FRESH WATER SPILL 2004
SYMPOSIUM

Oil and Gas Production Projects In the
Amazon Region - An Environmental
Challenge

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OIL & GAS INDUSTRIAL INSTALLATIONS AND ACTIVITIES IN THE AMAZON REGION
DIESEL OIL & GASOLINE & LPG DISTRIBUTION ALL OVER AMAZON REGION
<table>
<thead>
<tr>
<th>UNITY</th>
<th>ACTIVITIES DESCRIPTION</th>
<th>NOTES</th>
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<tbody>
<tr>
<td>REMAN</td>
<td>Isaac Sabbá Refinery, founded 45 years ago, now operating with 4 Oil Processing Unit representing a total processing capacity of 46,000 BBL/d</td>
<td>Diesel and gasoline</td>
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<td></td>
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<td>Fuel oil</td>
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<td>LPG and Naphtha production</td>
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<td>All from Urucu crude oil supply.</td>
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<td>UN-BSOL</td>
<td>Oil and Gas Production Unit in the Amazon Basin (also called Solimoes Basin), production activities started in 1988, now having 4 production camps (RUC; LUC; SUC e Igarapé Marta)</td>
<td>55 mil bbl/d oil production</td>
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<td>URUCU</td>
<td>The industrial complex count also with 2 Gas Processing Units (1 of them being the biggest in Brazil) and a small Diesel Unit.</td>
<td>All Occidental Amazon supply</td>
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<td>TA NORTE</td>
<td>River Terminals operating since 1988, nowadays counting ON 4 Terminals-A navigation grid - Manaus, Belém, Macapá and Coari (the so called Solimoes Terminal).</td>
<td>800 tons / d LPG production</td>
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<td>The Solimoes Terminal - TESOL having 3 tanks giving a total oil storage capacity of 58,000 tons, 4 LPG storage spheres to cop with a total of 7,500 tons of LPG coming from Urucu. Throughout a 280 Km pipeline.</td>
<td>All Amazon and part of the Northeast region supply</td>
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<td>The transport of oil products from TESOL to Manaus is done by river navigation in vessels up to 20,000 tons capacity, small ones are used for the LPG transport.</td>
<td>7,5 millions m³ of Natural Gas - reinjection of 6,5M m³</td>
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<td>Transportation of Oil and LPG from Urucu to Manaus TESOL 58,000 t oil and 7,500 t of LPG capacity.</td>
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<td>Transport of oil products from Manaus to all North capitals</td>
</tr>
<tr>
<td>BR-GRON</td>
<td>A distribution network for oil product distribution network for all Amazon region</td>
<td>230 mil m³ of oil products distribution for all Amazon region</td>
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<td>230,000 m³ product per month from Manaus., predominance diesel oil (40%) that is primary source for the electrical generation in Amazon.</td>
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<td>The operation is carried out by 100 boats from regional navigation companies.</td>
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Amazon Region Characteristics

- 4,000,000 km²
  40% USA, 50% Brazil
- 12 million inhabitants
- 3 persons / km²
  USA 27p/km²  Italy 190p/km²
- Little or no land transportation

- Huge freshwater volume
  20% of Earth’s volume
- Continuous rain forest
  50% of Earth’s
- Large tropical savanna area
GEOGRAPHICAL VIEW

Distâncias:
- Urucu – TESOL = 281 km
- Urucu – Manaus = 630 km
BASIC PRINCIPLES FOR OIL AND GAS INDUSTRIAL ACTIVITIES IN AMAZON

• All installations must have the proper environmental license.

• Installations must present a high environmental and security standard level.

• Environmental management at the same level of the “business running” management.

• Full respect for local culture aspects.

• Assumed partnership in local and regional environmental and social projects and initiatives.

• A heavy “Incident Response System” demand.
THE ENVIRONMENTAL CHALLENGE

• Oil spill Incidents can happen
  • The all surrounding area, anywhere, have a high environmental sensitivity
  • Any incident or bad response in the Amazon will attract worldwide attention
  • Every logistics move is extremely difficult and when possible it is sometimes very much costly
  • Any distance is “enormous”
THE ANSWER

• VAST REGION ENVIRONMENTAL KNOWLEDGE

• PREDICTIVE “ACCIDENTAL SCENARIO DEVELOPMENT” TOOLS

• HIGHLY IMPROVED LOGISTICS AND RESPONSE STRENGTH AND QUALITY

• FULL INVOLVEMENT OF THE COMMUNITIES
THE ANSWER

VAST REGION
ENVIRONMENTAL KNOWLEDGE
Aerial View of the Study Area

COARI RIVER

Flooded vegetation at the mouth of the Urucu River

(Solimões River Terminal)
Water Level at Coari Gauge from July 1982 to December 1998

DAILY WATER LEVEL AT COARI

(High flood JERS-1 SAR mosaic)

(Low flood JERS-1 SAR mosaic)
Global Rain Forest Mapping Project

Dual Season Image Mosaics -

- Low flood SAR mosaic – OCTOBER 1995
- High flood SAR mosaic – MAY 1996

USTC Classified Mosaic – Low flood

USTC Classified Mosaic – High flood
Summary of Change Detection Results Within Half Hydrological Cycle (Low to High Flood)
THE ANSWER

PREDICTIVE “ACCIDENT SCENARIO DEVELOPMENT” TOOLS
INCIDENT SCENARIO PREDICTION

✓ Available Data
✓ New Primary Data Acquisition
✓ Hydro Dynamics Model
✓ Initial Oil Spill Incident Scenarios
✓ Possible Developments of the Incident Scenarios
Working bathymetry at RHO-points (meter)
DATA SET: paranagua2.nc
THE ANSWER

HIGHLY IMPROVED
LOGISTICS STRENGTH AND
QUALITY OF RESPONSE
MATERIAL AND HUMAN RESOURCES
CDA - AMAZÔNIA


Em implantação 6 bases avançadas, a saber: Cruzeiro do Sul, Porto Velho, Cruzeiro do Sul, Coari, Belém e Macapá, com orçamento de US$ 15 milhões de dólares em 4 anos e meio.

THE ENVIRONMENTAL DEFENSE CENTER STRATEGY IN AMAZON

Belém
Macapá
Oriximiná
Manaus
Coari
Urucu
Cruzeiro do Sul
Porto Velho
Rio Branco

EDC - CENTRAL BASE
EDC - ADVANCED BASE
CITY
REFINERY
OIL and GAS E&P ACTIVITIES
OIL and OIL PRODUCTS TERMINAL
DISTRIBUTION BASE
ENVIRONMENTAL DEFENSE CENTER
CONTAINMENT BOOMS
BASIC RESPONSE EQUIPMENTS
WORKBOAT
EGMOPOL
Oil Recovery Equipment
PERMANENT TRAINING
DRILLING THE “U” FORMATION
ROBUST SUPPORT SOFTWARE
The INFOPAE

• Prediction and Monitoring the Incident Scenario.
• Follow up and technical information for decision maker during the spill response operations.
• Precise “on line” information about the incident development - and the response achievements.
• Provide “at any time” a full Incident Report.
10:18h - OIL SPILL START

1h 10' - FORECAST

V = 6 km/h

1h 10' - FORECAST

FORECAST X REAL OIL SPILL DEVELOPMENT
THE ANSWER

FULL INVOLVEMENT OF THE COMMUNITIES
PROJECTS

- SOCIAL PROJECTS
- ENVIRONMENTAL EDUCATION
- TECHNICAL SKILL EDUCATION
- OIL SPILL SURVEILLANCE
EDUCATIONAL ACTIVITY
SPREADING ENVIRONMENTAL CONCEPTS
OIL SPILL SURVEILLANCE TEAM UNIFORM
INFORMATION MULTIPLIER TEAM UNIFORM
CONCLUSION

• IF YOU CAN UNDERSTAND DIFFERENCES

• IF CAN HAVE AND DEMONSTRATE REAL COMMITMENT WITH THE REGION AND THEIR PEOPLE

• IF YOU REALLY CARE ABOUT THE ENVIRONMENTAL AND THE COMMUNITIES

• IF YOU AND YOUR BUSINESS CAN BECOME PART OF IT, AND NOT THE CONTRARY

IT CAN BE POSSIBLE TO ESTABLISH OIL AND GAS INDUSTRIAL ACTIVITIES IN AMAZON AS AN ENVIRONMENTALLY SUSTAINABLE BUSINESS
THANKS FOR YOUR ATTENTION

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