

INMETRO'S STRATEGIES FOR BIOFUELS

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President of Inmetro***

Overview

- ***Introduction***
- ***Inmetro and Biofuels***
- ***Previous activities***
- ***Current activities***
- ***Infrastructure and new activities***
- ***USA-Brazil cooperation on Biofuel standards***



INMETRO

NATIONAL INSTITUTE OF METROLOGY, STANDARDIZATION AND INDUSTRIAL QUALITY

Activities:

- **Scientific and Industrial Metrology**
- **Legal Metrology**
- **Regulatory Agency**
- **Coordination of CA activities**
- **National Accreditation Body**
- **Brazilian TBT/WTO Inquiry Point**
- **Technical Cooperation**



BRAZILIAN METROLOGY - OVERVIEW

The Role of Inmetro as the Brazilian NMI

*Previous Model: decentralized “national standards” -
no chemical, CRM, flow,...expertises .*

*New Model (since 2000): Inmetro is the responsible
for the “national standards” in “new fields”*

Strategies:

- *Strong basis in S&T, and coordination of key activities;*
- *Production and certification of reference materials;*
- *Link of the secondary laboratories and Industry*
- *Dissemination of information and knowledge;*
- *Strong international partnership and recognition;*
- *Support to Government policies, especially Industrial Policy.*

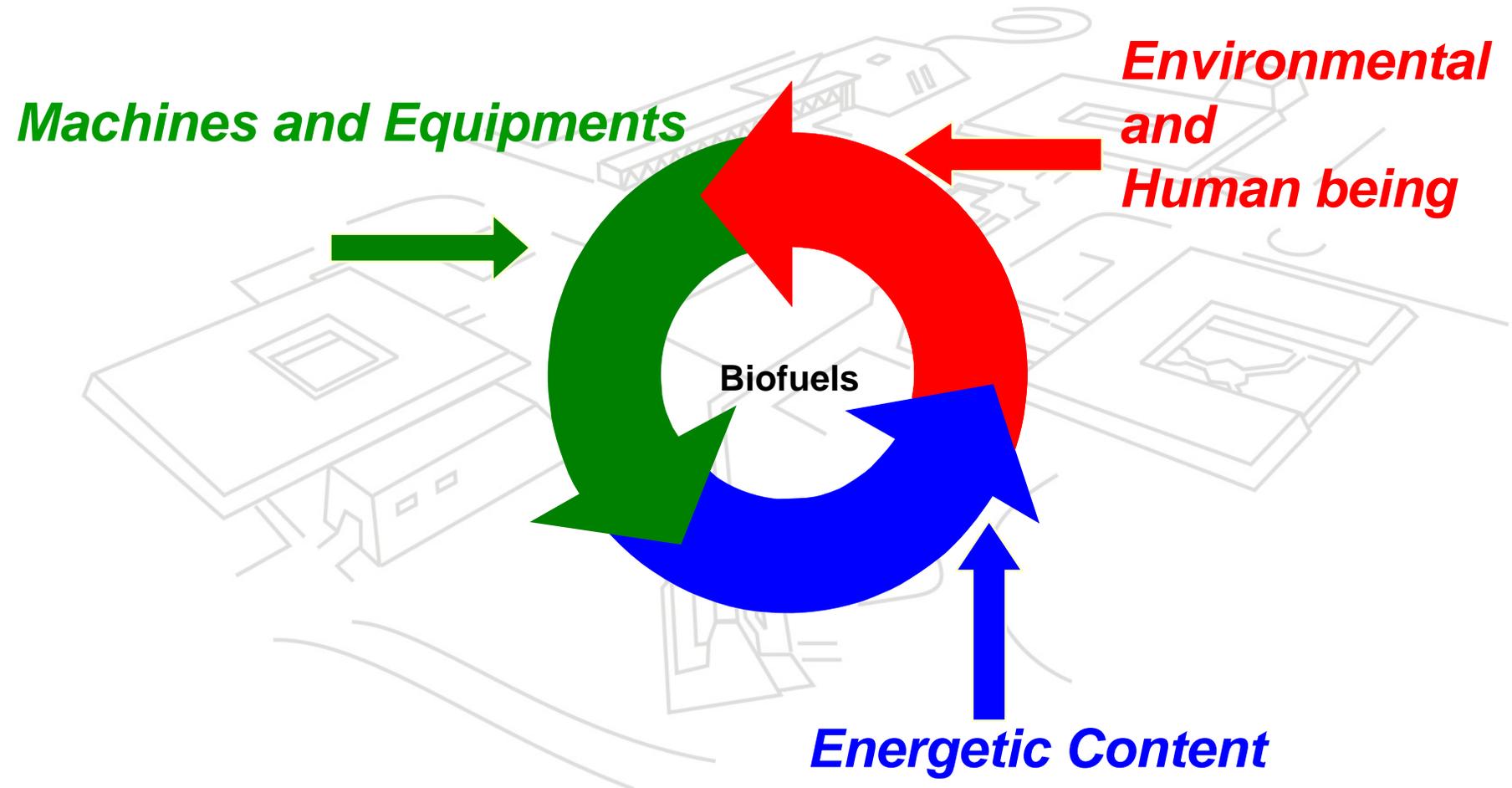


BRAZILIAN METROLOGY A NATIONAL OVERVIEW

APPROACHES:

- Strong international partnership and intercomparisons;
- Strong national partnership with Academia;
- Rapid absorption and training of qualified people;
- Effort in research and development;
- Strong partnership with accredited labs. and promotion of intercomparisons.

MAIN PERSPECTIVES





➤ **Panels**

- **Alcohol Fuel - Oct/03**
- **Biodiesel - Nov/05**
- **S&T strategies for Biofuels - Oct/06**

Results:

- **Profile of the needs**
- **Articulation with S&T community, Government**
- **Support to Standardization**
- **Laboratories Accreditation activities**



➤ **General lines of “products and services” aimed**

- **CRM**
- **Procedures**
- **S&T knowledge**
- **PT**
- **Training**
- **Support to Industry and Government**
- **Support to regulation and CA activities**



Sources: ASTM E826 and
ISO Guide 34 and 35

Certified Reference Material

HOMOGENEITY

STABILITY

CHARACTERIZATION

SHORT TERM STABILITY

Temperature : 40°C Time : 2 months
Temperature : 20°C Time : 6 months

LONG TERM STABILITY

Temperature :20°C Time : 12 months
Temperature :4°C Time : 24 months

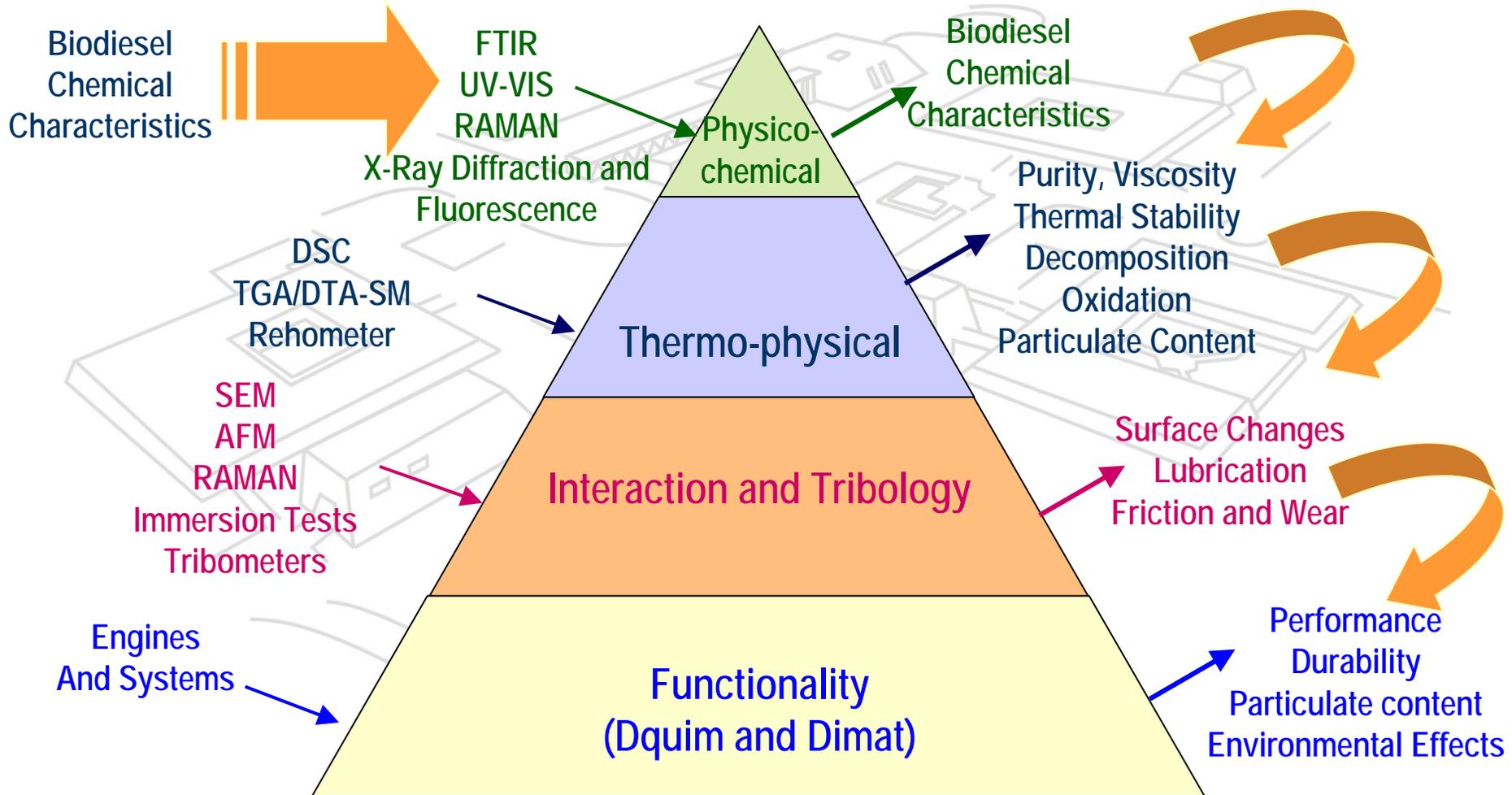


Inmetro and Biofuels

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➤ Development of CRM : Ethanol Fuel

HYDRATED



ANHYDROUS

➤ Production and Certification of Reference Materials: **CRM ethanol in water**

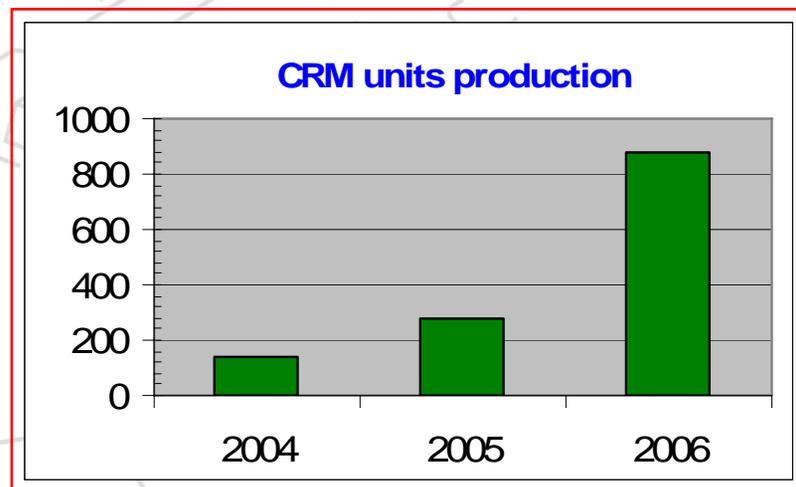


Used in the calibration of breath analyzers

Started in 2004

Concentrations

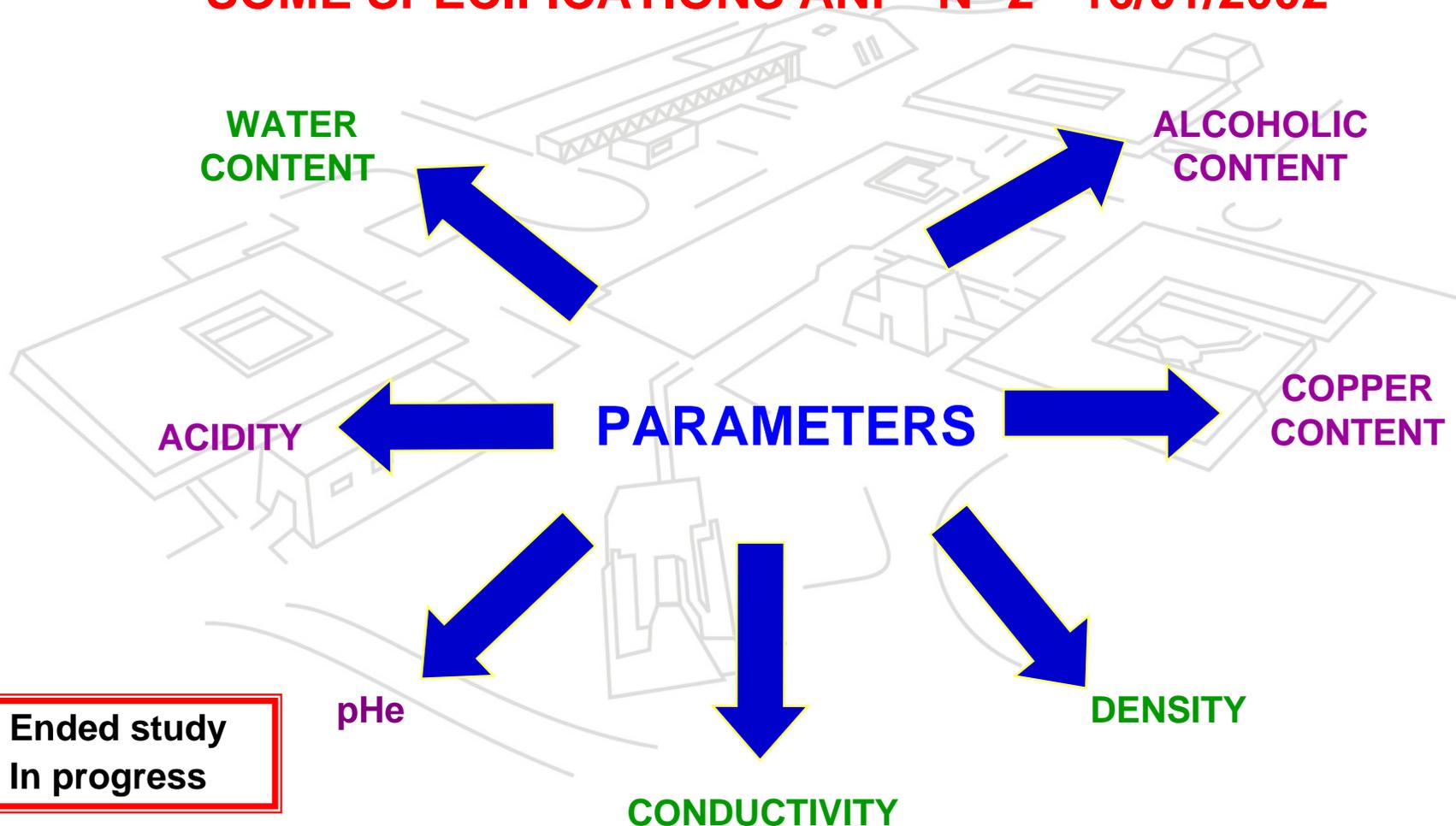
- 0.0509
- 0.0890
- 0.1145
- 0.3820
- 0.4960



% w/w

ANHYDROUS ALCOHOL FUEL

SOME SPECIFICATIONS ANP* N° 2 - 16/01/2002

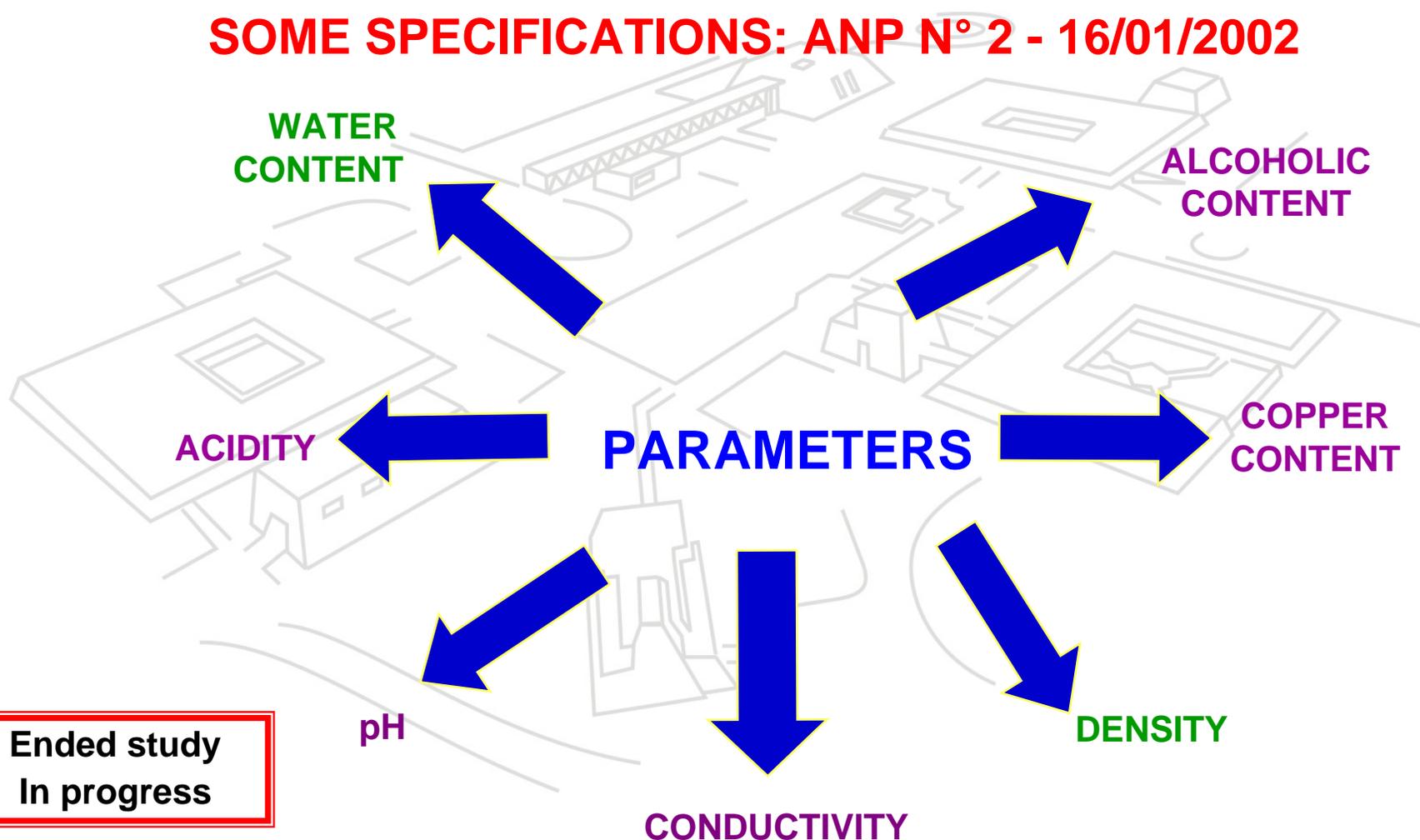


* National Agency for Oil, Natural Gas and Biofuels



HYDRATED ALCOHOL FUEL

SOME SPECIFICATIONS: ANP N° 2 - 16/01/2002





ANHYDROUS/ HYDRATED ETHANOL FUEL

CERTIFICATION METHODS OF SOME PARAMETERS

Concluded Studies:

- **WATER CONTENT:** Karl Fischer Coulometric Titration
- **CONDUCTIVITY:** Conductivity meter; establishment of Primary Method
- **DENSITY:** Digital Density meter

In progress :

- **ACIDITY:** Potentiometric Titration; gravimetric preparation and control of salts purity
- **ALCOHOL CONTENT:** GC-FID (Gas Chromatography Flame Ionization Detector) and DSC (Differential Scanning Calorimetry)
- **COPPER:** Absorption Atomic Spectrometry and Isotope Dilution Inductively Coupled Plasma Mass Spectrometry
- **pHe:** pH meter (ASTM D6423-99)
- **pH:** pH meter (ASTM D6423-99 and ABNT NBR 10891; traceability ensured through Primary Method of pH)

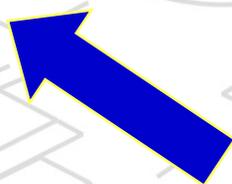
➤ **Proficiency Test Scheme on Vehicle Emissions (gasoline)**

- **Unique in South America**

BIODIESEL

SPECIFICATIONS UNDER STUDY AT INMETRO

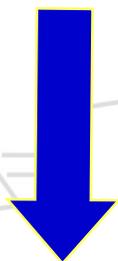
DENSITY
(NBR 14065 and
ASTM D4052)



**CINEMATIC
VISCOSITY**
(NBR 10441 and
ASTM D445/04)



PARAMETERS



NUMBER OF CETANE
(ASTM D 613)

Immersion Test, a simple way to detect surface changes

Materials of diesel engine parts
exposed to biodiesel

Controlled
environment



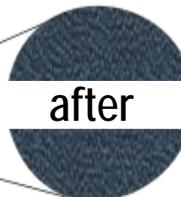
up to
6000
hours



Sample



before



after

Surfaces will be exposed
and compared





➤ Scientific Productions

- Souza, V.; Caixeiro, J. M. R.; Guimarães, E. F.; Silva, R. A. L.; Cruz, M. H. C. **Ensaio metrológico na determinação do teor de umidade no álcool combustível**, ENQUALAB, 2006, São Paulo, Brasil.
- Souza V.; Caixeiro, J. M. R.; Cunha R. D. C.; Valente L. A. N.; Borges R. M. H.; Silva, R. A. L. **Evaluation of stability of ethanol in water certified reference material: measurement uncertainty under transport and storage conditions**, XVIII IMEKO World Congress, 2006, Rio de Janeiro, Brazil.
- Borges, R. M. H.; Lemos, I. M. G.; Couto, P.R.G.; Fraga, I. C. S., Franco, A. P.; Vieira, A. T.; Ribeiro, R. C., Silva, F. R., Gomes, E. G. ; Pinheiro, A. P. G. ; Couto, R. S. ; Antunes, A M. S. ; d' Ávila, L. A. **Avaliação da Incerteza de Medição de pH em Alcool Combustível**, METROLOGIA-2003 – Metrologia para a Vida Sociedade Brasileira de Metrologia (SBM), 2003, Recife, Brasil.
- Damasceno, J.C.; Borges, R.M.H.; Ordine, A.P.; Getrouw, M.A.; Fraga, I.C.S.; Borges P.P.; Souza V. **Evaluation of Ag/AgCl-electrode standard potential uncertainty used in primary pH measurements by Monte Carlo simulation**, 5th International Conference Measurement, 2005, Bratislava, Eslováquia.



➤ Accredited Laboratories Against ISO 17025

- Escola de Química - Universidade Federal do Rio de Janeiro - Laboratório de Combustíveis e Derivados de Petróleo
- Centro de Tecnologia Canavieira - Laboratório de Análises
- CIENTEC - Fundação de Ciência e Tecnologia - Departamento de Química - Dequim
- ISATEC - Pesquisa, Desenvolvimento e Análises Químicas LTDA - Laboratório de Ensaio ISATEC
- Robert Bosch LTDA - Laboratório de Emissões Veiculares
- CETESB - Companhia de Tecnologia de Saneamento Ambiental - Laboratório de Veículos
- F. A. Powertrain LTDA - Laboratório de Emissões e Consumo
- Delphi Automotive System do Brasil LTDA - Centro Tecnológico de Piracicaba.
- SENAI - Serviço Nacional de Aprendizagem Industrial - Laboratórios de Ensaio em Óleos Lubrificantes e Combustíveis
- Fundação Centro Tecnológico de Minas Gerais - CETEC - Laboratórios de Ensaio e Combustíveis - CETEC/LEC
- Ford Motor Company Brasil LTDA - Laboratório de Emissões do Campo de Prova de Tatuí
- Amongst others



➤ Support to Committee's Activities

- ABNT (Brazilian Association for Technical Standards) - fuel gases, alcohol and biodiesel

ANP required ABNT to revise standards for pH determination, electrical conductivity, density, alcohol fuel total acidity and development of standards for biodiesel

- IBP - lubricants, gasoline and biodiesel
- ISOREMCO - reference material (Representing ABNT)

➤ Partnership

- NIST
- PTB
- BAM
- CTC Piracicaba
- ANP
- PUC - RJ
- UFRJ



CFR Motor - octane number



CFR Motor - cetane number



Atomic Absorption Spectrometer Flame and Graphite Furnace



Infrastructure and new activities

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**Potentiometric Titration
and
Karl Fischer Coulometric Titration**



Digital Density meter

Motors and Fuels Laboratory Effects in machines and equipments



Dinamometric Workbench:

Essays of engines driven by diesel/biodiesel to evaluate the following parameters:

- emissions
- power
- wear
- consumption

Motors and Fuels Laboratory Restructure Workbench room



Results:

Essays of long term of engines driven by diesel/biodiesel to evaluate the following parameters:

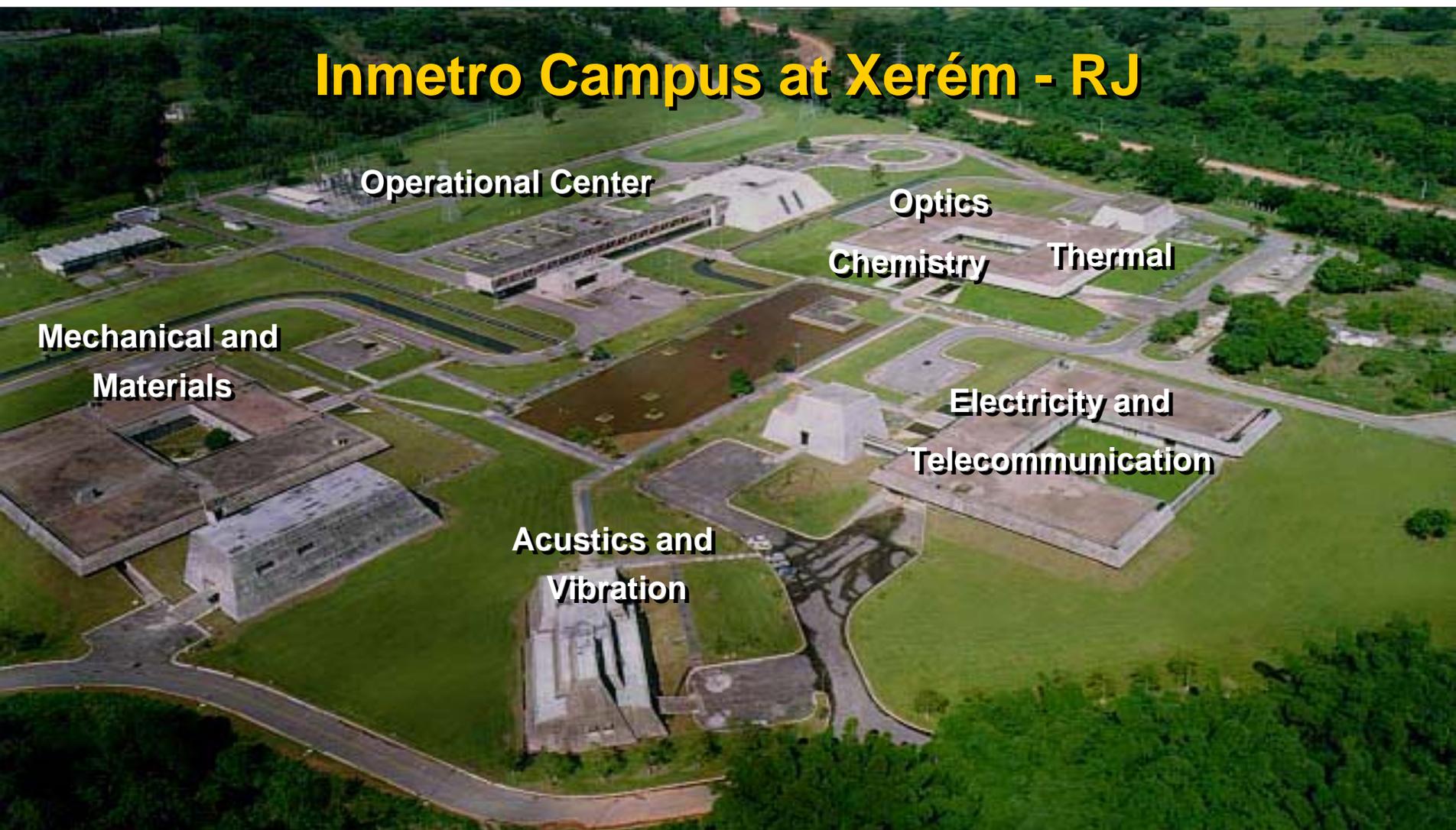
- emissions
- power
- wear
- consumption



Infrastructure and new activities

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Inmetro Campus at Xerém - RJ



Operational Center

Optics

Chemistry

Thermal

**Mechanical and
Materials**

**Electricity and
Telecommunication**

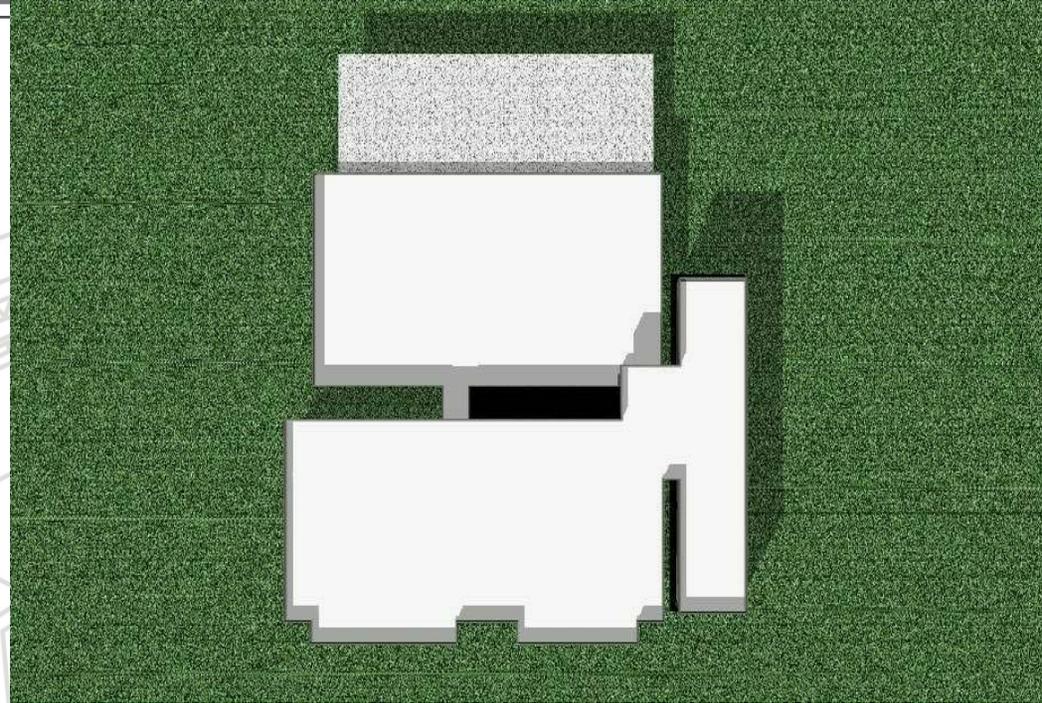
**Acustics and
Vibration**



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New Laboratory of Materials Metrology 2007





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New Laboratory for Chemical Metrology 2007





USA-Brazil cooperation on Biofuel standards

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THE BASIS FOR THE COOPERATION

↑ Meeting of the Informal Consultative Mechanism MDIC – DoC- Rio de Janeiro, June 6 and 7, 2006: “INMETRO and NIST will establish a collaborative program on Metrology and Standards for Biofuels. As a first step, a Workshop will be held in Rio de Janeiro in Sept. 2006 in conjunction with the IMEKO Conference, to share experiences and identify measurement and standards issues of mutual interest. Other interested government and private sector organizations will be invited to participate.”

↑ The US-Brazil ministerial level Joint Commission Meeting on scientific and technological cooperation- July 21, 2006, Washington, DC : “The JCM confirmed the importance of cooperation in the fields of metrology and standards and welcomed the report on the activities agreed to by the National Institute for Standards and Technology (NIST) and the National Institute of Metrology, Standardization and Industrial Quality (INMETRO) under the Science and Technology Agreement between the Government of Brazil and the Government of the United States and under the U.S.-Brazil Commercial Dialogue in measurement standards... The JCM recognized and encouraged expanded cooperation in standards and metrology activities that impact innovation and competitiveness and support economic growth and development, including in nanotechnology and biofuels.”



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Thank you very much!

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