



raízen

Second Generation Ethanol

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ADDING VALEU TO BIOMASS

Potential use

Potencial Biomass

Bagasse }
Straw } 10 millions ton

Vinasse }
Filter cake } 3 millions ton

TECHNOLOGY



Products

- Electricity
- Cellulosic ethanol
- Methane
- Chemicals

Investment attractive - Biomass

EBITIDA/CAPEX



- Prices of Electricity/ Ethanol
- Stable technology
- Product demand
- Premium price for green product

These numbers can change based on the value of CAPEX, production costs and 2G productivity combined with the progress of technology.

E2G COPI Project

Located in

COSTA PINTO (COPI)

PIRACICABA, SP

Capacity: 42.200 m³/year

Capex: 72.2 MM US\$

Commissioning:

Out/14 – C6 Fermentation;

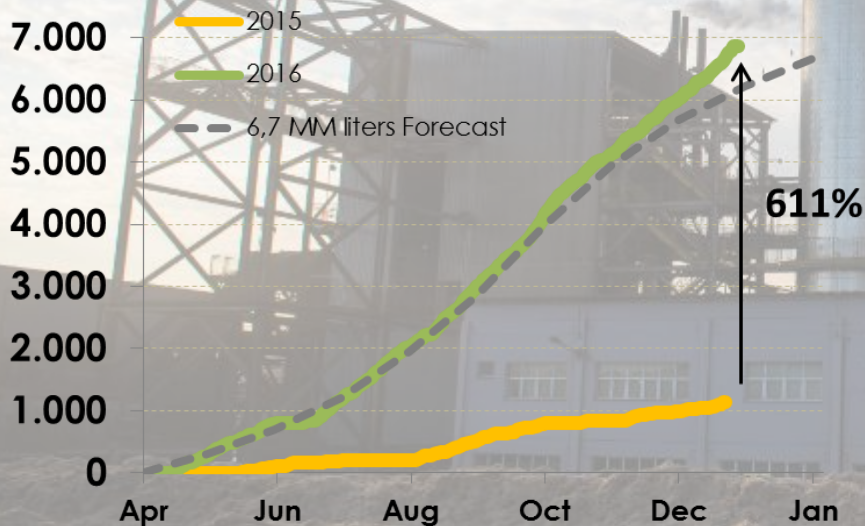
Out/15 – C5 Fermentation.



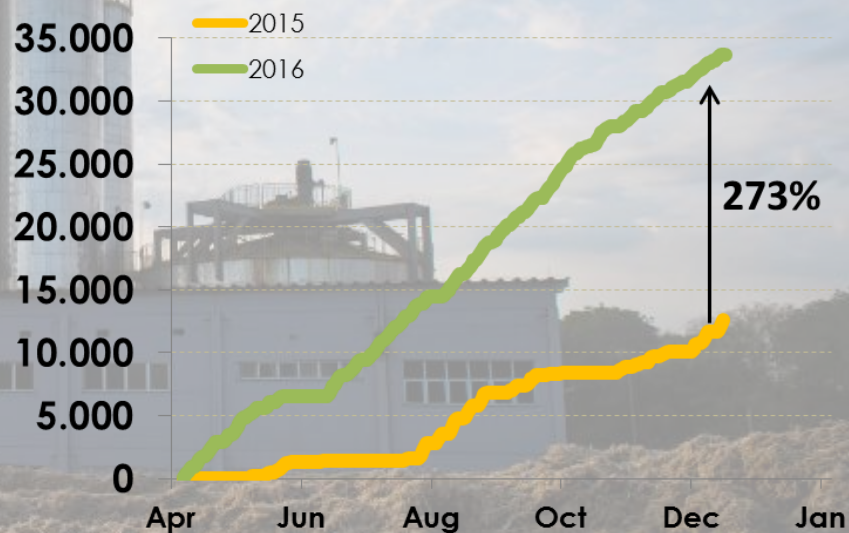
E2G Production

Updated 2016

Raízen E2G Production (m³)



Biomass Consumption (ton)



Business case 289 Liters EtOH / ton biomass

2015: **91** Liters EtOH / ton biomass

2016: **200** Liters EtOH / ton biomass

Status and next steps



What we have done?

- ✓ More than **9 Million** liters of ethanol produced;
- ✓ Advances in projects of special materials development;
- ✓ Customized enzymes cocktail developed with a partner;
- ✓ Development of dedicated microorganism for C5 fermentation;
- ✓ Synergy between 1G and 2G as a key to success;
- ✓ Bottlenecks were identified and solved;
- ✓ High level of reliability achieved.



What are we doing know?

- ✓ Increasing the plant capacity;
- ✓ Achieve throughput;
- ✓ Reduce losses to achieve efficiency.

CASE OF SUCCESS

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novozymes[®] 



Benchmark for
the industry



**4 new
molecules**



Simulated plant
conditions in
laboratory



Approx. 2X less
specific enzyme
consumption
in **3 years**
development

Potential of Biomass - vinasse and filter cake

Organic composition of vinasse and filter cake

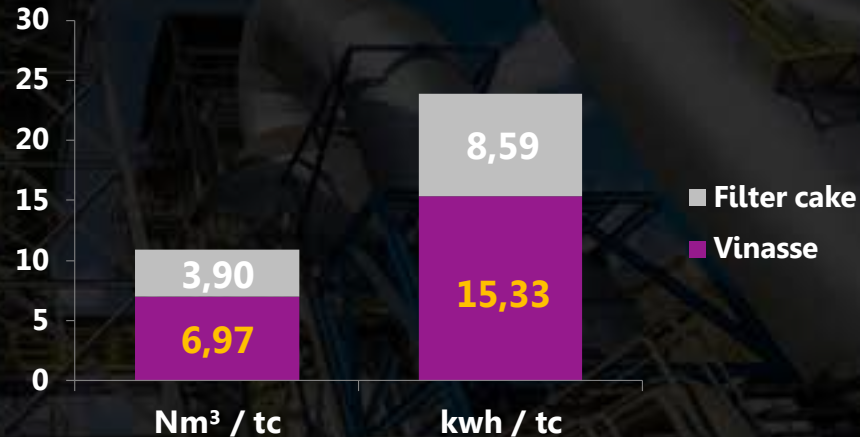
Vinasse: The vinasse organic matter remains constant per tons of sugar cane, not depending on production mix;

Filter cake: Plants with traditional milling has a constant organic matter per ton of sugar cane. In plants with diffuser, most part of the organic matter becomes bagasse.

Opportunities to use the organic matter of vinasse and filter cake

Transformation of organic compound into Biogas

- 600 Nm³ / ton Org. Comp.(approx.)
@ 50% methane.
- 2,2 kwh / Nm³ use in internal combustion engines
combined cycle.



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