GLOBAL TRENDS IN THE WASTE TO ENERGY INDUSTRY

summary

1. FCC Group Overview
2. WTE – Present Status
3. A View to the Future
- Business model supported on long-term growth potential activities.
We operate in **35 countries**, hiring over **65,000 people** (**40,000 in FCC Environment**).

We collect and treat **20 million tonnes** of waste per year.

We provide Environmental Services to **53 million people** at nearly **5,000 municipalities** around the world.

**Aqualia**, our water business area, attends up to **27 million people** in **14 countries**.

**World Leader in Waste-to-Energy**, ten facilities with **2.6 million tonnes** annual capacity and over **300 MWe Power Output**.

**Cementos Portland** has an annual production capacity of **16 million tonnes** of cement, with 11 factories in USA, Spain and Tunisia.

We manage from **Globalvía**, **23 motorways** in Europe and America, with **1.719 Km** of total route.

**42%** of our revenues are **International**.
Group Results $^1$ 2014 (M€)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Turnover</strong></td>
<td>6,334.1</td>
</tr>
<tr>
<td><strong>EBITDA</strong></td>
<td>804.0</td>
</tr>
<tr>
<td><strong>EBITDA Margin</strong></td>
<td>12.7%</td>
</tr>
<tr>
<td><strong>Backlog $^2$</strong></td>
<td>32,996.5</td>
</tr>
</tbody>
</table>

$^1$ After scope reduction due to divestments and other discontinued operations

$^2$ Equivalent to 5.2 years of turnover
Recycling and WTE Activities bring 25% of EBITDA and 36% of Capex in 2014
Recent contracts in international markets

- Gerald Desmond Bridge, Los Ángeles
- Mersey Bridge
- Haren Prison
- Chucas Dam, (Costa Rica)
- Riyadh Metro
- Hospital City, Panamá
- El Callao Port, Peru
- Açu Port
- Doha Metro, (Qatar)
- Lima Metro
WTE – PRESENT STATUS
The WORLD has been divided in 17 REGIONS / COUNTRIES, for each one it has been studied:

GLOBALLY

- **Inhabitants** – 6,938 million
- **Nº of operational facilities** – 1,518 facilities
- **WTE capacity (TPD)** – 625,956 tpd
- **Average size (KTPA)** – 137 ktpa

Also defined the **WTE RATIO**: “tpd per million inhabitants” as a way to assess the degree of introduction of WTE as a method of Waste Management at each region.
Recycling and Waste-to-Energy in combination for sustainable waste management

Graph by CEWEP, Source: EUROSTAT 2013
WTE is **well developed** in Europe and USA – Canada, and **highly** developed in specific Far-East cases, as Singapore, Japan and Taiwan. China has developed in some main cities, but **still a long way to go**.

Level of development **in Europe is variable** depending on countries, there is **room for development**, but always in **combination with recycling/composting**

**Positive factors** for WTE development:

- **Densely populated areas**, shortage of land
- **Aligned policies of Waste Management** and **Renewable Energy** development
- **Good socio-economic development**, allowing **good financial environment** and **appropriate levels of affordability** for Authorities.
- **Commitment and support from governments** at national and local levels. **Ad-hoc legal framework**
A TECHNOLOGY is good for MSW-WTE if:

- Meet the needs of the Community at an affordable cost and minimum environmental impact
- Is Reliable, delivers and presents long-track record references, all allowing Bankability

Most of existing and developing MSW-WTE facilities are based on high-capacity, robust and proved, mass-burn grate technologies.

ACTs will keep good pace on developing for large volumes of MSW, reaching proper levels of affordability and deliverability, becoming more bankable too.

CHALLENGES:

- Keep working on financing structures and protocols to make them simpler
- Improving citizen’s perception on WTE (and thus easing planning and permitting) by means of good Communication, training, best technologies and being transparent in operations and emissions’ monitoring: there’s nothing to hide or to be afraid of.
WTE – A VIEW TO THE FUTURE
**ANALYSIS ON FACILITIES UNDER DEVELOPMENT**

- For the same **17 REGIONS / COUNTRIES** and inhabitants of the present day, it has been studied:

  - **NUMBER**: 511 facilities
  - **WTE capacity (TPD)**: 409,378 tpd
  - **Average size (KTPA)**: 267 ktpa

In this case, the **WTE RATIO**: “tpd per million inhabitants” is a way to assess how focused are the different regions / countries in developing **WTE** as a method of Waste Management.

_Sources: ISWA, WMW, ERC (USA), CEWEP, own research_
CONCENTRATION IN DEVELOPING PROJECTS
(based on Nº of facilities and ratio TPD per million inhabs)

- NEGLIGIBLE
- LOW
- MEDIUM
- HIGH
- VERY HIGH

SOUTH KOREA
TAIWAN
ISRAEL
As with all studies prospecting the future, specially when based on databases that may be incomplete and estimates, this forecast must not be taken as a certainty, but can be used to predict some trends in the WTE Industry.

**REGIONAL MARKETS**: looking at the WTE development ratio, the number and size of projects, and considering some socio-economic conditions, could be advanced:

- **China** (219 developing projects), GCC countries and Australia will consolidate as important markets, ASEAN (20) and Japan (25) are interesting
- **USA-Canada**, and specially **Europe** (155 projects), will keep a good pace in developing WTE

The average size of MSW-WTE facilities almost doubles in new projects (from ~140 to ~270 ktpa), making them more cost-efficient (increase in line throughput, larger projects in big metro areas)

Waste Management in a comprehensive approach and affordably optimizing materials recovery bring IWMCI: WTE combined with other technologies for treating diverse waste streams (e.g. Bahrain Manama project: 1.5 mtpa, WTETW, AD, compost, CDWrec, MRF)
Global Urbanisation – As a fact, in 1800 2% of world population lived in cities, today, more than 50% reside in cities that occupy less than 0.5% of world surface but consume 75% of world resources.

Top 10 Largest Urban Agglomerations in 1975, 2000, and 2025 (in million inhabs.)

<table>
<thead>
<tr>
<th>1975</th>
<th>2000</th>
<th>2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Tokyo, Japan</td>
<td>26.6</td>
<td>1. Tokyo, Japan</td>
</tr>
<tr>
<td>2. New York- Newark, USA</td>
<td>15.9</td>
<td>2. Mexico City, Mexico</td>
</tr>
<tr>
<td>3. Mexico City, Mexico</td>
<td>10.7</td>
<td>3. New York-Newark, USA</td>
</tr>
<tr>
<td>4. Osaka-Kobe, Japan</td>
<td>9.8</td>
<td>4. São Paulo, Brazil</td>
</tr>
<tr>
<td>5. São Paulo, Brazil</td>
<td>9.6</td>
<td>5. Bombay, India</td>
</tr>
<tr>
<td>7. Buenos Aires, Argentina</td>
<td>8.8</td>
<td>7. Calcutta, India</td>
</tr>
<tr>
<td>8. Paris, France</td>
<td>8.6</td>
<td>8. Delhi, India</td>
</tr>
<tr>
<td>10. Moscow, Russian Federation</td>
<td>7.6</td>
<td>10. Los Angeles-Long Beach-Santa Ana, USA</td>
</tr>
</tbody>
</table>

FOOD FOR THOUGHT…

- WHERE THE MAIN WORLD METROPOLITAN AREAS WILL BE LOCATED AT THE FUTURE?

- WHAT DEGREE OF INVOLVEMENT MUST DEVELOPED COUNTRIES HAVE IN THE WAY EMERGING COUNTRIES MANAGE THEIR ENVIRONMENTAL ISSUES?

- WHAT IMPACT THIS LATTER MATTER MAY HAVE ON DEVELOPED COUNTRIES’ ENVIRONMENTAL CONDITIONS?

- MUST DEVELOPED COUNTRIES TRANSFER TECHNOLOGY AND FINANCING RESOURCES TO HELP?

SD-TJ WPP
We help in making the world more eco-efficient
THANK YOU!

felipeu@fcc.es - www.fcc.es
The San Diego - Tijuana metropolitan area
San Diego Metro area: near 2 million people, 550 sq miles, providing primary sewage water treatment for 190 million gallons per day (gpd), discharged at South Bay five miles off shore, 350 feet deep.

Tijuana area: near 1.3 million inhabs. From the 60’s to end of 90’s unable to get funding and proper technology for primary treatment of 20 million gpd. Discharging raw sewage four miles south of US border.

Finally, in 1997, joint entity IBWC (International Boundary and Water Commission) puts into operation the International Treatment Plant, treating 25 million gpd of Tijuana’s sewage. Treated wastewater is now discharged three miles off shore 90 feet deep (South Bay Ocean Outfall) - Located North of the Border!

Still insufficient, however. Un-sewered towns discharge directly to Tijuana River Valley.
### SOME MSW ACT PROJECTS UNDER DEVELOPMENT

<table>
<thead>
<tr>
<th>PROJECT / DEVELOPER</th>
<th>CAPACITY (ktpa)</th>
<th>TECHNOLOGY</th>
<th>OUTPUT</th>
<th>EXPECTED OPERATIONAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reno (Nevada) – Fulcrum Bio</td>
<td>200</td>
<td>Gasification - TermoChem</td>
<td>Syncrude (pre-jetfuel)</td>
<td>2017</td>
</tr>
<tr>
<td>Essex (UK) - BA/Solena</td>
<td>550</td>
<td>Plasma - Solena</td>
<td>Syngas (pre-jetfuel)</td>
<td>2017</td>
</tr>
<tr>
<td>Tees Valley 1&amp;2 – Air Products</td>
<td>350 x 2</td>
<td>Plasma - Westinghouse</td>
<td>50 MW x 2</td>
<td>2016/17?</td>
</tr>
<tr>
<td>Milton Keynes – Cespa Amey</td>
<td>90</td>
<td>Gasification - Energos</td>
<td>7 MW</td>
<td>2016</td>
</tr>
<tr>
<td>Wiltshire (UK) – Hills group</td>
<td>160</td>
<td>Gasification – Chinook Sciences</td>
<td>22 MW</td>
<td>2017?</td>
</tr>
<tr>
<td>Derby (UK) - Shanks/Interserve</td>
<td>140</td>
<td>Gasification - Energos</td>
<td>11 MW</td>
<td>2017?</td>
</tr>
</tbody>
</table>