IGCC PLANT - Falconara M.ma

“PERFORMANCE UPDATE AND FUTURE ENHANCEMENTS”

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“2007 GASIFICATION TECHNOLOGY CONFERENCE”
October 14-17, 2007 – San Francisco (USA)
# MILESTONES OF THE PROJECT

<table>
<thead>
<tr>
<th>Milestone</th>
<th>Description</th>
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</table>
| Jan, 1997 | CONSTRUCTION START-UP  
( Project Financing ~600.000.000€ ) |
| Apr, 2001 | ACCEPTANCE TEST (PAC) |
| 2001 – 2003 | INTERRUPTED OPERATION  
( Availability Factor < 70% ) |
| 2002 – 2004 | RELIABILITY IMPROVEMENT PROJECT  
( Upgrading Investment = 50.000.000 € ) |
| 2004-2007 | RELIABLE OPERATION  
( Availability Factor > 90% ) |
MAIN UPGRADINGS

“RELIABILITY IMPROVEMENT PROJECT” CONCERNED THE FOLLOWING ASPECTS:

- AUTOMATIC CONTROL AND EMERGENCY LOGICS OPTIMIZATION;
  (Gasifiers load control, ASU Supervision, GT emergency change-over, Master Controller)

- UPGRADING OF EQUIPMENT AND PIPING METALLURGY;

- SUBSTITUTION/UPGRADING OF SOME EQUIPMENT
  (UNDERSIZED, NON SUITABLE MATERIALS, UNRELIABLE)
  (Air Intake Filters, Main Air Compressor, Water Flash Separator)

- IMPROVEMENT OF PLANT INSTRUMENTATION AND REDUNDANCY

- OVERALL TECHNOLOGICAL IMPROVEMENTS
  (New DeNOx System, Gas Turbine XL Technology, Gasifiers ....)
GAS TURBINE PICTURES

NEW GT AIR INTAKE FILTER

NEW GT BLADES “XL VERSION”
NEW AIR COMPRESSOR PICTURES

NEW AIR COMPRESSOR ROTOR
(5 STAGES)

NEW AIR COMPRESSOR MOTOR
(24MW)
RUNNING HOURS and AVAILABILITY

### IGCC - Operating Hours [%]

<table>
<thead>
<tr>
<th>YEARS</th>
<th>Operating Hours [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>0%</td>
</tr>
<tr>
<td>2002</td>
<td>20%</td>
</tr>
<tr>
<td>2003</td>
<td>40%</td>
</tr>
<tr>
<td>2004</td>
<td>60%</td>
</tr>
<tr>
<td>2005</td>
<td>80%</td>
</tr>
<tr>
<td>2006</td>
<td>100%</td>
</tr>
<tr>
<td>2007</td>
<td>100%</td>
</tr>
</tbody>
</table>

### IGCC - Gross Power Output [MWh]

<table>
<thead>
<tr>
<th>YEARS</th>
<th>GPO [GWh]</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>1387</td>
</tr>
<tr>
<td>2002</td>
<td>1475</td>
</tr>
<tr>
<td>2003</td>
<td>1462</td>
</tr>
<tr>
<td>2004</td>
<td>2252</td>
</tr>
<tr>
<td>2005</td>
<td>2168</td>
</tr>
<tr>
<td>2006</td>
<td>2141</td>
</tr>
<tr>
<td>2007</td>
<td>2200</td>
</tr>
</tbody>
</table>

*Expected

### OH [h]

<table>
<thead>
<tr>
<th>YEARS</th>
<th>OH [h]</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>64.2%</td>
</tr>
<tr>
<td>2002</td>
<td>68.8%</td>
</tr>
<tr>
<td>2003</td>
<td>62.4%</td>
</tr>
<tr>
<td>2004</td>
<td>95.3%</td>
</tr>
<tr>
<td>2005</td>
<td>90.4%</td>
</tr>
<tr>
<td>2006</td>
<td>89.7%</td>
</tr>
<tr>
<td>2007</td>
<td>91.0%</td>
</tr>
</tbody>
</table>

*Q3 - 2007
## ANNUAL OPERATING PLANT RESULTS

<table>
<thead>
<tr>
<th></th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>Q3-2007</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SYNGAS OPERATION [h]</strong></td>
<td>7943</td>
<td>7674</td>
<td>7737</td>
<td>5901</td>
</tr>
<tr>
<td><strong>DIESEL OPERATION [h]</strong></td>
<td>403</td>
<td>243</td>
<td>118.7</td>
<td>64</td>
</tr>
<tr>
<td><strong>SCHEDULED S/D [h]</strong></td>
<td>252</td>
<td>504</td>
<td>870</td>
<td>523</td>
</tr>
<tr>
<td><strong>UNSCHEDULED S/D [h]</strong></td>
<td>187</td>
<td>338</td>
<td>34</td>
<td>64</td>
</tr>
<tr>
<td><strong>NUMBER of INSPECTIONS</strong></td>
<td>1 (A)</td>
<td>2 (B - A)</td>
<td>1 (C)</td>
<td>2 (A + B)</td>
</tr>
<tr>
<td><strong>AVAILABILITY at SYNGAS</strong></td>
<td>90.4%</td>
<td>87.6%</td>
<td>88.3%</td>
<td>90.1%</td>
</tr>
<tr>
<td><strong>TOTAL AVAILABILITY</strong></td>
<td>95.0%</td>
<td>90.4%</td>
<td>89.7%</td>
<td>91.0%</td>
</tr>
</tbody>
</table>

- **CONTINUOUS REDUCTION OF DIESEL OIL OPERATION**
- **DECREASE IN UNSCHEDULED SHUT-DOWN HOURS**
- **PRESERVING EXCELLENT PLANT AVAILABILITY**
FUTURE ENHANCEMENTS

REDUCTION OF NOx EMISSION

HYDROGEN PRODUCTION FROM SYNGAS

CO2 CAPTURE STUDIES

BIOFUEL CO-GASIFICATION

“2007 GASIFICATION TECHNOLOGY CONFERENCE”

October 14-17, 2007 – San Francisco (USA)
SCOPE OF THE PROJECT
- Supply Biofuels to Gasification mixed with heavy residues

GOALS
- Respond to increasing requests to improve environmental protection.
- Increase the environmental friendly value of the IGCC Technology.
- Access to “Green Certificate System”

TARGET
- To produce 20-30 MW of “green energy” by feeding ~5 ton/h of biofuel into Gasifiers (7-10% of the overall power production)
STEPS OF THE PROJECT

- COMPLETE FAMILIARIZATION WITH AUTHORITY REGULATIONS
- IDENTIFICATION OF THE MOST SUITABLE BIO-FUELS (compatible both with technology and legislation)
- ECONOMICAL EVALUATION
- FEASIBILITY TESTS
- GENERAL BIO FUEL SUPPLY CONTRACTS
- DETAILED ENGINEERING OF PLANT MODIFICATIONS
- FINALIZATION OF LEGISLATIVE PERMISSIONS (approval of plant modifications and authorization of incentive rates)
- PLANT MODIFICATION
- CO-GASIFICATION START UP

IN PROGRESS
STRENGTHS & WEAKNESSES

COGASIFICATION STRENGTHS

- Environmentally compatible technology
- Mild reduction of CO2 emission
- Easy to be implemented (just minor plant modifications needed)
- Economical value of green certificates
- Increase plant profitability

COGASIFICATION WEAKNESSES

- High costs of conventional biofuels (in continuous increase);
- Lack of a clear authority regulation
- Unclear list of accepted biofuels (Glycerin ?)
- Raw bio-products not easily available (for about 50000 t/y)
INTEGRATION WITH EXISTING PLANT
“GASIFICATION TECHNOLOGY CONFERENCE”

San Francisco – October 14th-17th, 2007

Thanks for your attention!

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