Fuel Ethanol Industry in China: Status and Brief Outlook

Apr 8, 2018
China is one of the most important countries in fuel ethanol promotion.

- **Fuel ethanol** is reproducible fuel, with similar function as petrol;
- Currently, more than ten countries/regions are implementing fuel ethanol, the USA, Brazil, EU and China are the top four.

**World Fuel Ethanol Production in 2017, in Million Gallons, RFA statistics**
Chinese ethanol industry is a foundation of fuel ethanol industry

- Annual production of Chinese ethanol industry: around 6 million tones.

![Graph showing ethanol production from 2006 to 2016](image)
As the market concentration of Chinese ethanol industry increased, the scale of single device increased

- Sum up ≥10k tons capacity enterprise:s total capacity over 6million tons. Total production over 4million tons, accounting for 65% of the total production.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Enterprise</th>
<th>Capacity</th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>COFCO BIO (3 plants)</td>
<td>120</td>
<td>110</td>
</tr>
<tr>
<td>2</td>
<td>Alcohol Group</td>
<td>100</td>
<td>70</td>
</tr>
<tr>
<td>3</td>
<td>Jilin Fuel</td>
<td>70</td>
<td>65</td>
</tr>
<tr>
<td>4</td>
<td>Henan Tianguan Ltd.</td>
<td>70</td>
<td>35</td>
</tr>
<tr>
<td>5</td>
<td>Jilin Xintianlong alcohol Ltd.</td>
<td>35</td>
<td>30</td>
</tr>
<tr>
<td>6</td>
<td>Celanese Corporation</td>
<td>28</td>
<td>20</td>
</tr>
<tr>
<td>7</td>
<td>Yinshan hongzhan Ltd.</td>
<td>18</td>
<td>10</td>
</tr>
<tr>
<td>8</td>
<td>Jiangsu Huating alcohol Ltd.</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>9</td>
<td>Heilongjiang Shenglong alcohol Ltd.</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>10</td>
<td>Liaoyuan Jufeng Bio-tech Ltd.</td>
<td>25</td>
<td>10</td>
</tr>
<tr>
<td>11</td>
<td>Guangxi xintiande fuel Ltd.</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>12</td>
<td>Daqing borun bio-tech Ltd.</td>
<td>22</td>
<td>8</td>
</tr>
<tr>
<td>13</td>
<td>Henan mengzhou hoaxing alcohol Ltd.</td>
<td>15</td>
<td>8</td>
</tr>
<tr>
<td>14</td>
<td>Jiangsu Lianyungang Dongcheng Alcohol</td>
<td>15</td>
<td>8</td>
</tr>
<tr>
<td>15</td>
<td>SDIC Guangdong Bio-energy CO., LTD</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Jinyimeng Group CO., LTD</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>17</td>
<td>Jinyuan Jiujiang</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>605</strong></td>
<td><strong>420</strong></td>
</tr>
</tbody>
</table>
Diversified Feedstock Development

- The feedstock includes corn, cassava, molasses, old wheat and old rice.

Geographical distribution of different feedstock

2016 feedstock for ethanol (million tons)

- Corn 4.2 69%
- Cassava 1.8 29%
- Molasses 0.1 2%
Ethanol consumption in China

- Ethanol consumption increases **3.4 million** tons from 2004 (3.3 million tons) to 2016 (6.7 million tons) in China.
- Fuel ethanol consumption increases **2.3 million** tons from 2004 (0.2 million tons) to 2016 (2.5 million tons), accounting for an increase from 6% to 38% of the total ethanol consumption.

Ps: the imported ethanol in 2014, 2015, 2016 are 20k tons, 54k tons and 60k tons.
China fuel ethanol production and development

- 2002, the government started to develop fuel ethanol industry;
- 2016, annual consumption around 2.5 million tons, feedstock include corn, cassava, non-edible rice and wheat.

In 2002, started 2 fuel ethanol pilot programs in Heilongjiang and Henan Provinces and extended the mandatory market to 9 provinces in 2004.

In 2007, started promoting advanced non-grain fuel ethanol production. In 2008, COFCO built the first non-grain, 0.2 million tons cassava based ethanol plant.

In 2012, Henan Tianguan built its first 10k-tons cellulosic fuel ethanol demonstration program.
In 2013, Shandong Longli built its 50k-tons corn cob based fuel ethanol production line.
In 2014, Zonergy built its 30k-tons sweet sorghum based fuel ethanol factory.
China fuel ethanol market and supplier

- 11 provinces are using E10 gasoline, COFCO got the largest market share in China.

**Geographic market and supplier**

**Market share of fuel ethanol in 2016, in 10k tons**

- COFCO, 101.4, 50%
- Jilin Fuel, 65.4, 32%
- Tianguan, 35.1, 17%
- Longlive, 1.9, 1%
- Others, 0%

11 provinces are using E10 gasoline, COFCO got the largest market share in China.
Policy develops and becomes mature, new opportunities increase

- China fuel ethanol industry policy: steady operation according to ‘approved production, targeted circulation, closed operation, orderly development’

- 2002, Vehicle ethanol gasoline pilot program, started pilot stage
- 2004, Vehicle ethanol gasoline expand pilot program, pilot stage extended
- 2005, Renewable Energy Law of China
- 2014, Strategic action plan for energy development (2014-2020), vigorously develop non-grain ethanol.
- 2016, 13th Five-Year plan for the development of biomass energy released
- 2017, On the implementation of bio-ethanol production and promotion of the use of vehicle ethanol gasoline implementation plan. According to this plan, by 2020, China will basically achieve the full coverage of vehicle fuel ethanol. By 2025, achieve large-scale production of cellulosic ethanol, forming a more consummate market-oriented operation mechanism.
China fuel ethanol industry is about to surge

- Gasoline consumption in 2017 is 120 million tons
- Fuel ethanol demand gap: around 9.5 million tons per year
- Potential demand in developed area (1st tier cities) markets exceeds 7 million tons

**Consumption vs Demand**

10k tons per year

- Current consumption
- Potential demand

**China fuel ethanol pilot area**

- Closed
- Semi closed
- Not open
With the increase of gasoline demand blending ratio, the demand of fuel ethanol will be increased

- 2020, if Chinese government implements the E10 standard, >13 million tons of fuel ethanol per year is needed;
- If under the E15 standard, 20 million tons of fuel ethanol per year will be needed.
COFCO Biochemical is an important player in Chinese fuel ethanol industry

专业化公司（平台） 专业化公司（平台）
Specialized companies (platforms)

在中粮的各个业务领域
in COFCO business domain
COFCO R&D in Fuel ethanol

Process Engineering
- Process simulation, equipment development, TEA, PDP development

Bioseparation
- single column separation model, continuous ion exchange, simulated moving bed, affinity chromatography, membrane separation

Bioconversion
- high density fermentation, enzymatic application, fermentation optimization

Strain Development
- bioinformatics, genetic engineering, microbiome, high throughput screening technology
COFCO R&D in Fuel ethanol

Feedstock, enzymes, strains, nutrients

New technology validation

PDP upgrade

Angel

AB MAURI

LESAFFRE
COFCO R&D in Fuel ethanol

- Based on the existing cellulosic ethanol demonstration plant, COFCO will further explore the feasible route for the commercial production of cellulosic ethanol and launch the construction of 50k tons/y cellulosic ethanol plant.

**Corn (Old rice) ethanol**
- (1st generation)
  - 4 million tons

**Cassava ethanol**
- (1.5 generation)
  - 0.2 million tons

**Cellulosic ethanol**
- (2nd generation)
  - Several 50k tons demonstration plant
Witness of Chinese fuel ethanol industry

- COFCO is the largest fuel ethanol producer, 3 wholly owned companies and one shared company.
- COFCO is one of the earliest fuel ethanol producers in China, using corn, cassava, old rice as feedstocks.
- COFCO has 4 sugar mills in Brazil, co-produce 0.4 million tons of fuel ethanol (hydrous + anhydrous).

2020 China Fuel Ethanol Market Share Forecast (by COFCO)

<table>
<thead>
<tr>
<th>Company</th>
<th>Capacity (10k tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEB</td>
<td>460</td>
</tr>
<tr>
<td>MER</td>
<td>240</td>
</tr>
<tr>
<td>CAT</td>
<td>120</td>
</tr>
<tr>
<td>COFCO</td>
<td>720</td>
</tr>
<tr>
<td>Others</td>
<td>480</td>
</tr>
</tbody>
</table>

COFCO: 40% (720/1800) = 40%

Others: 60% (480/1800) = 40%

(10k tons)
Thank you!