PAN AMERICAN HYDROGEN, INC.

PAN AMERICAN ENTERPRISES, INC.

HYDROGEN GENERATION PLANTS
Resources and Capabilities
History

• *Pan American* is a Hydrogen Plant Specialist
  – Has **30 years** of experience in the Hydrogen Industry.
  – Dedicated to manufacture only **Hydrogen Generation Plants**.
  – It specializes in the design, engineering, manufacturing installation and startup of **Modular Hydrogen Plants**.
  – It specializes in the execution of **Turn-Key projects**
  – *Maintains a Worldwide Service Operation*. 
HYDROGEN GENERATION PLANTS

GEOGRAPHICAL MARKET COVERAGE

Canada
United States of America
Mexico
El Salvador
Peru
Venezuela
Spain
Ukraine
Kazakhstan
Egypt
Pakistan
Singapore
Taiwan
Philippines
Indonesia
Malaysia
HYDROGEN GENERATION PLANTS

OUR KEY
HYDROGEN PLANTS
CUSTOMERS

H2
# HYDROGEN GENERATION PLANTS

## PARTIAL LIST OF CUSTOMERS

### HYDROGEN GENERATION PLANTS:

<table>
<thead>
<tr>
<th>Company</th>
<th>Country</th>
<th>Hydrogen Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical Company</td>
<td>USA</td>
<td>508,333 SCFH (13,620 Nm3H)</td>
</tr>
<tr>
<td>Biofuels Company</td>
<td>USA</td>
<td>166,666 SCFH (4,465 Nm3H)</td>
</tr>
<tr>
<td>Frontier Refinery, Inc.</td>
<td>USA</td>
<td>229,167SCFH (6,141 Nm3H)</td>
</tr>
<tr>
<td>Sempec PT Risjad/Degussa</td>
<td>Indonesia</td>
<td>56,727 SCFH (1,520 Nm3H)</td>
</tr>
<tr>
<td>SITARA, Islamabad</td>
<td>Pakistan</td>
<td>55,980 SCFH (1,500Nm3H)</td>
</tr>
<tr>
<td>Palm Chem MSDN, BHD</td>
<td>Malaysia</td>
<td>18,660 SCFH (500 Nm3H)</td>
</tr>
<tr>
<td>Tereftalatos, Altamira</td>
<td>Mexico</td>
<td>18,660 SCFH (500 Nm3H)</td>
</tr>
<tr>
<td>Kellog/Bufete Industrial/Temex</td>
<td>Mexico</td>
<td>13,000 SCFH (350 Nm3H)</td>
</tr>
<tr>
<td>PT Agip PT Zama</td>
<td>Indonesia</td>
<td>11,196 SCFH (300 Nm3H)</td>
</tr>
<tr>
<td>MISR, Canada (Egypt)</td>
<td>Egypt</td>
<td>11,196 SCFH (300 Nm3H)</td>
</tr>
</tbody>
</table>

### INDUSTRIAL GASES COMPANIES

<table>
<thead>
<tr>
<th>Company</th>
<th>Country</th>
<th>Hydrogen Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malaysian Oxygen BHD (BOC/AL)</td>
<td>Malaysia</td>
<td>111,960 SCFH (3,000 Nm3H)</td>
</tr>
<tr>
<td>Air Separation Co, WA</td>
<td>USA</td>
<td>45,000 SCFH (1,500 Nm3H)</td>
</tr>
<tr>
<td>Praxair, Monterrey</td>
<td>Mexico</td>
<td>30,000 SCFH (800 Nm3H)</td>
</tr>
<tr>
<td>British Oxygen, Lien Hwa,(BOC)</td>
<td>Taiwan</td>
<td>37,320 SCFH (1,000 Nm3H)</td>
</tr>
<tr>
<td>Malaysian Oxygen BHD (BOC/AL)</td>
<td>Malaysia</td>
<td>37,324 SCFH (1,000 Nm3H)</td>
</tr>
<tr>
<td>Air, Separation Co, IN</td>
<td>USA</td>
<td>30,000 SCFH (800 Nm3H)</td>
</tr>
<tr>
<td>PT Industrial Gases</td>
<td>Indonesia</td>
<td>26,124 SCFH (700 Nm3H)</td>
</tr>
<tr>
<td>C.I.G.I. British Oxygen (BOC)</td>
<td>Philippines</td>
<td>18,660 SCFH (500 Nm3H)</td>
</tr>
<tr>
<td>Soxal Singapore Oxygen (BOC/AL)</td>
<td>Singapore</td>
<td>18,660 SCFH (500 Nm3H)</td>
</tr>
</tbody>
</table>
## HYDROGEN GENERATION PLANTS

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<tr>
<td><strong>VEGETABLE OIL COMPANIES</strong></td>
<td></td>
</tr>
<tr>
<td>Bunge, Co.</td>
<td>USA 100,000 SCFH (2,680Nm3H)</td>
</tr>
<tr>
<td>Honeymead Products, Co.</td>
<td>USA 62,550 SCFH (1,676 Nm3H)</td>
</tr>
<tr>
<td>Archer, Daniels, Midland, Ontario.</td>
<td>Canada 54,167 SCFH (1,451 Nm3H)</td>
</tr>
<tr>
<td>Archer, Daniels, Midland/U.S.A.</td>
<td>USA 50,000 SCFH PSA UNIT</td>
</tr>
<tr>
<td>Cargill</td>
<td>USA 30,000 SCFH (800 Nm3H)</td>
</tr>
<tr>
<td>Mateos, Valldolid</td>
<td>Spain 11,000 SCFH (300 Nm3H)</td>
</tr>
<tr>
<td>Vita, Almaty</td>
<td>Kazakhstan 9,330 SCFH (250 Nm3H)</td>
</tr>
<tr>
<td>IO&amp;FIC, Iliychevsk</td>
<td>Ukraine 7,464 SCFH (200 Nm3H)</td>
</tr>
</tbody>
</table>
Technology

With the acquisition of the KOCH-GLITSCH INC.

HYDROGEN GENERATION PLANTS

HYDROGEN BUSINESS

In Year 2000, Pan American is consolidated as a major player in the hydrogen world market
TYPES OF PLANTS BUILT WITH OUR TECHNOLOGY

5.5 MMSCFD

3.0 MMSCFD

0.5 MMSCFD

5.5 MMSCFD
CURRENT CAPABILITY

12.2 MMSCFD WITH THE PARTICIPATION OF MUSTANG ENGINEERING

5.5 MMSCFD
HYDROGEN GENERATION PLANTS

TURN-KEY PROJECT CAPABILITY
From drawing board
Plant will be designed and fabricated in accordance with following national and industry codes and standards where applicable:

- American Society of Mechanical Engineers - ASME
- American Society for Testing and Materials - ASTM
- American National Standards Institute - ANSI
- American Petroleum Institute - API
- Institute of Electrical and Electronics Engineers, Inc. - IEEE
- Instrument Society of America - ISA
- National Board - NB
- National Electrical Manufacturers Association - NEMA
- National Fire Protection Association - NFPA
- Tubular Exchanger Manufacturers Association - TEMA

All ladders, platforms, coupling guards, belt guards will be in accordance with OSHA standards.
H2 PLANT MAIN CHARACTERISTICS:

- Skid-Mounted Equipment
- Pre-Assembled, Modular Design
- Faster Installation
- Easy to Operate and LOW Maintenance
- High Reliability
- High On-Steam Factor
- Low Manning and Automatic Operation
- Flexibility in Turn-down
- Proven Long Lasting Life
HYDROGEN GENERATION PLANTS

RELEVANT FEATURES

OF PHI’s PLANT

H₂
HYDROGEN GENERATION PLANTS

CONTROL INSTRUMENTS

State-of-the-art equipment and Instruments are used, supplied by:

• Emerson
• Flowserve
• Honeywell
• Endress+Hauser
HYDROGEN GENERATION PLANTS

KEY ON SAFETY

Redundant Instrumentation can be installed.

We install equipment that provides safety operation by installing redundant:

• Alarms
• Shutdowns
• Pressure Safety Devices
• PLC / Screens Advisors
HYDROGEN GENERATION PLANTS
RELIABLE CONTROL SYSTEM

IN-HOUSE PROGRAMING FOR DCS, PLC AND HMI

EMERSON – DELTA V ARCHITECTURE
FOCUS ON SAFETY
with
DELTA V- EMERSON

Predictive Maintenance

- With Asset Management Solutions:
  - DIAGNOSTICS,
  - CALIBRATION &
  - DOCUMENTATION.
The Hydrogen Plant can be remotely controlled from Multiple computer stations:

- From central control station
- From in-plant control screen
- From operator’s mobile phone
- From remote computer
- Optional monitoring/control from PHI’s control center
HYDROGEN GENERATION PLANTS
Key Features of the H2 Plant

CATALYST

Install commercial brands such as:

- Sud-Chemie
- Johnson-Matthey
HYDROGEN GENERATION PLANTS
Key Features of the H2 Plant

METALLURGY

Install Upgraded Alloy Metallurgy for hot zones such as:

- Hastelloy
- Incolloy
- And other Alloys
HYDROGEN GENERATION PLANTS

PLANT PERFORMANCE
HYDROGEN GENERATION PLANTS
Key Features of the H2 Plant

ON-STREAM FACTOR

Continuous Operation thru the year.

Our On-Stream factor is > 0.98
Two-Three Years Between Maintenance Shutdowns is Normal
Less than one week per year is scheduled for maintenance
HYDROGEN GENERATION PLANTS

Key Features of the H2 Plant

Purity up to 99.99999+
HYDROGEN GENERATION PLANTS

Key Features of the H2 Plant

In Summary

Plant are designed for:

- Expected life: More than 25 Years,
- Low energy consumption: <0.15 KwH/Nm3 H2
- High product efficiency: <0.44 (NG vol./H2 vol.)
- High pressure Export Steam: 650 psig & 750 F
- High on stream factor: 0.98
  (Minimum Maintenance)
HYDROGEN GENERATION PLANTS

END

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