

**Notes from PHMSA Trip to Brazil
September 30 – October 5, 2007**

Trip Overview: David Kunz, Chief Counsel, and Bob Smith, PHP Research and Development Manager, traveled to Brazil on September 30 – October 5, 2007 to attend the 2007 Rio International Pipeline Conference and to meet with key Brazilian government and industry officials regarding biofuels issues.

The Rio Pipeline Conference is an American Society of Mechanical Engineers driven event and the sister conference to the International Pipeline Conference held in Canada in opposite years. The main purposes for attending the conference were to share and obtain information on how threats to steel pipelines from corn-based ethanol compare to threats from sugarcane-based ethanol and to learn about Brazil's experiences with using, producing, and transporting ethanol and biofuels. PHMSA staff provided opening remarks at the conference and helped moderate a panel discussion on the transportation of ethanol via pipelines.

In addition, PHMSA staff met with the following: Agência Nacional do Petróleo (ANP) officials (the rough Brazilian counterpart to PHMSA and FERC); Petrobras officials (major Brazilian petroleum company); TransPetro (Brazilian petroleum transportation company that also operates pipelines); ethanol producers; various researchers; and various other participants, including PHMSA counterparts from Canada.

Key Messages: Brazil appears to be significantly ahead of the U.S. in the production, transportation, distribution and social education regarding biofuels. The oil & gas operator, Petrobras/Transpetro, and the regulator, ANP, are offering the following opportunities:

1. PHMSA or DOT to enter into a confidential agreement or memorandum of understanding with Petrobras/Transpetro and/or ANP to share 30 years of biofuel production, transportation, and distribution knowledge and know-how. Petrobras has approximately 35 QA/QC Protocols, Safety Standards and Best Practices used in transporting alcohol/ethanol/bio-diesel. Petrobras/Transpetro will only share these to PHMSA in confidence because of commercial considerations with the U.S. oil and pipeline industry.
2. Petrobras/Transpetro has extended an invitation to have a DOT-delegation tour various sites and facilities related to the production, transportation, and distribution of ethanol. The visit would focus on the sugarcane fields west of Sao Paulo to see cane harvest, feedstock movement & ethanol production and then likely break into interest groups to examine issues associated with highway, barge, rail and pipeline movement of ethanol. The visit would likely conclude at a terminal where neat ethanol is blended with gasoline for distribution to service stations. In addition, the visit would also likely include opportunities to view research and development facilities and to meet with various government officials.
3. Separate from biofuels issues, ANP is also interested in coordinating with PHMSA on LNG issues.

Background on Biofuels Use in Brazil

Meetings and discussions held by PHMSA staff yielded the following information on the use of ethanol/biofuels in Brazil. Ethanol production in Brazil intensified after the 1970's oil embargo to reduce imports of petroleum and is now very common at the pump. Pure/neat ethanol was first moved in pipelines in approximately 1975--batched with other liquid products. There are currently 500 miles of neat, denatured ethanol pipelines in support of their domestic demand.

Approximately 80%-90% of all alcohol/ethanol is moved via pipelines. Brazil is also producing a limited (no numbers provided) amount of biodiesel mostly in the Amazon areas. Approximately 100% of biodiesel is moved by tanker truck over significant distances (1,000s of miles).

Construction of two new, denatured ethanol pipelines are planned to support the expanding export or potential export market (U.S./France/Japan). These new pipelines will more than quadruple ethanol pipeline mileage to over 3,000 miles. Ethanol pipelines are highly unregulated with the only regulations addressing QA/QC. The government regulator, ANP, was given oversight authorities in 2005, and new laws coming in CY 2008 will expand ANP jurisdiction over safety and environmental issues. No corrosion or stress corrosion cracking has been found in the Petrobras pipeline system as a result of the movement of ethanol.

The following is a summary of key milestones and events regarding Brazil's history with biofuels:

THEN

- The 1970's oil embargo drove Brazil to reduce imports and invest in alternatives.
- First alcohol and ethanol batched pipelines seen in 1975.
- Some pipeline material problems seen in early 1980's.
 - Rubber components such as seals and o-rings problematic.
 - Inhibitor testing begins to mitigate corrosion seen only in the lab.

NOW

- Brazil producing approximately 4.4 billion gallons of ethanol each year.
 - Brazil exporting limited amounts of blended ethanol (10% Ethanol & 90% Gasoline) to U.S. through Caribbean countries to circumvent U.S. tariff on ethanol imports.
 - Currently, only a small portion of conducive agriculture lands used to grow sugarcane are utilized, leaving vast amounts of untapped, new future production areas. It is estimated that ethanol production in Brazil could expand 8 or 9 fold.
- There are approximately 500 miles of denatured alcohol/ethanol pipelines in operation for domestic demand.
 - Approximately 80%-90% of all denatured alcohol/ethanol moved via pipelines to terminal then blended and moved via truck to service station.
 - Ethanol is also moved via shuttle tanker up and down the coast to other terminals for distribution to service stations.

- Brazil is producing and refining a limited (no numbers provided) amount of biodiesel mostly in Amazon areas.
 - Approximately 100% of bio-diesel moved by tanker truck over significant distances (1,000s of miles).

- Petrobras/Transpetro claims never having corrosion or Stress Corrosion Cracking problem in batched or dedicated alcohol/ethanol pipelines.
 - Huge investment in inhibitor programs and strict QA/QC practices were cited as why no corrosion problem.
 - Current inhibitor testing is underway to address new production area specificities such as microbial content.
 - Approximately \$3-4 million current (CY 08 & 09) investment in inhibitor research.
 - All new storage tanks are lined with a specifically-designed coating to complement inhibitor program.
 - No coatings are used within pipelines.
 - No hydrostatic testing is done with the pipelines.

- Petrobras/Transpetro has over 35 QA/QC Protocols, Safety Standards and Best Practices used in transporting alcohol/ethanol.
 - Petrobras/Transpetro is approx. 35% government owned.
 - Brazil using all U.S. standards for QA/QC (ASTM).

- ANP is the oil and gas regulator and is only 10 years old having operation divisions for various subjects such as biofuels.
 - They only incorporate QA/QC standards into their limited ethanol pipeline regulations.
 - Ethanol pipelines are currently highly unregulated but new laws are planned to increase oversight.

- Cars and light trucks in Brazil are either using Flex Technology or run solely on alcohol.
 - All gasoline sold in Brazil for use by automobiles is E25 (i.e., 25% ethanol).
 - Older cars (1980's to 2003) run on alcohol (E25 gasohol).
 - Newer cars are Flex and can run on any mixture alcohol, blended ethanol/gasoline (25% E) or pure ethanol.
 - Approximately \$100 can convert an older car to Flex.
 - Flex cars are also able to use Compressed Natural Gas and the costs to convert is highly subsidized (70%) by the government.