

# Ethanol Specification & Distribution

## Sharing Brazil's Experience with India

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**ISMA DATAGRO CONFERENCE  
on SUGAR & ETHANOL**

Taj Palace, New Delhi

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# Ethanol Specifications can be classified in 2 ways

- By Alcohol Content
  - Anhydrous (usually used in blends with gasoline)
  - Hydrous (in Brazil, used in flex fuel vehicles - 2, 3 & 4 wheelers)
- By Level of Contaminants
  - Fuel grade
  - Industrial grade
  - Refined
  - Neutral

# Main Fuel Grade Ethanol Specifications in the World

By Total Alcohol content & Water

<b>Specifications in Total Alcohol Content &amp; Water</b>		
Country/Bloc	Total Alcohol Content % in vol. at 15 C, GL - Gay Lussac	Water %
US	Min. 99.0	Max 1.0
Brazil		
Anhydrous	Min. 99.5	Max 0.5
Hydrous	95.5 +/- 0.5	Aver 4.5
EU	Min. 99.8	Max 0.2

Notes:

US - ASTM 4806

Brazil - ANP, calculated as water is not specified

# Other Items of Specification in the Main Fuel Grade Ethanol Specs (I)

## Characteristics

- Alcohol content at 20o. C % vol
- Alcohol content at 20o. C (INPM) % w/w
- Alcohol content with 30 ml/L gasoline % w/w 20 C
- Water content % weigh
- Water content % vol
- Specific mass at 20o. C kg/m<sup>3</sup>
- Specific mass at 20o. C with 30 ml/L of gasoline kg/m<sup>3</sup>
- pH
- Acidity as acetic acid mg/L
- Acidity as acetic acid % w/w
- Denaturant % vol
- Hydrocarbons % vol

# Other Items of Specification in the Main Fuel Grade Ethanol Specs (II)

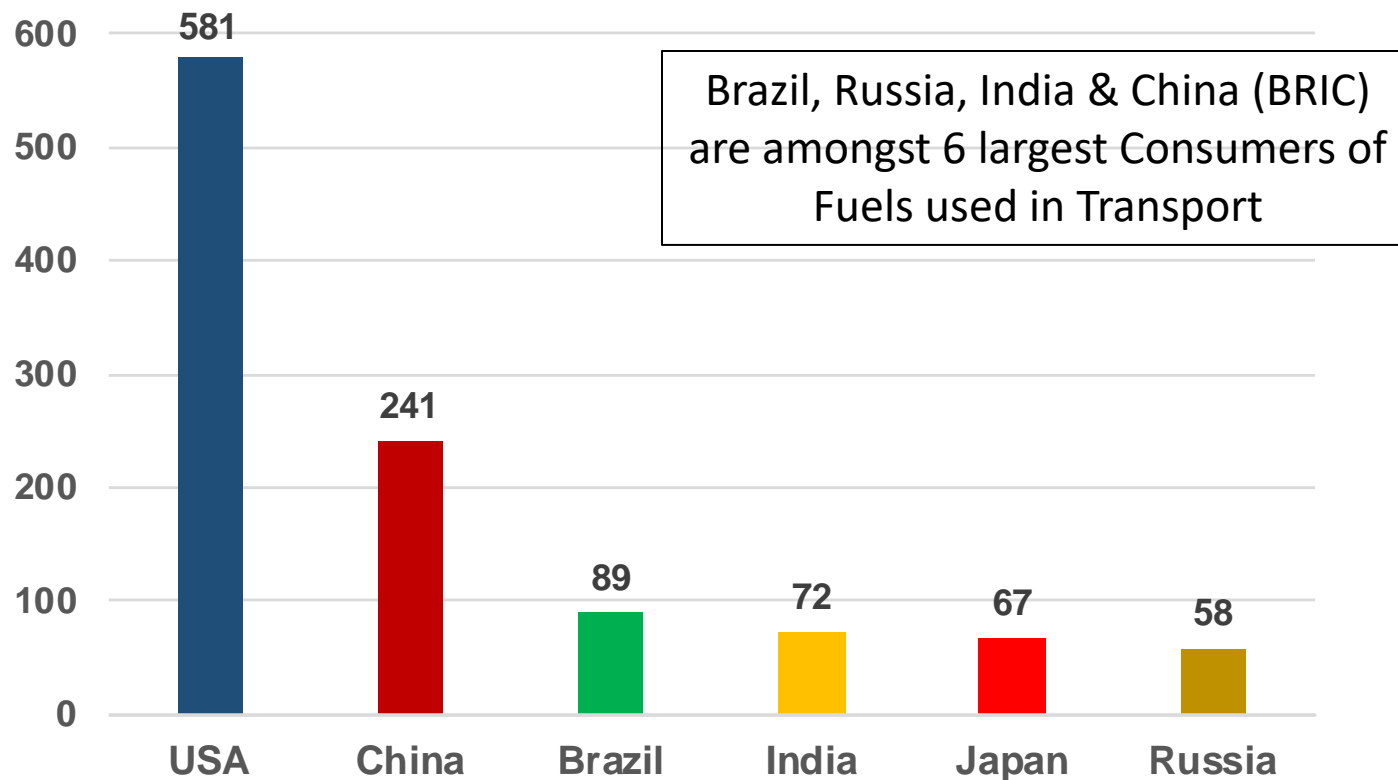
## Characteristics

- Electric conductivity microSiemens/m
- Iron mg/kg
- Sodium mg/kg
- Copper mg/kg
- Sulphates (SO<sub>4</sub>) mg/kg
- Chloride mg/kg
- Chloride mg/L
- Sulphur mg/kg
- Aspect

# Brazil's Experience is Relevant

## Main World Consumers of Fuels used in Transport

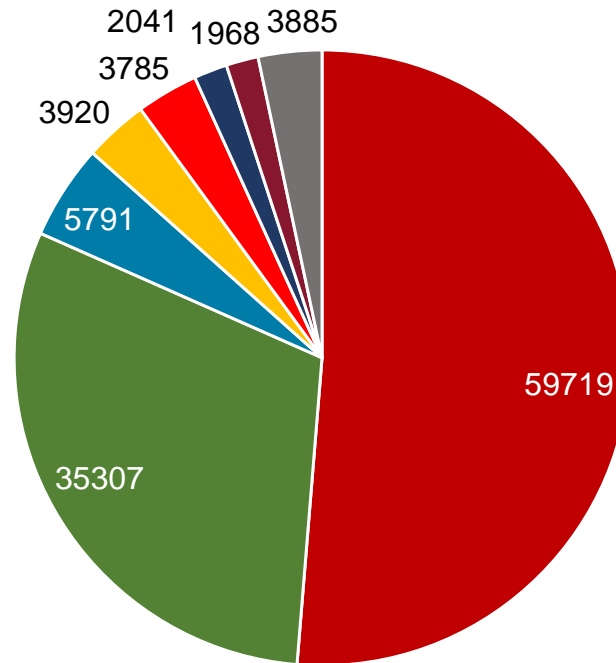
Million tonnes oil eq.



Source: IEA, 2016

# USA has the largest Fuel Ethanol market in the world

World Ethanol Production 2019  
In 000 cubic meters



- USA
- Brazil
- EU
- India
- China
- Thailand
- Canada
- ROW

Source: DATAGRO  
Note: India, 2021



# Main Uses

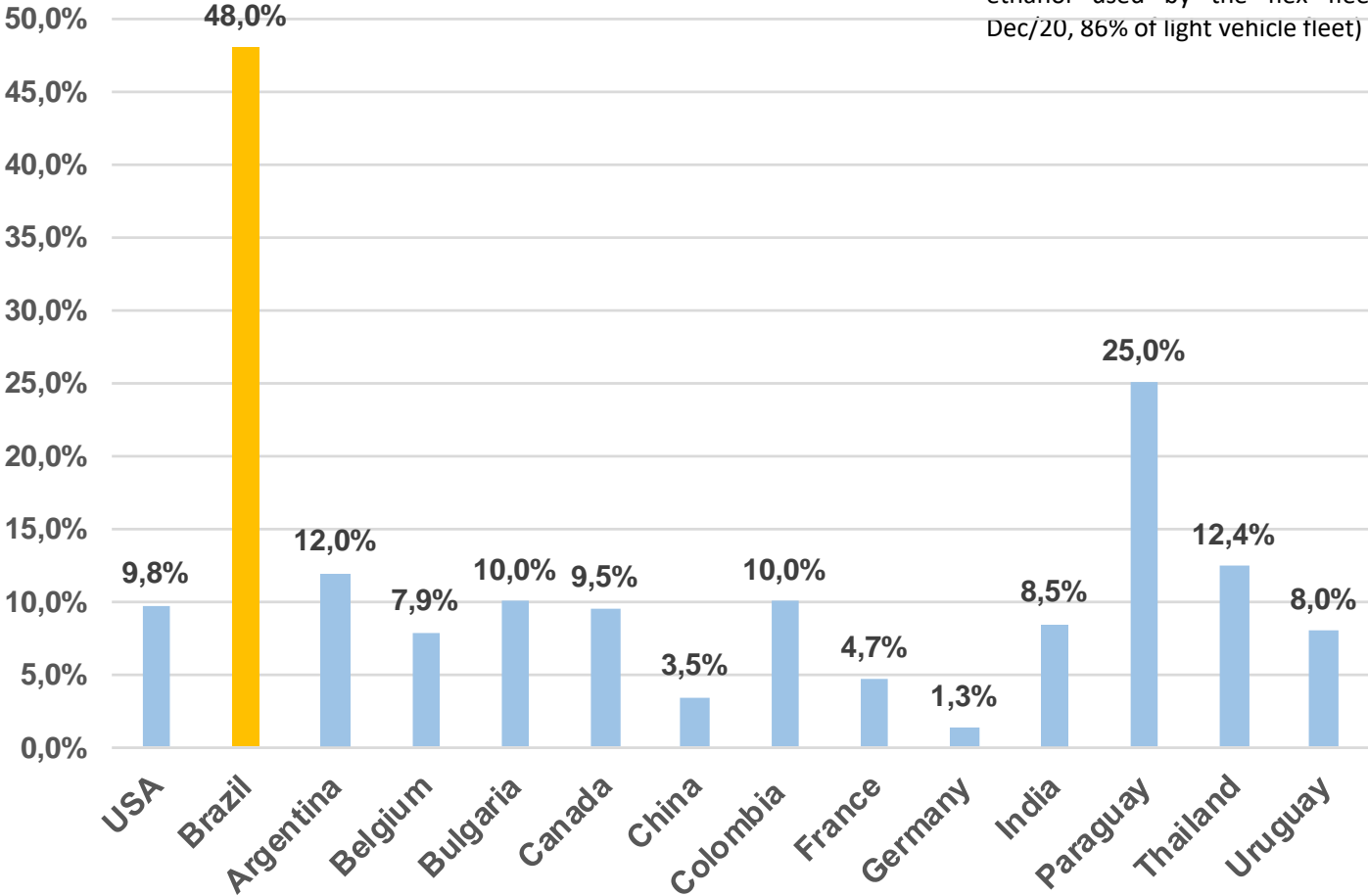
- US
  - The US uses broadly E10, has authorized recently E15, and has a minor experience with E85.
  - Has a large FFV fleet but from lack of E85 distribution has not been effective.
- Brazil
  - Has extensive experience with higher ethanol blends in gasoline: since 1978 above 20%, since 2015 at 27% (E27).
  - Has extensive experience with distribution of E100 used by a flex fleet that represents majority of vehicles (2 & 4 wheelers).
- EU
  - Uses blends ranging from E3 to E10.



# Global experience with Ethanol in selected countries

## % of Ethanol in Consumption of Otto Cycle Fuels 2020

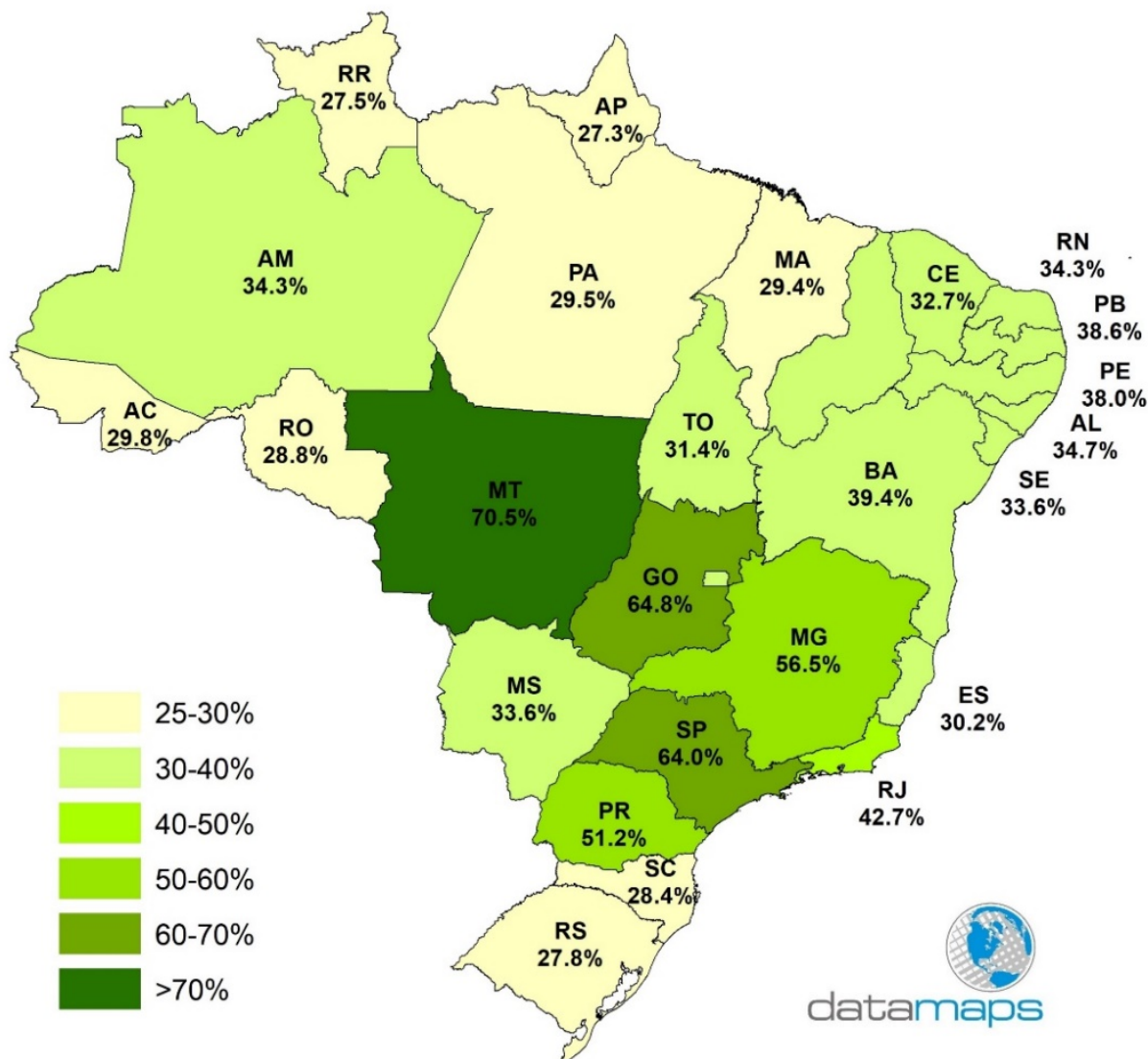
In Brazil, based on 27% anhydrous ethanol blended in gasoline + hydrous ethanol used by the flex fleet (in Dec/20, 86% of light vehicle fleet)



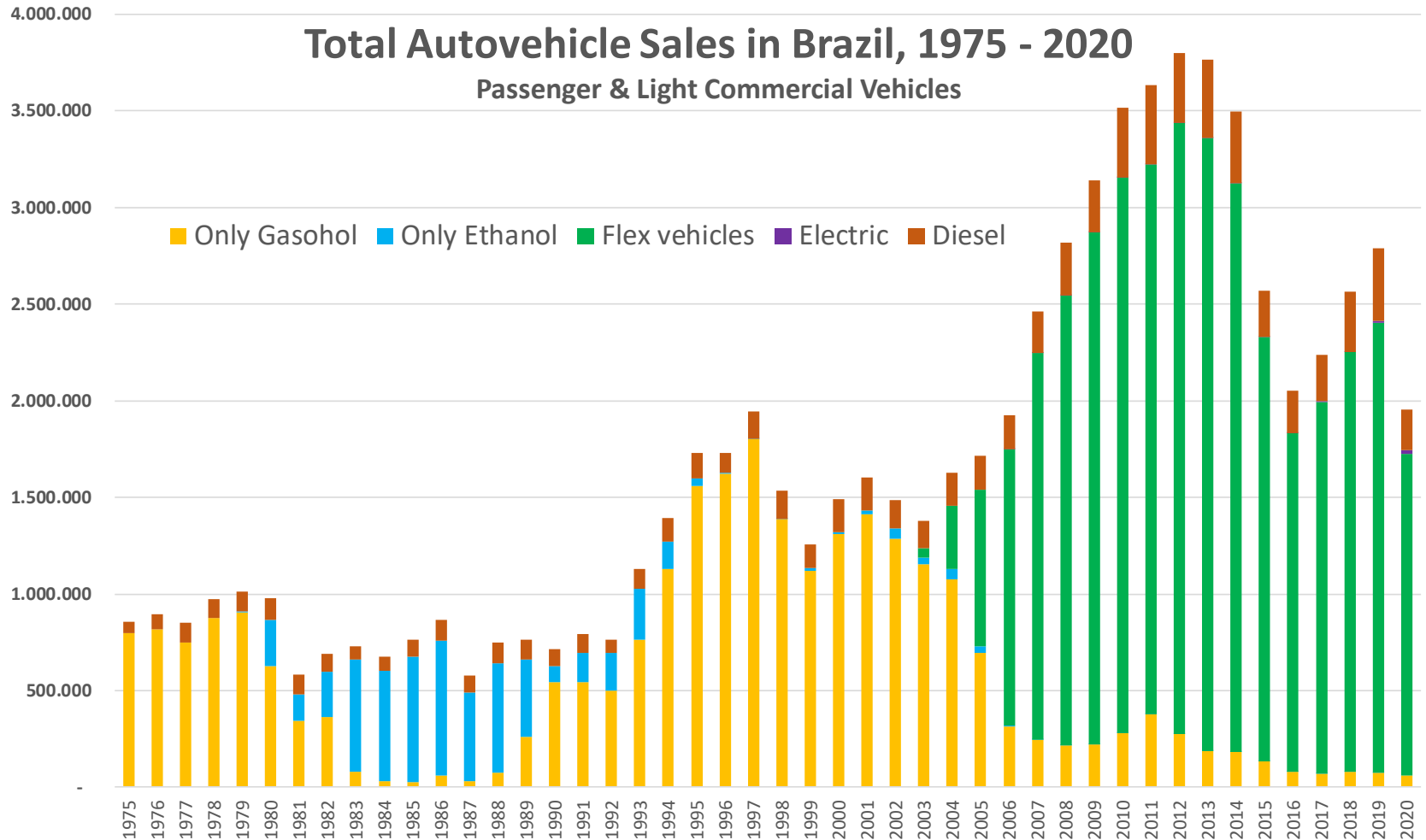
Source: DATAGRO, in gasoline equivalent.



# SHARE OF ETHANOL IN OTTO CYCLE FUEL CONSUMPTION BY STATE IN BRAZIL (2020), in % of gasoline equivalent



# AUTOVEHICLE SALES IN BRAZIL ACCORDING TO FUEL USE

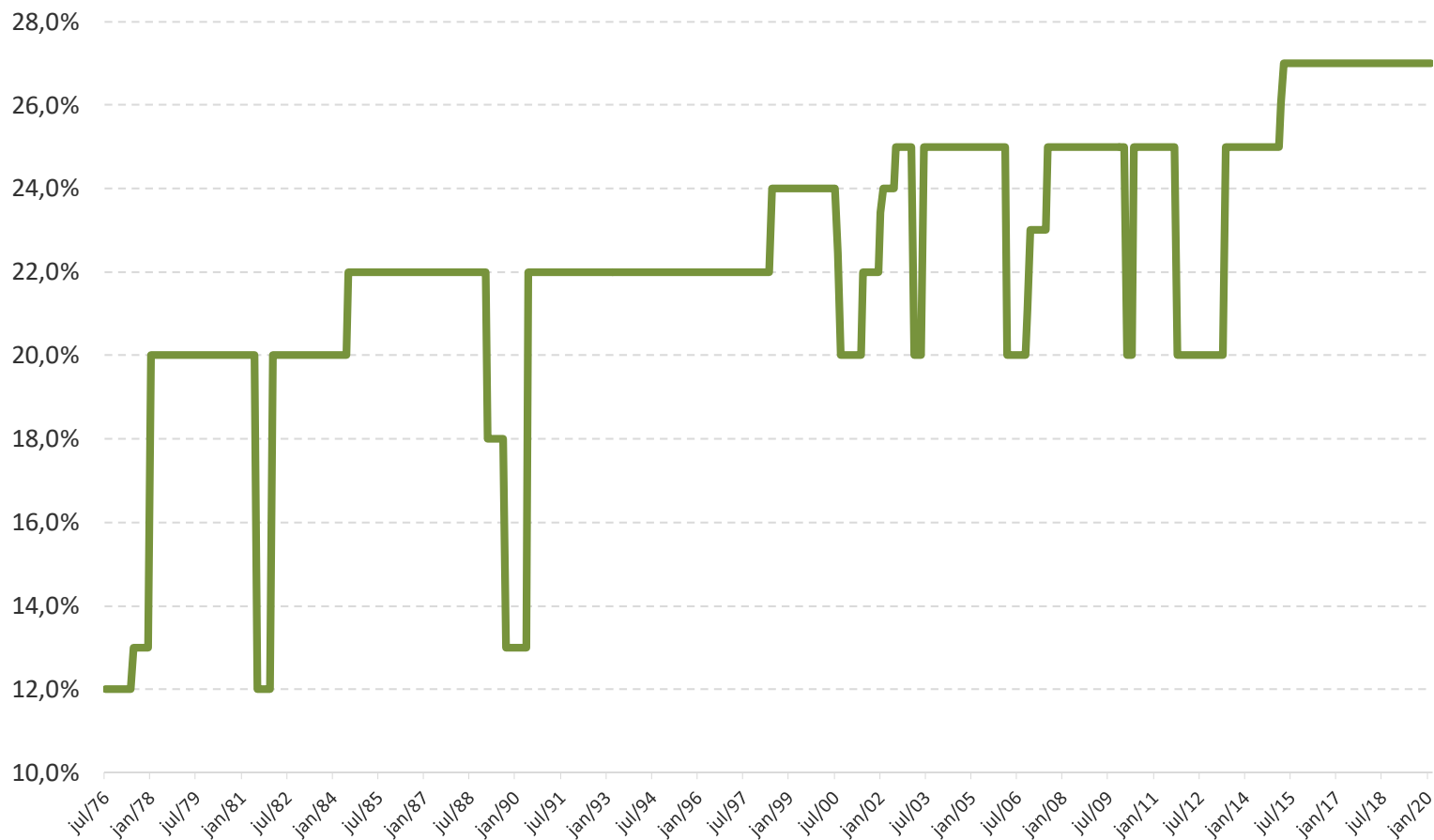


Source: ANFAVEA, Brazil's Automanufacturers Association, prepared by DATAGRO.

- **1984-87:** neat ethanol car sales were 92% to 96% of all car sales.
- **2020:** Flex-cars are 85.2% of all vehicle sales.
- In Dec/20, flex-fuel cars accounted for 83% of total light vehicle fleet.
- Since 2015, mandatory blend of 27% in all common gasoline sold in the country.



# EVOLUTION OF ETHANOL BLEND MANDATE IN BRAZIL 1976-2020



Source: DATAGRO, based on regulations published in Brazil's Official Gazette.

- Mandatory blend of anhydrous ethanol, min 99.5%. GL at 15°. C, as % in volume
- Since Jan/1978, 20% ; Since Jul/1984, 22% ; Since Jun/1998, 24% ; Since Jul/2002, 25%
- Since Mar/2015, 27% - Applies to all common gasoline sold in the country

# India can leapfrog

DATAGRO's recommendation is that India adopts:

- One single fuel grade ethanol specification for the purpose of blending ethanol in gasoline (gasohol) and its distribution as pure ethanol, with minimum Total Alcohol content of 99.0% in volume (v/v).
- For pure ethanol to be used in flex fleet use E100, not E85.

# Advantages for India

- One single fuel grade ethanol specification
  - For producers: production will be more economical, and storage and distribution simplified;
  - For OMCs: enables lower costs of handling, storage and distribution;
  - For automakers: allow higher levels of efficiency using higher alcohol content ethanol for flexible fuel vehicles (2, 3 & 4 wheelers).
- Adopt E100 as pure ethanol to be used in flex fleets
  - E100 is simpler than E85 for logistics and distribution purposes.
  - Technology has solved all and any initial issues related to cold start.

# India & Brazil together are decarbonizing Energy in Transport



Using Bioenergy, high Energy Density, Hydrogen-rich liquid fuels, that use existing infrastructure:

- Improve Energy Independence
- Clean the Environment
- Promote farmers income & local jobs, using available feedstocks and organic residues.



# PLANTING DATA

## HARVESTING SOLUTIONS

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### Calendar of events

**October 24-25<sup>th</sup> 2022**

**22<sup>th</sup> INTERNATIONAL DATAGRO CONFERENCE ON SUGAR & ETHANOL**

Grand Hyatt Sao Paulo  
Sao Paulo, Brazil

**May 04<sup>th</sup> 2023**

**16<sup>th</sup> CITI ISO DATAGRO NEW YORK CONFERENCE ON SUGAR & ETHANOL**

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