

25th world gas conference
“Gas: Sustaining Future Global Growth”

The URUCU – MANAUS Project

Construction in Extreme Conditions

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Venue: Kuala Lumpur Convention Center



Patron



Host

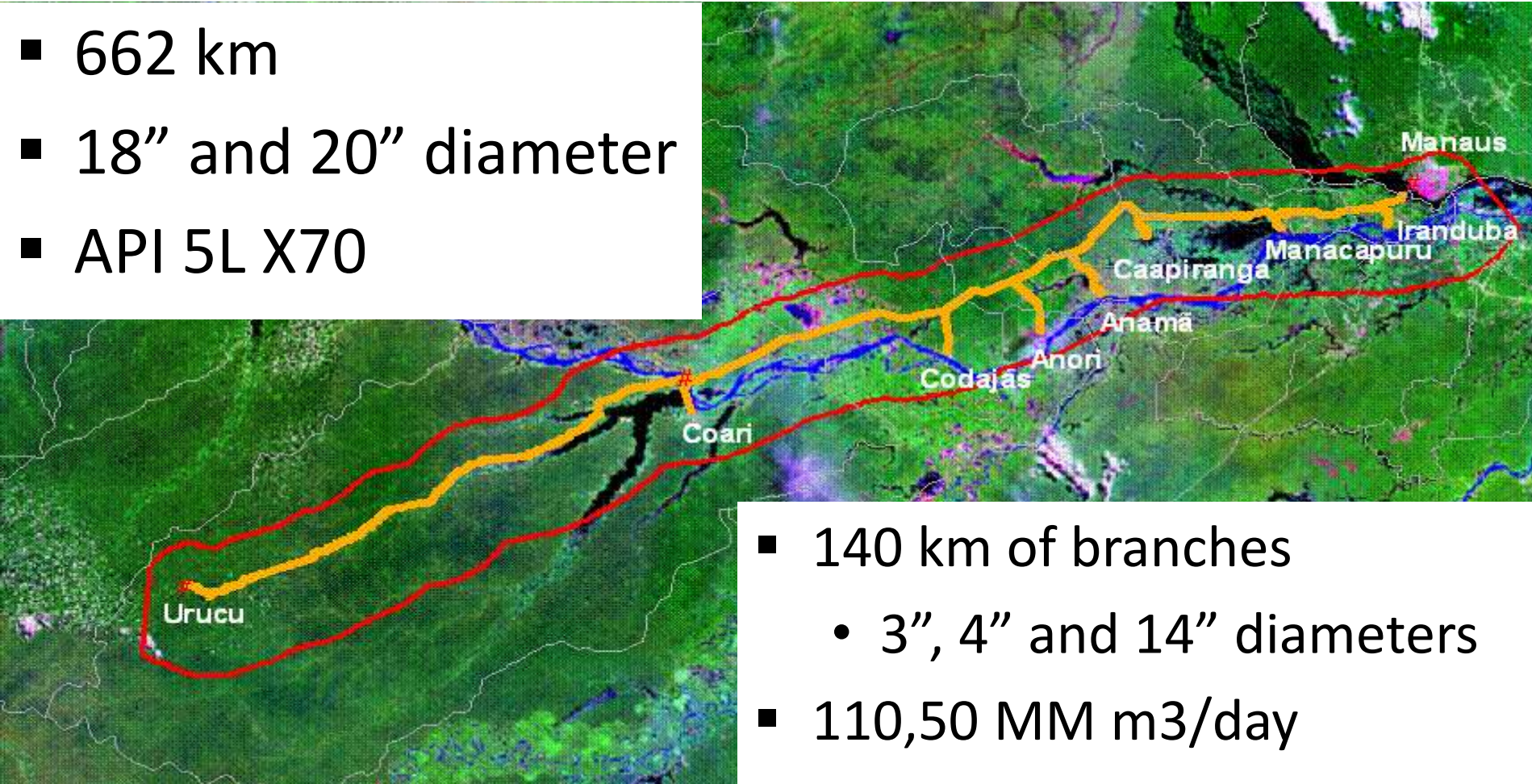


Host Sponsor



Introduction: Overview

- 662 km
- 18" and 20" diameter
- API 5L X70



- 140 km of branches
 - 3", 4" and 14" diameters
- 110,50 MM m³/day

Introduction: Regional Context (2)



- Isolated Area
- High pluviometric index;
- Periodically flooding areas;
- No terrestrial accesses;
- River ways are main transportation used by locals.

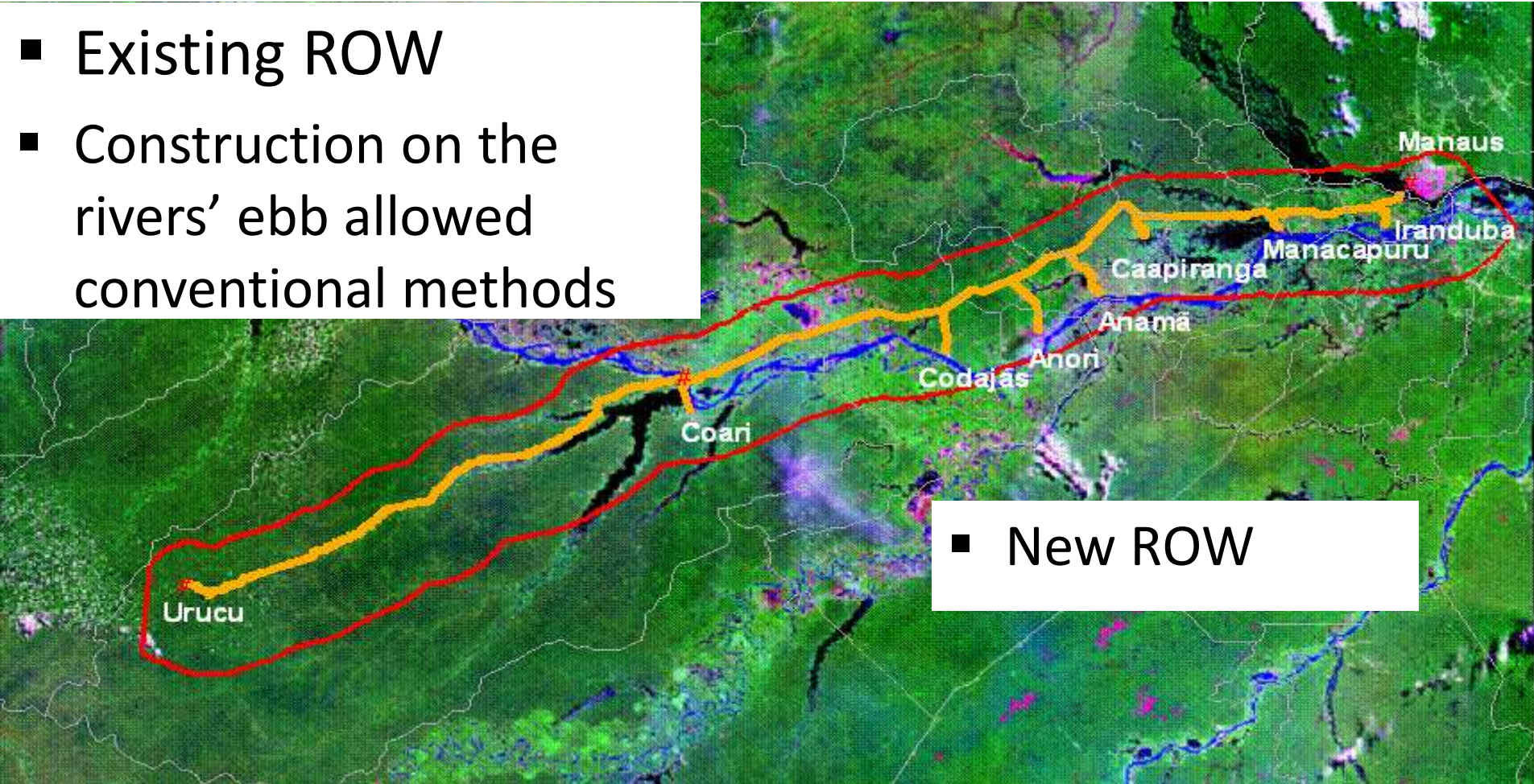
Introduction: Regional Context (3)

- Uneven Topography
- Plain areas with difficult draining of the rain precipitation;
- Endemic region of tropical illnesses;



Introduction: Overview

- Existing ROW
- Construction on the rivers' ebb allowed conventional methods



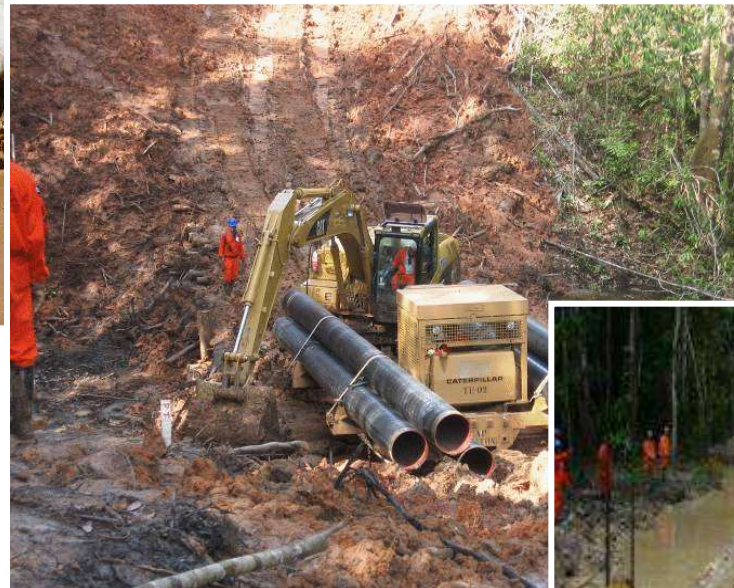
- New ROW

Introduction: Beginning



Introduction: Beginning (2)

- Inappropriate ground for the equipment traffic when saturated by water.



Introduction: Beginning (3)

- Construction of several stowages and bridges



Introduction: Beginning (5)

- Adapted equipment for soil conditions



- Alternative solutions for logistics were implemented, reducing traffic on the ROW
 - Use of helicopters to transport pipes, people and supply.
 - Construction of occasional take off and landing areas along the pipeline area.
 - Need of fuel storage (aviation kerosene, diesel and gasoline) along the pipeline area.
 - Use of jungle camping lodges at the pipeline area.
 - Construction of new waterways

New Approach (2): Lodging

- Increased time spent on jungle conditions by the workers
 - Brazilian Army gave support both in lodging design and training workers in jungle survival techniques



New Approach (3): Waterways



Helicopters in Pipe Distribution (1)



- The Kamov 32A can carry up to 4.5 tons and was used to transport double joints, and baskets with materials and equipment
- **36,578** meters of unconcreted pipes transported.



- The **S-64E** can carry up to **8.5 tons** and was used to transport 12 meters long pipes, concrete-lined, and baskets with materials supply to construction and equipment.
- 11,951 meters of concreted pipes transported

Helicopters in Pipe Distribution (2)



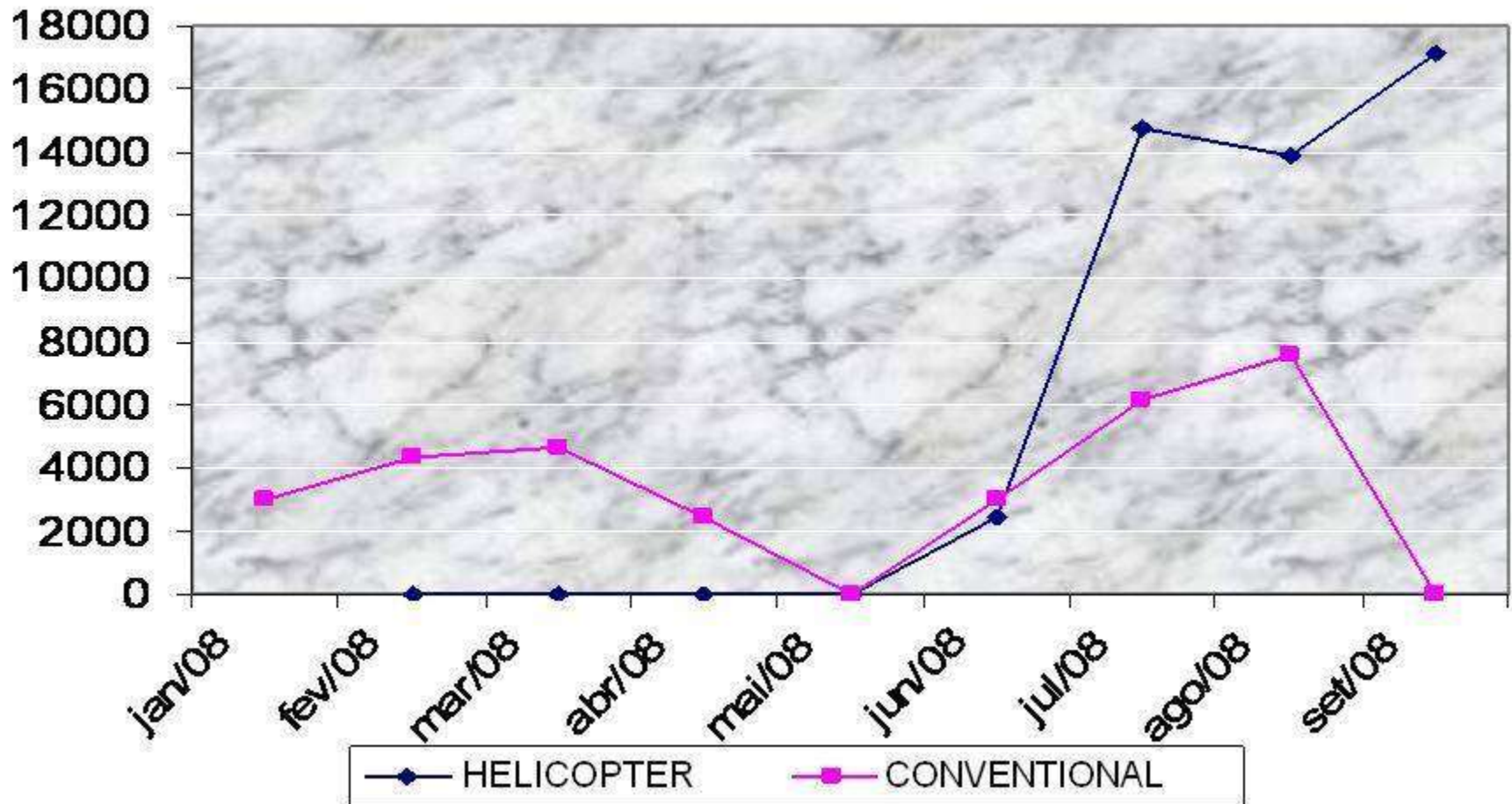
Helicopters in Pipe Distribution (3)



Helicopters in Pipe Distribution (4)

Helicopters Average= 12.037 m

Conventional Average = 3.463 m



Excavators on “H” barges



Excavators on “H” barges (2)

- 8 “H” barges were built, all with lowered decks at their bow and stern, allowing to fix 2 excavators with 11m spears
- It was necessary that the “H” barge system executed additional services of lowering the river bed, allowing the navigation of the mentioned barges through the ROW .
- The digging ditch services with barges assistance completed 43km of ROW.

Excavators on “H” barges (3)



Excavators on “H” barges (4)



“Pushing and Pull” using platform barges

- Use of floating platforms at the columns assembly.
- 2 Barges were designed specifically to build columns and allow “pushing and pull” launching method

“Pushing and Pull” using platform barges (2)



Tubes movement

Production stages

Barrels for flotation

Launch to the river

“Pushing and Pull” using platform barges (3)



Pipe Lifting



Coupling



Welding



Ultrasound Inspection



Lining



“PEAD” and float installation

“Pushing and Pull” using platform barges (4)

- BAG-1 spent 82 days operating and executed a extension of 19,659 m, with a production of 1,666 joints or 20.32 joints/day.
- BAG-2 operated during 58 days, executing on the extension of 14,408 m, with a production of 1,221 joints or 21.05 /day.

| Welding Productivity – Pipeline | | |
|---------------------------------|--------------------|-------------------|
| Method | Welding joints/day | Repair percentage |
| Conventional Welding | 10,96 | 4,68% |
| Barge Welding | 21,05 | 1,98% |

“Pushing and Pull” using platform barges (5)



Floating porches

- Floating porches were used to tie-in closing, between welded columns at BAG-1 and BAG-2 barges, on the flooded area of Coari-Anamã.
- Two floating porch systems were built, each one with 3 barges.
- Before the operation started, it was expected to spend three days in each “tie-in”; experience proved one day was enough.

Floating porches (2)



Floating porches (3)



Pipe lifting



Welding



Non-destructive testing



Surface preparation



Joints lining



Lining inspection

Conclusions

- Lesson learnt: sometimes an Onshore Pipeline may not be Onshore
- The cost / benefit is favorable to the use of helicopters cargo in remote areas;
- Increased productivity was obtained;
- The environmental component was extremely favorable.