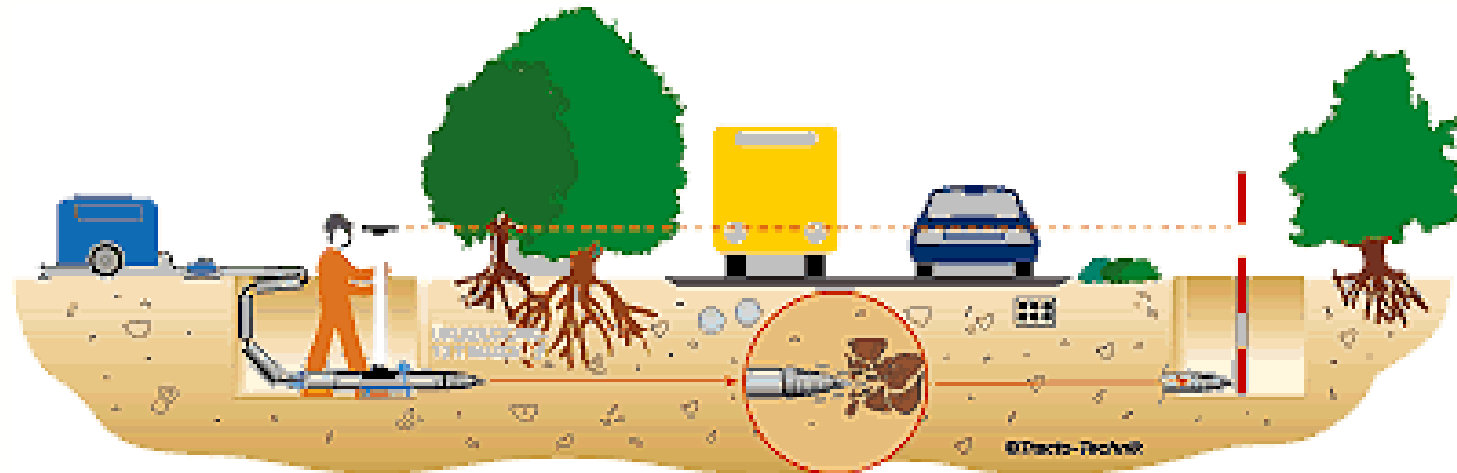
Traditional Open-cut Technology



Infrastructure Challenges

➤ Trenchless Technology the Right Methods

Trenchless construction a family of methods, materials, and equipment capable of being used for the installation of new or replacement or rehabilitation of existing underground infrastructure with minimal disruption to surface traffic, business, and other activities”



Trenchless Technology



Historically:

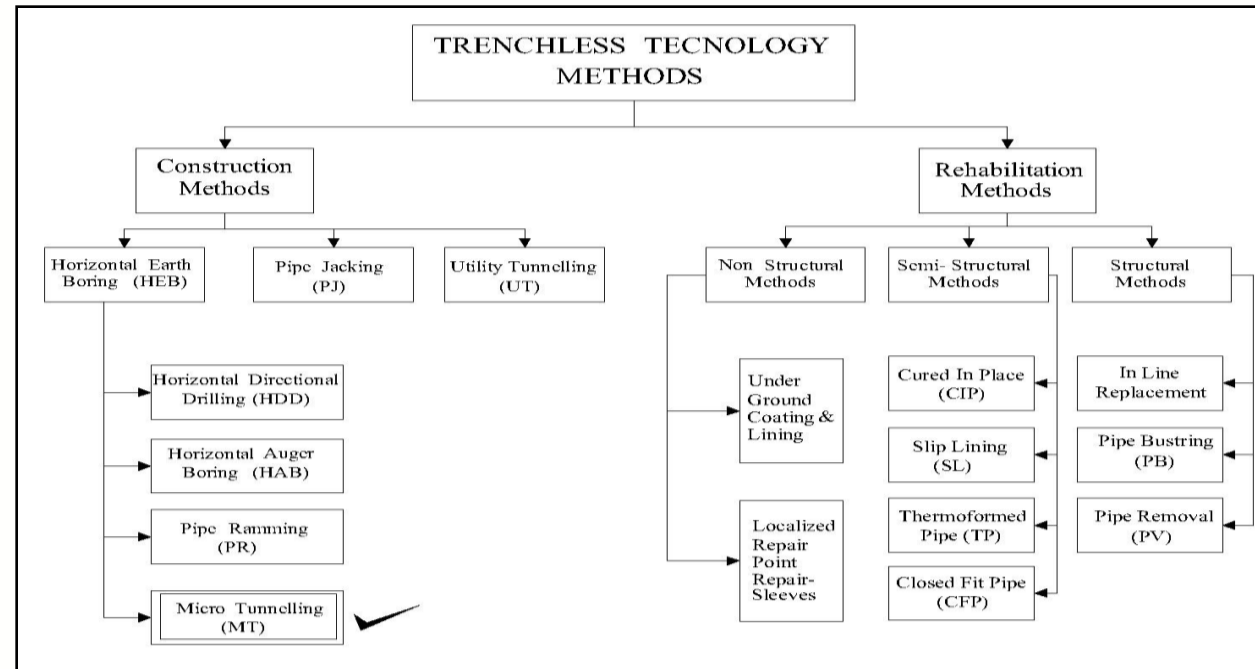
➤ **The idea and uses of Trenchless techniques dates back in History:**

- 1860s: Pioneer Northern Pacific Railroad Company use a pipe jacking technique.
- 1930s: Reinforced concrete pipes had been installed using this technique in USA.
- 1940: Subsequently, other methods of trenchless construction began to emerge and utilized including auger boring,
- 1962: Impact moling technique was used
- 1971: Horizontal directional drilling
- 1973: Micro tunneling
- 1980: Pipe bursting

➤ **In the last 15 years: many developed countries have successfully started to adopt Trenchless technology in one form or another.**

Trenchless Technology Methods

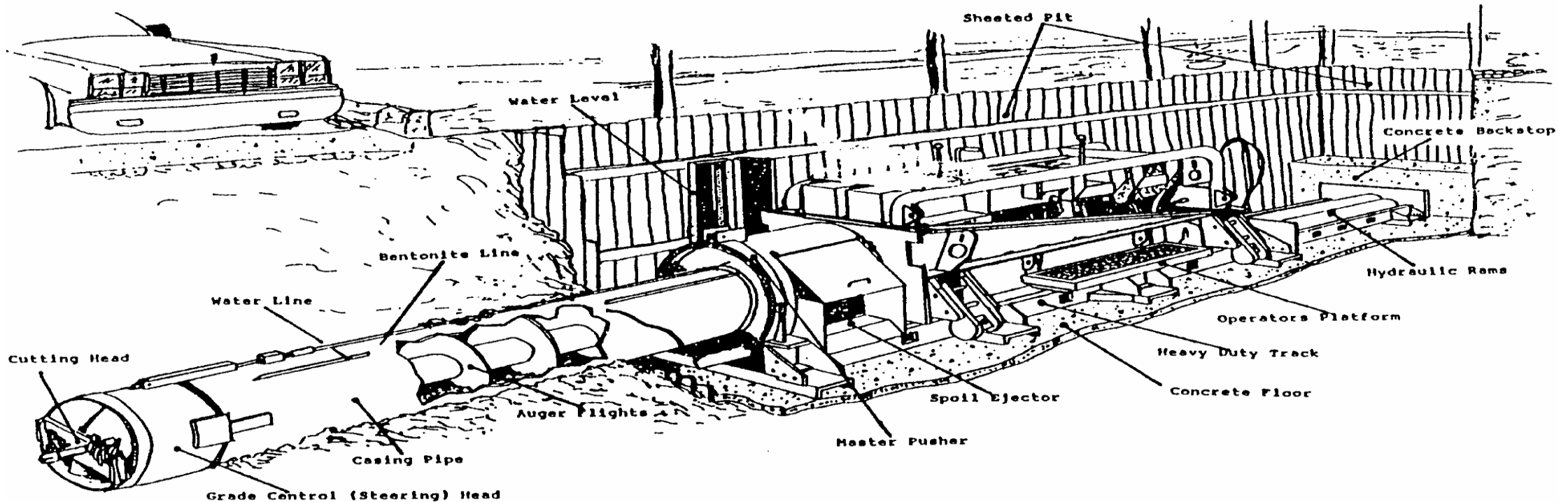
- Based on location
- Type of Infrastructure's Utility Project
- Soil Type



Trenchless Technology Methods

Horizontal Auger Boring

A technique for forming a bore from a drive pit to a reception pit, by means of a rotating cutting head. Spoil is removed back to the drive shaft by helically wound auger flights rotating in a steel casing. The equipment may have limited steering capability



Trenchless Technology Methods

Horizontal directional drilling

- A steerable system for the installation of pipes, conduits, and cables in a shallow arc using a surface launched drilling rig.
- Traditionally HDD is applied to large scale crossings such as rivers in which a fluid filled pilot bore is drilled without rotating the drill string
- and this is then enlarged by a wash over pipe and back reamer to the size required for the product pipe

Pipe Bursting

-A technique for breaking existing pipe by brittle fracture, using force from within, applied mechanically. Pipe remains are forced into the surrounding soil. At the same time a new pipe, of the same or larger diameter, is drawn behind the bursting tool

Trenchless Technology Methods: Pipes Bursting

Text

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Traditional Repair Method



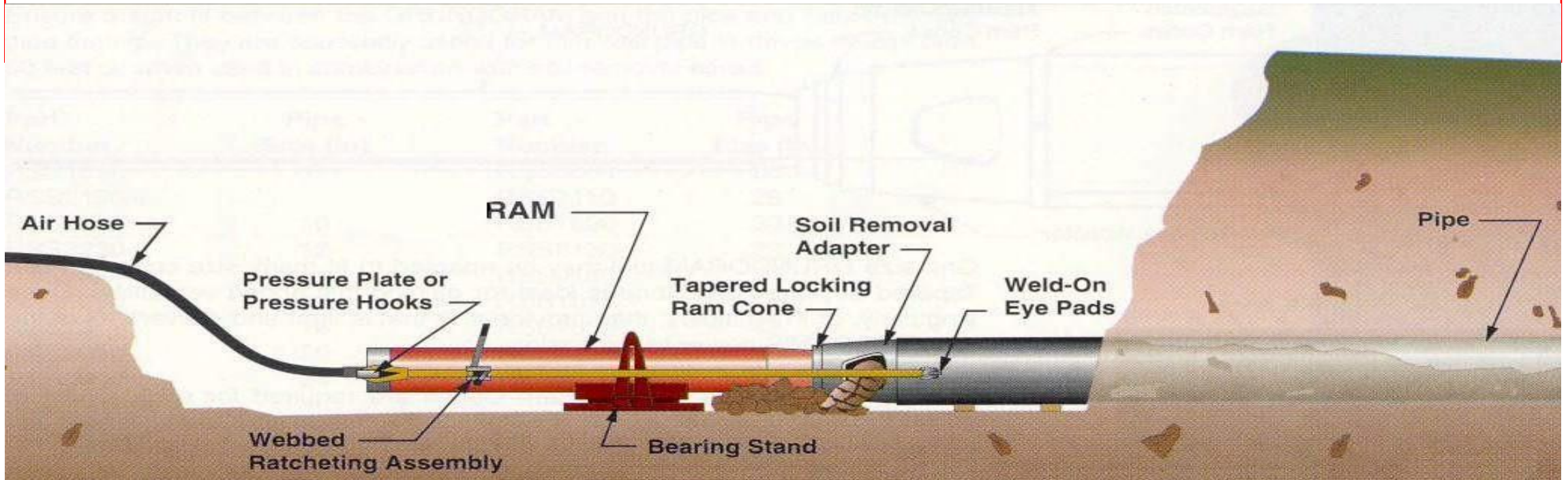
Trenchless Repair Methods



Trenchless Technology Methods

Pipe Ramming

-A technique for installing steel casing from a drive shaft to a reception shaft by utilizing the dynamic energy from a percussion hammer attached to the end of the pipe. A continuous casing support is provided and over-excavation or water is not required.



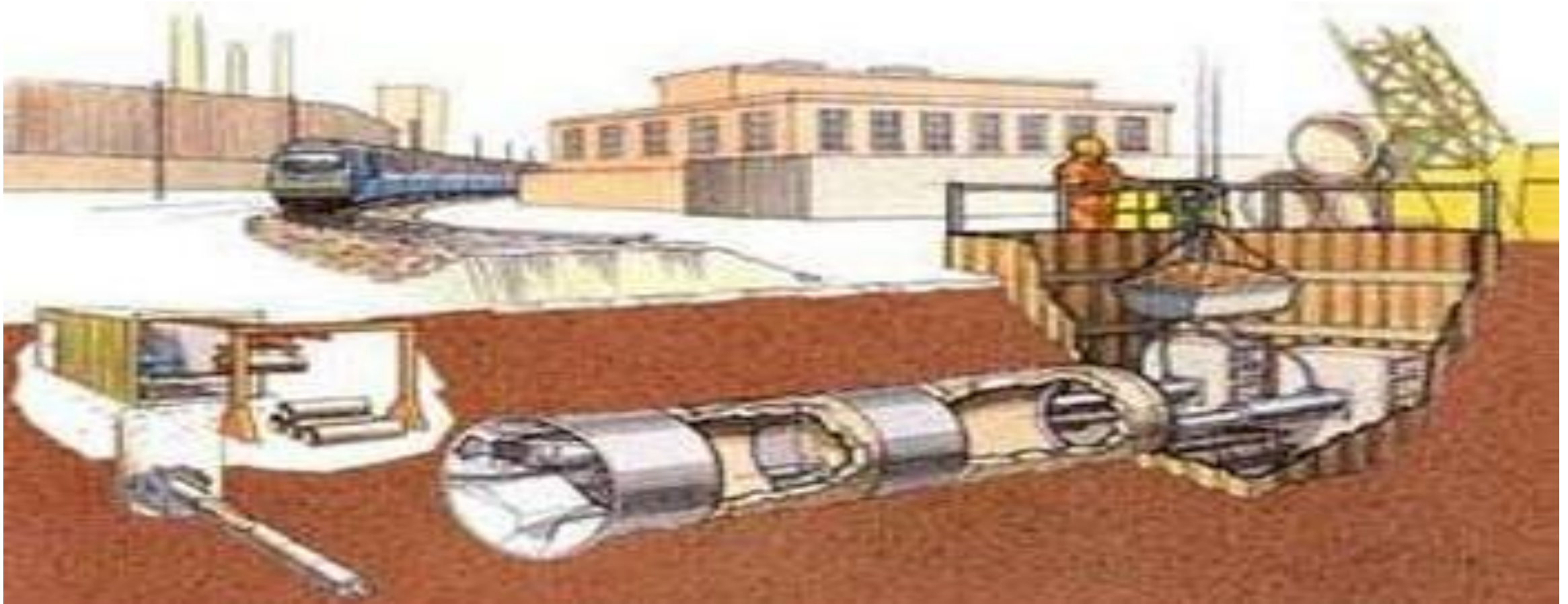
Trenchless Technology Methods: Microtunneling



- TT construction method for installing pipelines
- Remote Controlled – The Micro Tunnel Boring Machine (MTBM) is operated from a control panel, normally located on the surface.
- It simultaneously installs pipe as spoil being excavated and removed.
- Guided – The guidance system usually refers to a laser beam projected onto a target in the MTBM, capable of installing gravity sewers or other types of pipeline to the required tolerance for line and grade.
- Jacking Pipe – The process of constructing a pipeline by consecutively pushing the MTBM through the ground using a Jacking system.
- Face Support – Continuous pressure is provided to the face of the excavation to balance groundwater and earth pressure.

Trenchless Technology Methods

Microtunneling



Trenchless Technology vs. Open Trench Excavation



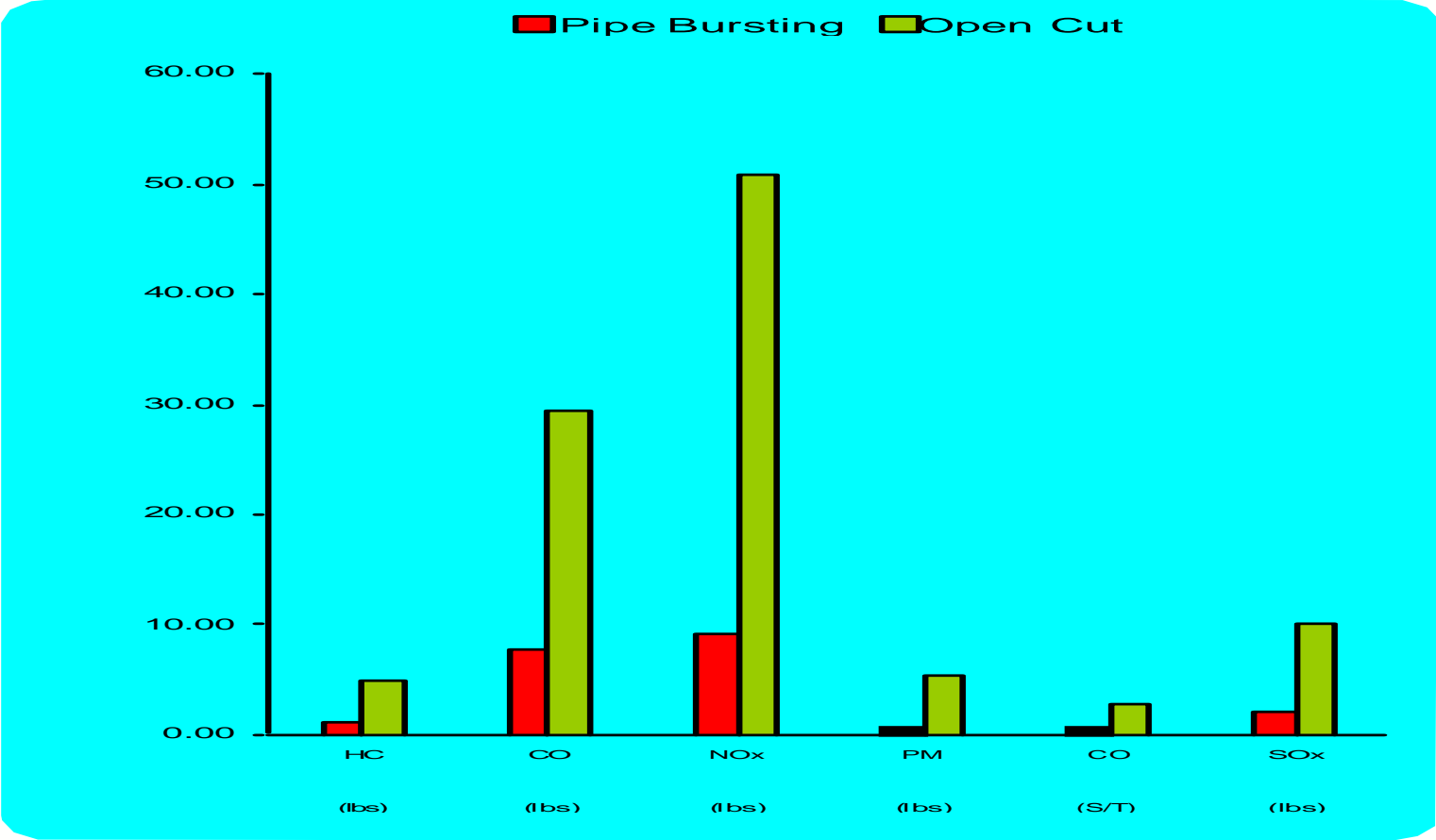
- **Increase productivity**
- **Less or no disturbance or time Delays**
- **Enhance Safety for: workers – Pedestrians - Traffic**
- **Less construction cost**
- **Less damages to existing utilities above**
- **Less disturbance to local business**
- **Less damages to above surface**
- **Sustainable and Environmentally friendly**

Infrastructure Challenges

Open-cut technology method



Trenchless Technology vs. Open Trench Excavation



Conclusion



- **Infrastructure / Utilities construction & maintenance in congested streets and crowded vicinities**
- **C & M in crowded vicinities = Construction managers and Decision makers Challenge.**
- **Open Trench methods: Costly, time consuming, traffic congestion, pedestrian disturbance, and environmental damages: Trees, landscape, air pollutions**
- **Emerging Trenchless technology the right sustainable choices for crowded locations with Success stories in the western countries**
- **Various TT Techniques for different site conditions**
- **Many advantages and few drawbacks**

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Thank you