

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.***

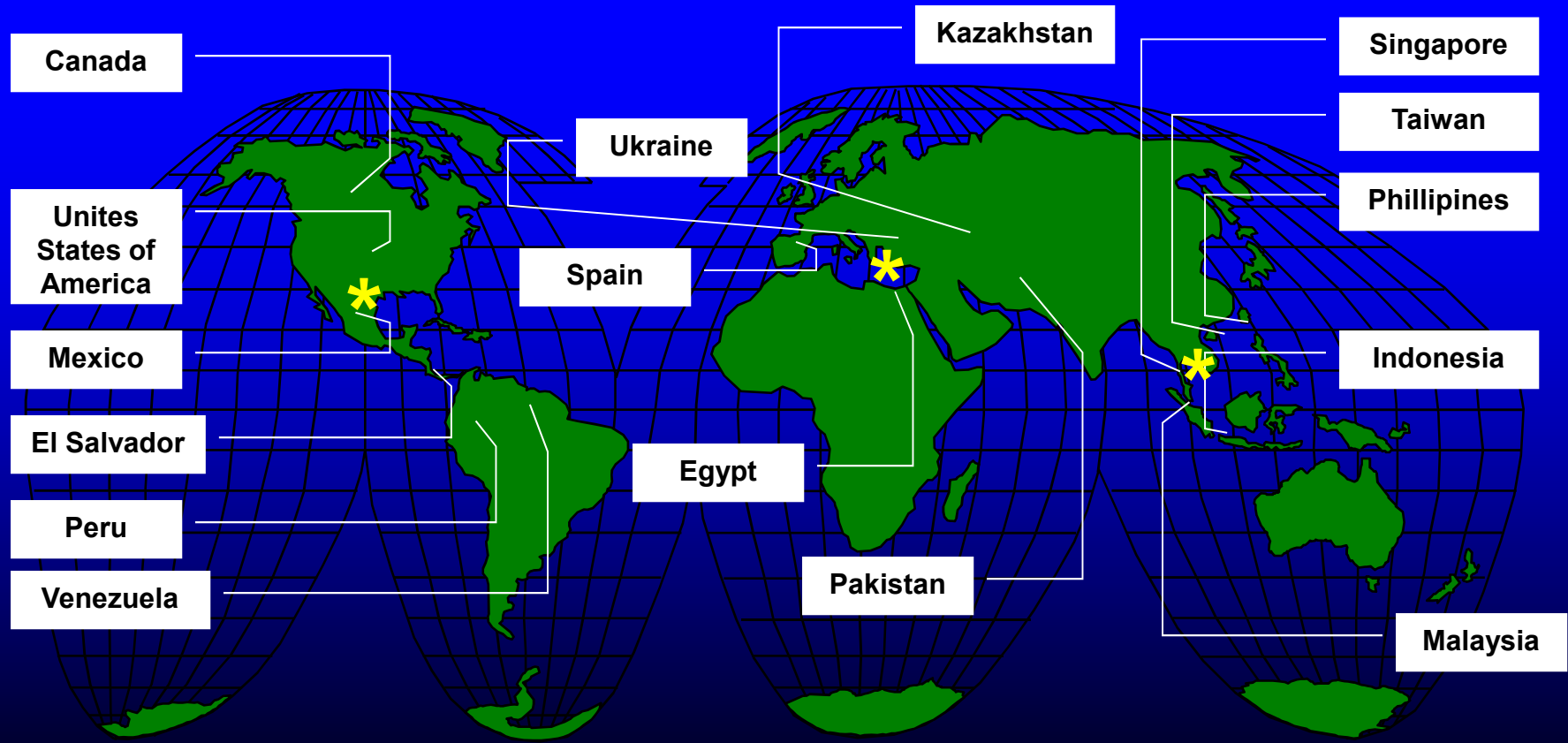
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HYDROGEN GENERATION PLANTS



GEOGRAPHICAL MARKET COVERAGE



HYDROGEN GENERATION PLANTS

OUR KEY
HYDROGEN PLANTS
CUSTOMERS





HYDROGEN GENERATION PLANTS

PARTIAL LIST OF CUSTOMERS



HYDROGEN GENERATION PLANTS:

Hydrogen Capacity.

REFINERY & CHEMICAL COMPANIES

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

INDUSTRIAL GASES COMPANIES

Malaysian Oxygen BHD (BOC/AL)	Malaysia	111,960 SCFH (3,000 Nm3H)
Air Separation Co, WA	USA	45,000 SCFH (1,500 Nm3H)
Praxair, Monterrey	Mexico	30,000 SCFH (800 Nm3H)
British Oxygen, Lien Hwa,(BOC)	Taiwan	37,320 SCFH (1,000 Nm3H)
Malaysian Oxygen BHD (BOC/AL)	Malaysia	37,324 SCFH (1,000 Nm3H)
Air, Separation Co, IN	USA	30,000 SCFH (800 Nm3H)
PT Industrial Gases	Indonesia	26,124 SCFH (700 Nm3H)
C.I.G.I. British Oxygen (BOC)	Philippines	18,660 SCFH (500 Nm3H)
Soxal Singapore Oxygen (BOC/AL)	Singapore	18,660 SCFH (500 Nm3H)



HYDROGEN GENERATION PLANTS

PARTIAL LIST OF CUSTOMERS



HYDROGEN GENERATION PLANTS:

Hydrogen Capacity.

VEGETABLE OIL COMPANIES

Bunge, Co.	USA	100,000 SCFH (2,680Nm³H)
Honeymead Products, Co.	USA	62,550 SCFH (1,676 Nm³H)
Archer, Daniels, Midland, Ontario.	Canada	54,167 SCFH (1,451 Nm³H)
Archer, Daniels, Midland/U.S.A.	USA	50,000 SCFH PSA UNIT
Cargill	USA	30,000 SCFH (800 Nm³H)
Mateos, Valldolid	Spain	11,000 SCFH (300 Nm³H)
Vita, Almaty	Kazakhstan	9,330 SCFH (250 Nm³H)
IO&FIC, Ilyichevsk	Ukraine	7,464 SCFH (200 Nm³H)



HYDROGEN GENERATION PLANTS



Technology

With the acquisition of the

KOCH-GLITSCH INC.

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



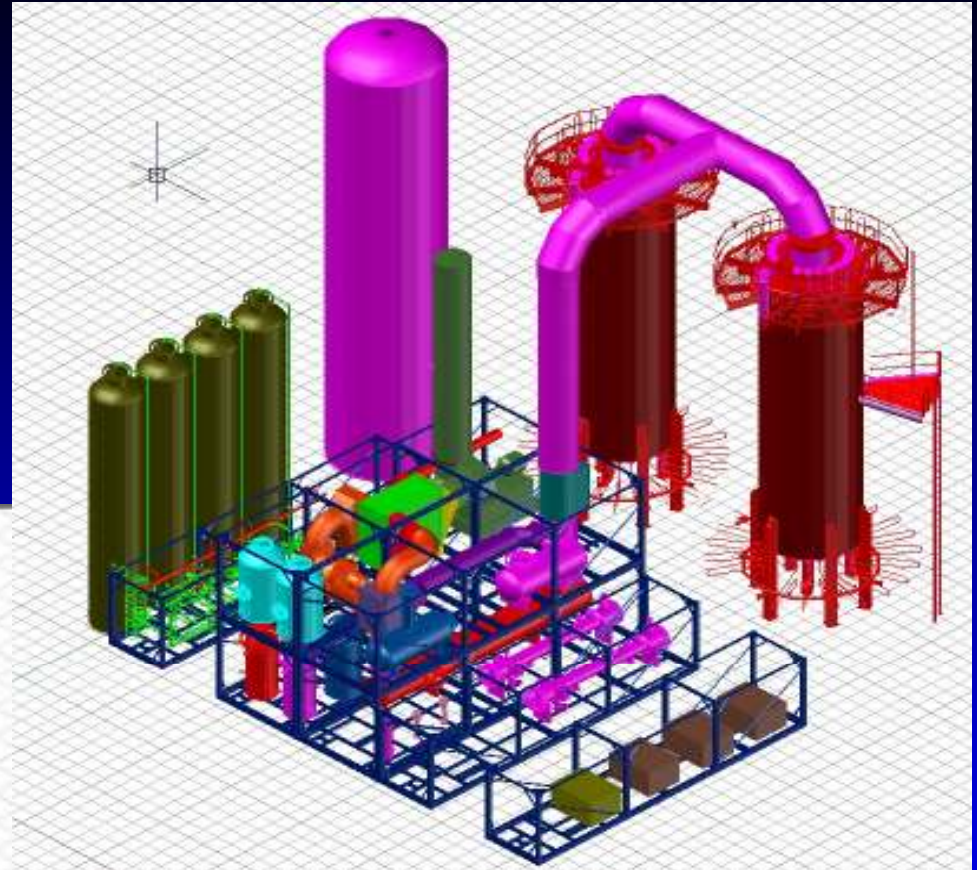
0.5 MMSCFD



CURRENT
CAPABILITY



5.5 MMSCFD

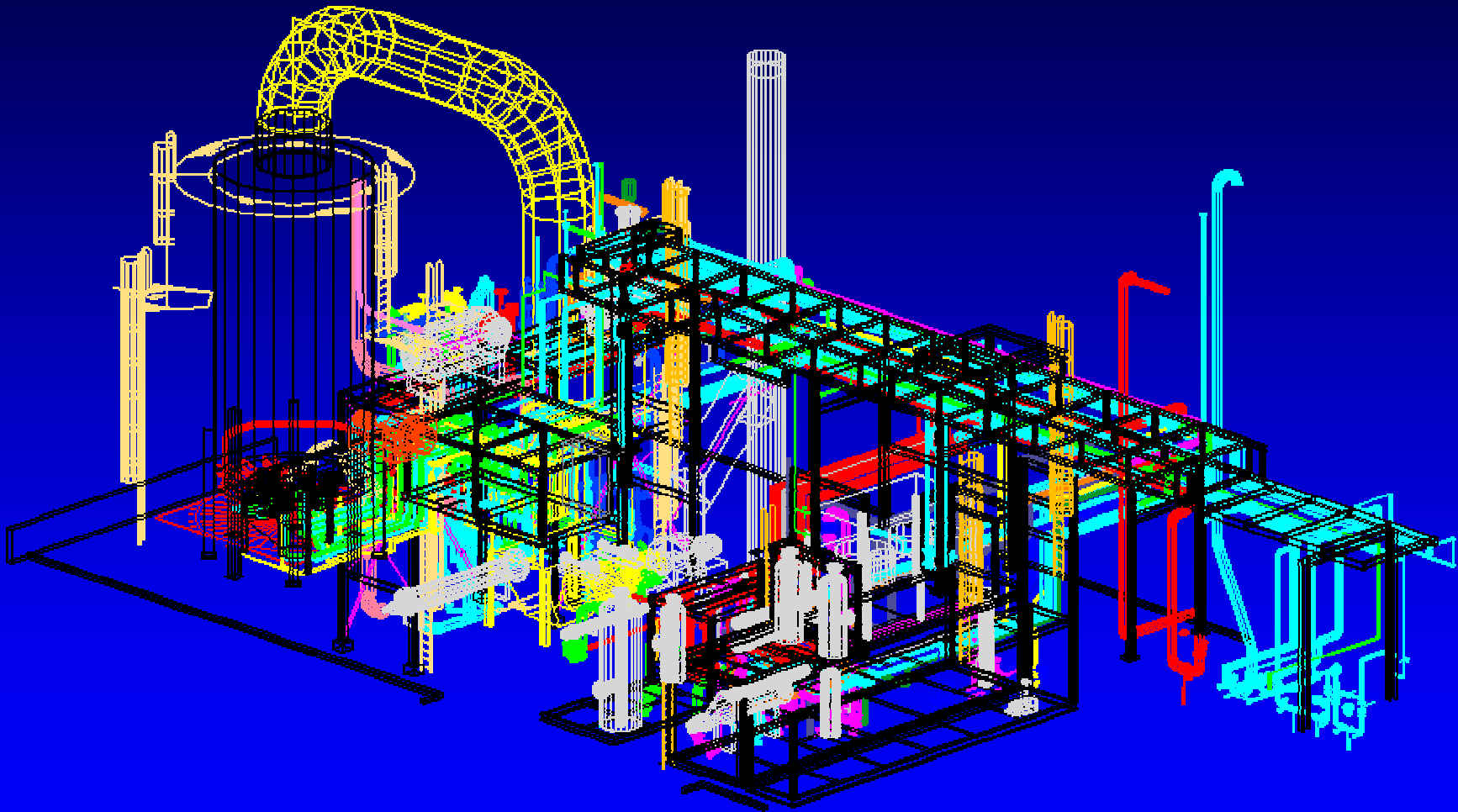


12.2 MMSCFD
WITH THE PARTICIPATION
OF MUSTANG ENGINEERING

HYDROGEN GENERATION PLANTS

TURN-KEY
PROJECT
CAPABILITY

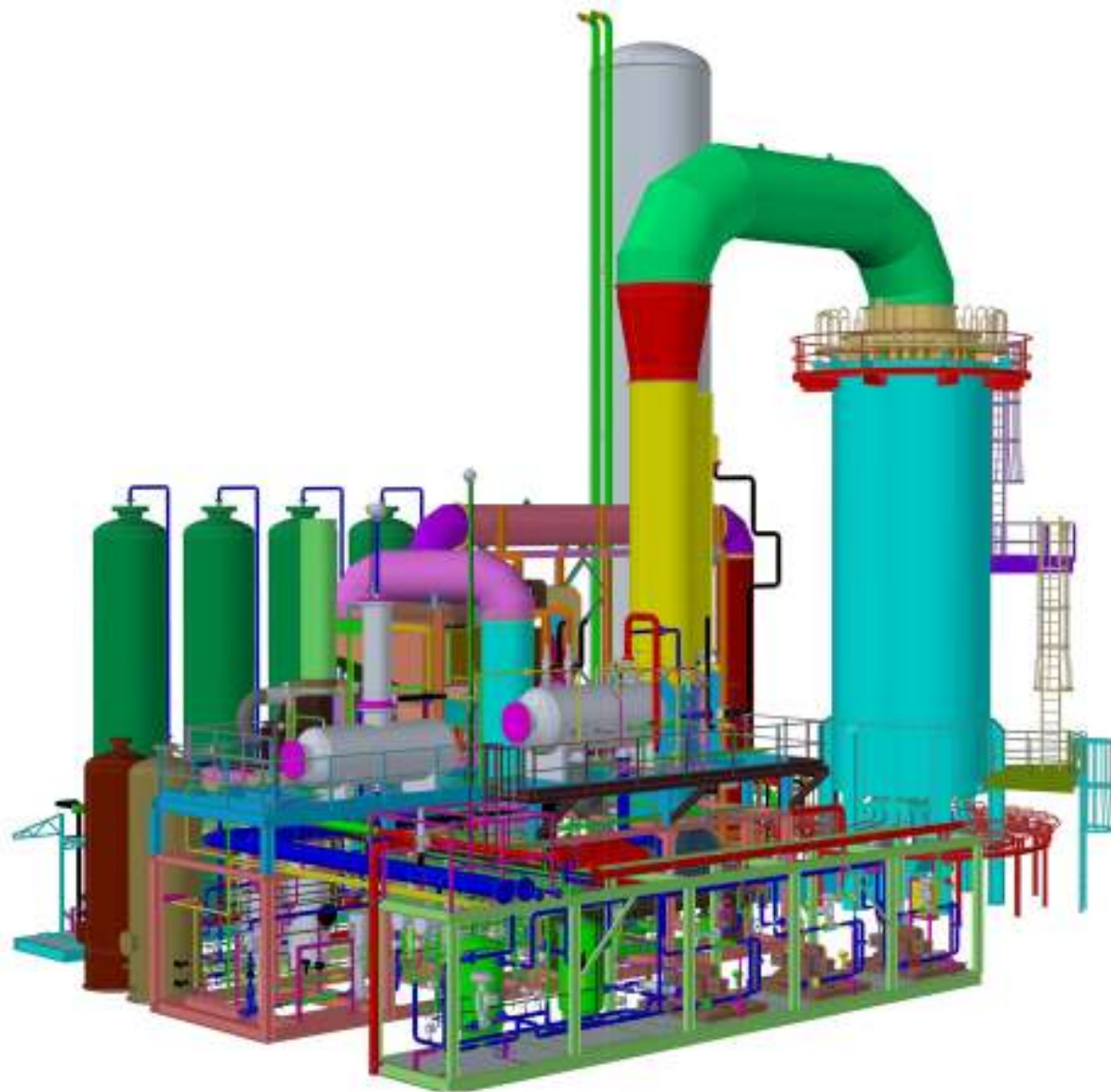




From drawing board

To Reality









HYDROGEN GENERATION PLANTS



US Standards & Codes Of Construction

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.



HYDROGEN GENERATION PLANTS



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





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



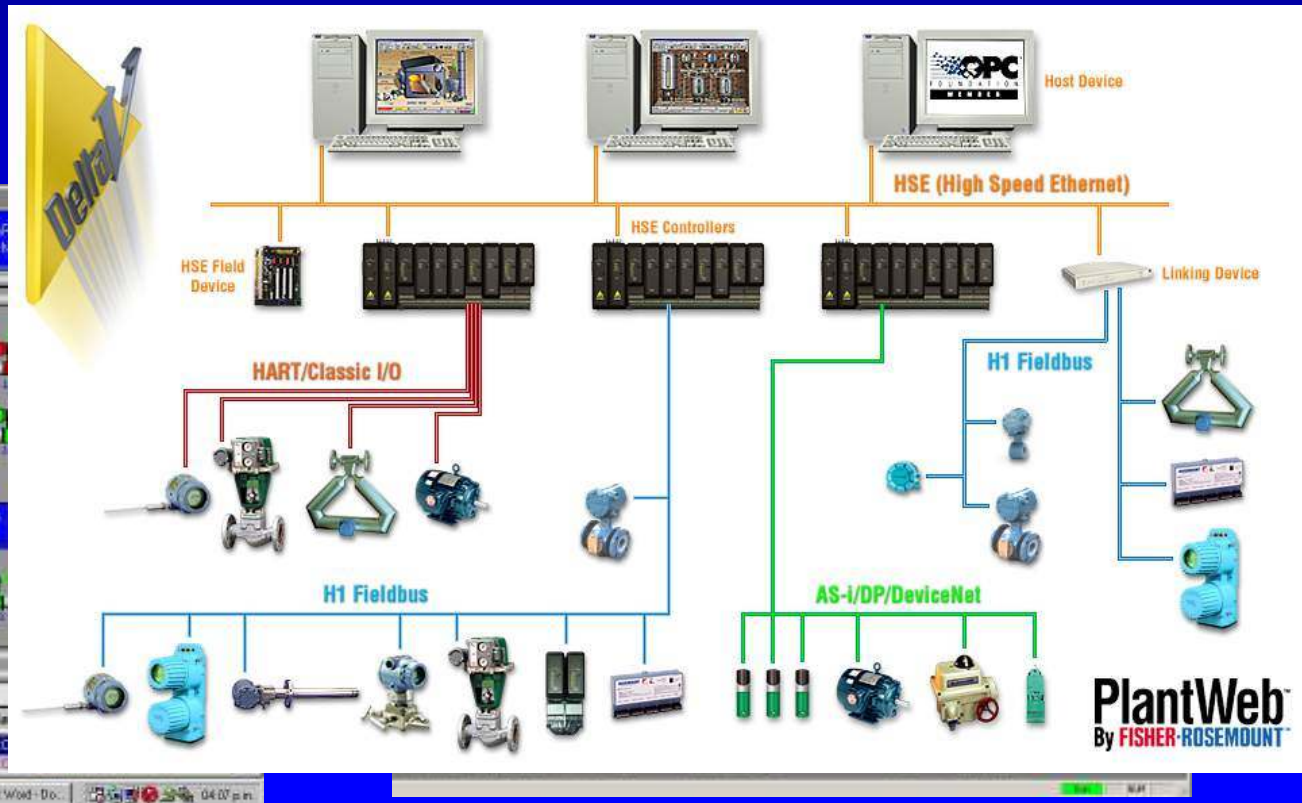


HYDROGEN GENERATION PLANTS RELIABLE CONTROL SYSTEM



**IN-HOUSE
PROGRAMING FOR
DCS, PLC AND HMI**

EMERSON – DELTA V ARCHITECTURE





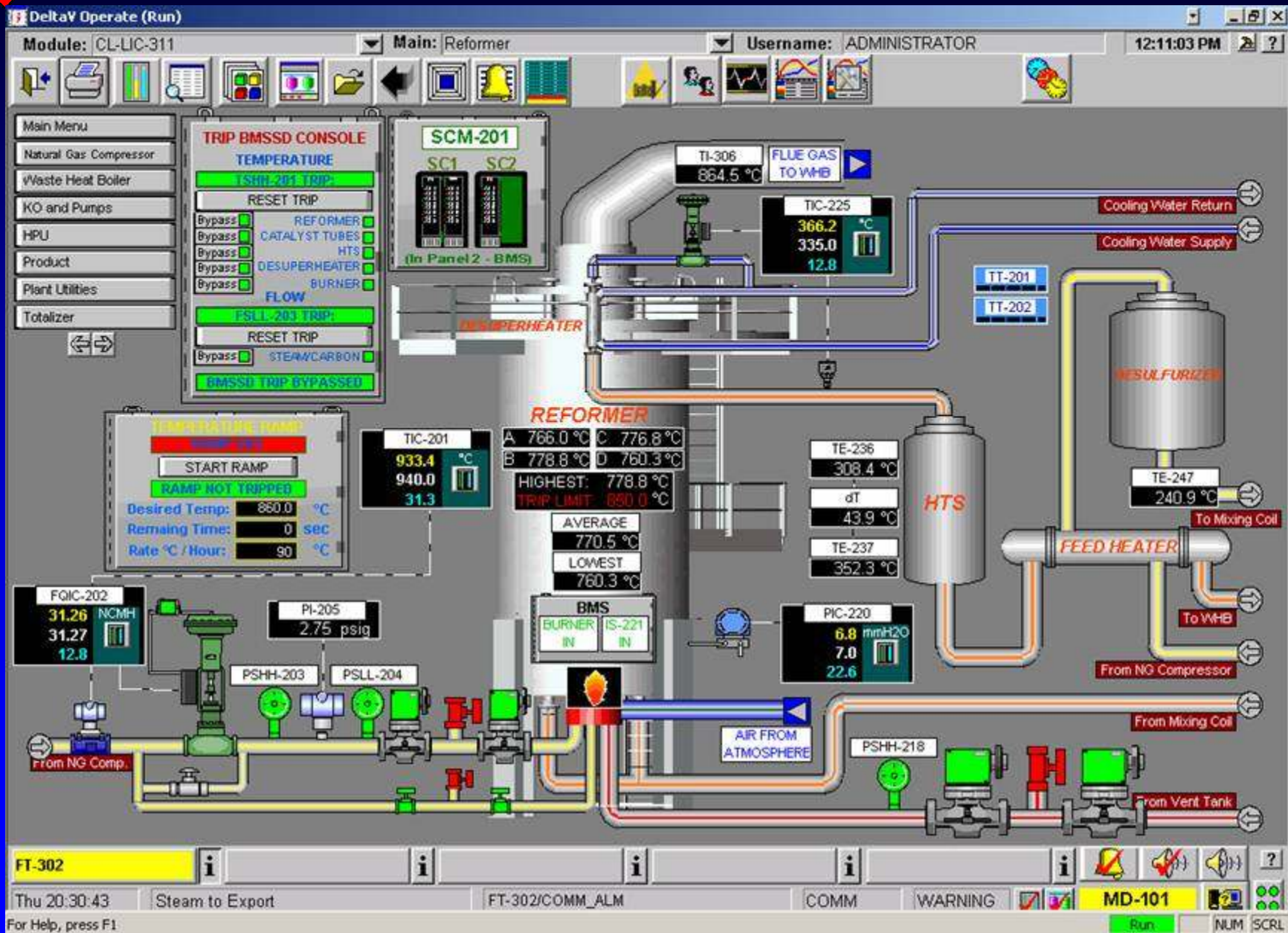
FOCUS ON SAFETY **with** **DELTA V- EMERSON**

Predictive Maintenance

- **With Asset Management Solutions:**
 - - **DIAGNOSTICS,**
 - - **CALIBRATION &**
 - - **DOCUMENTATION.**

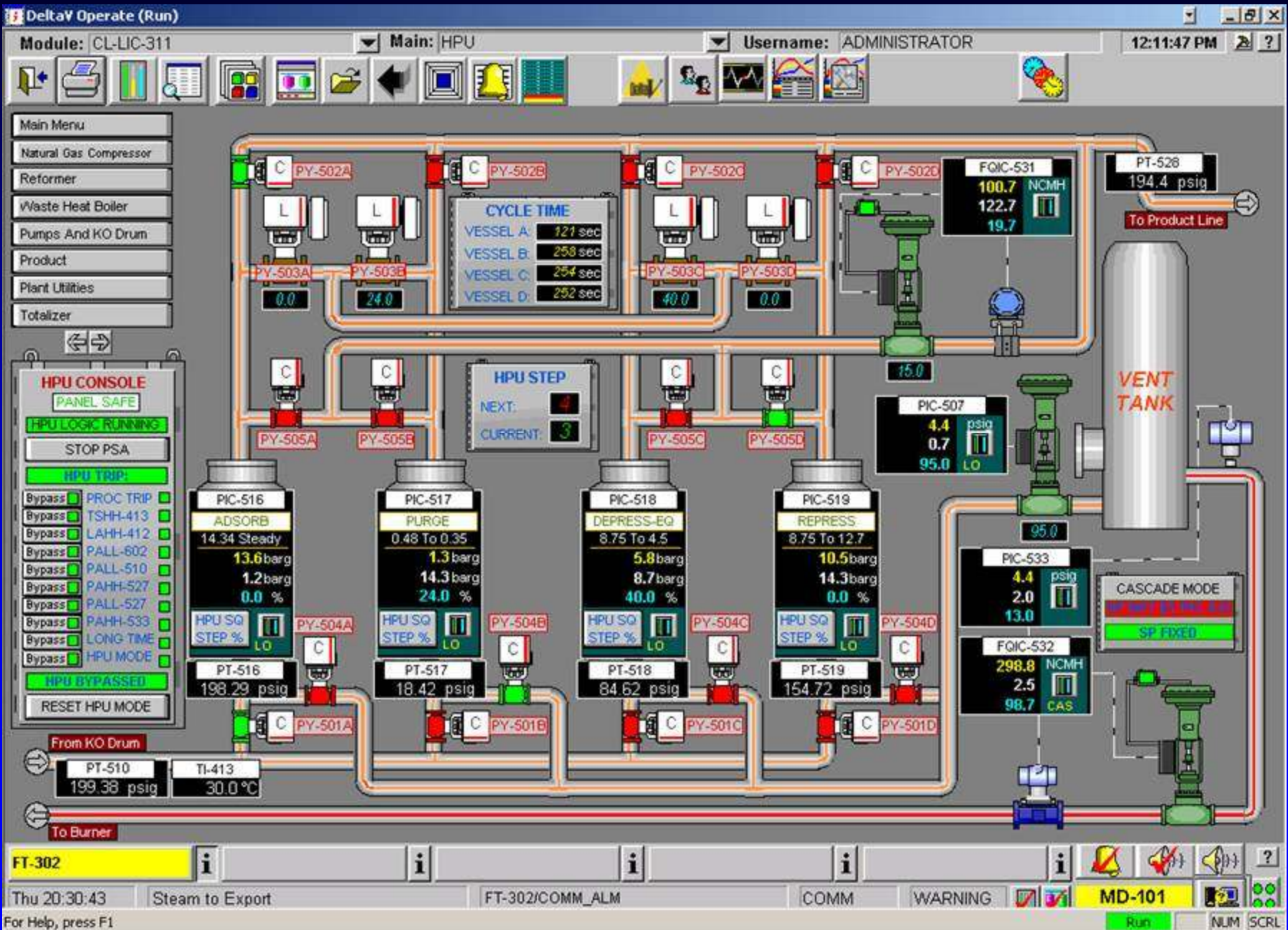


Reformer





PSA Unit





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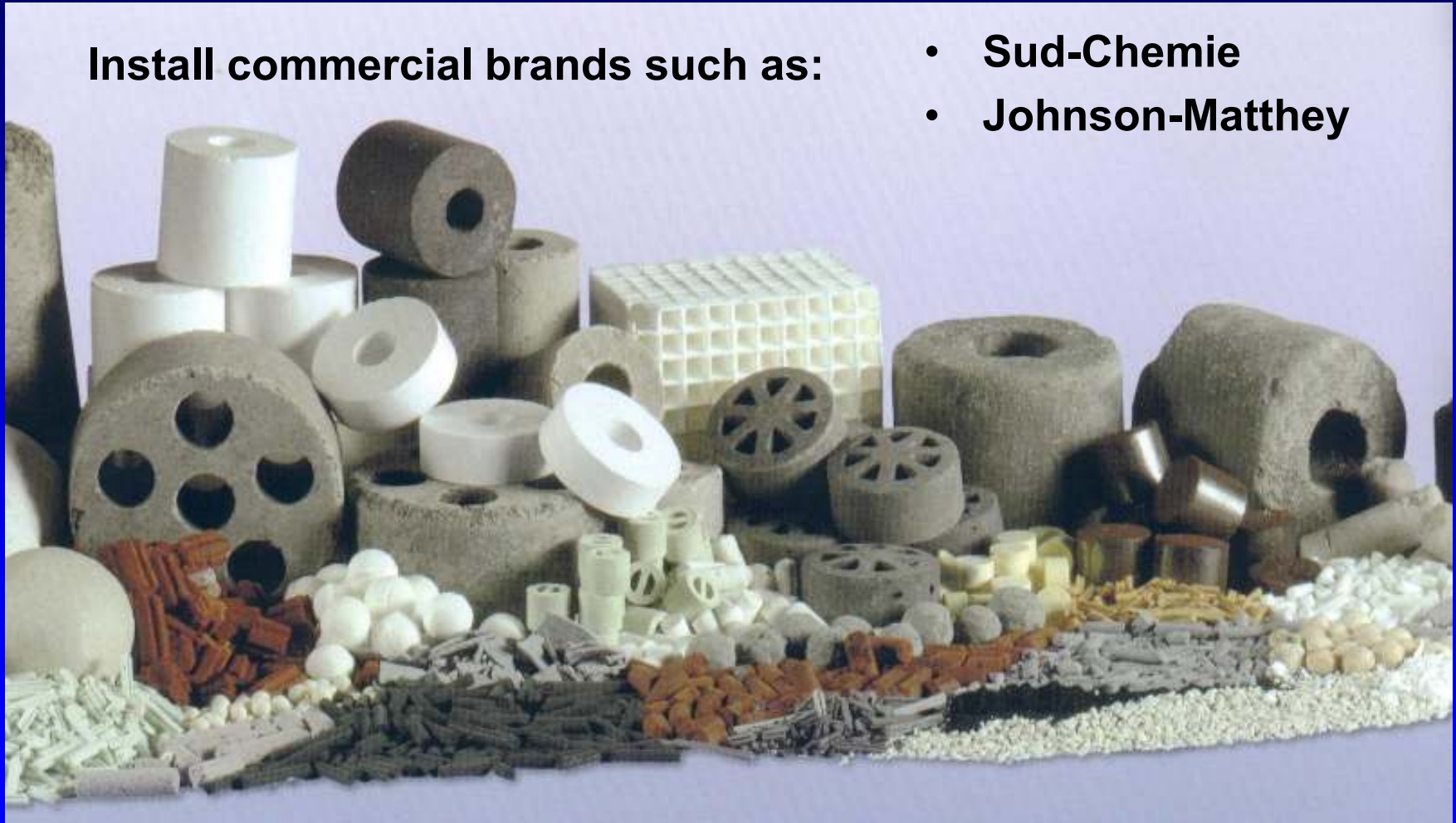
Key Features of the H₂ Plant



CATALYST

Install commercial brands such as:

- Sud-Chemie
- Johnson-Matthey





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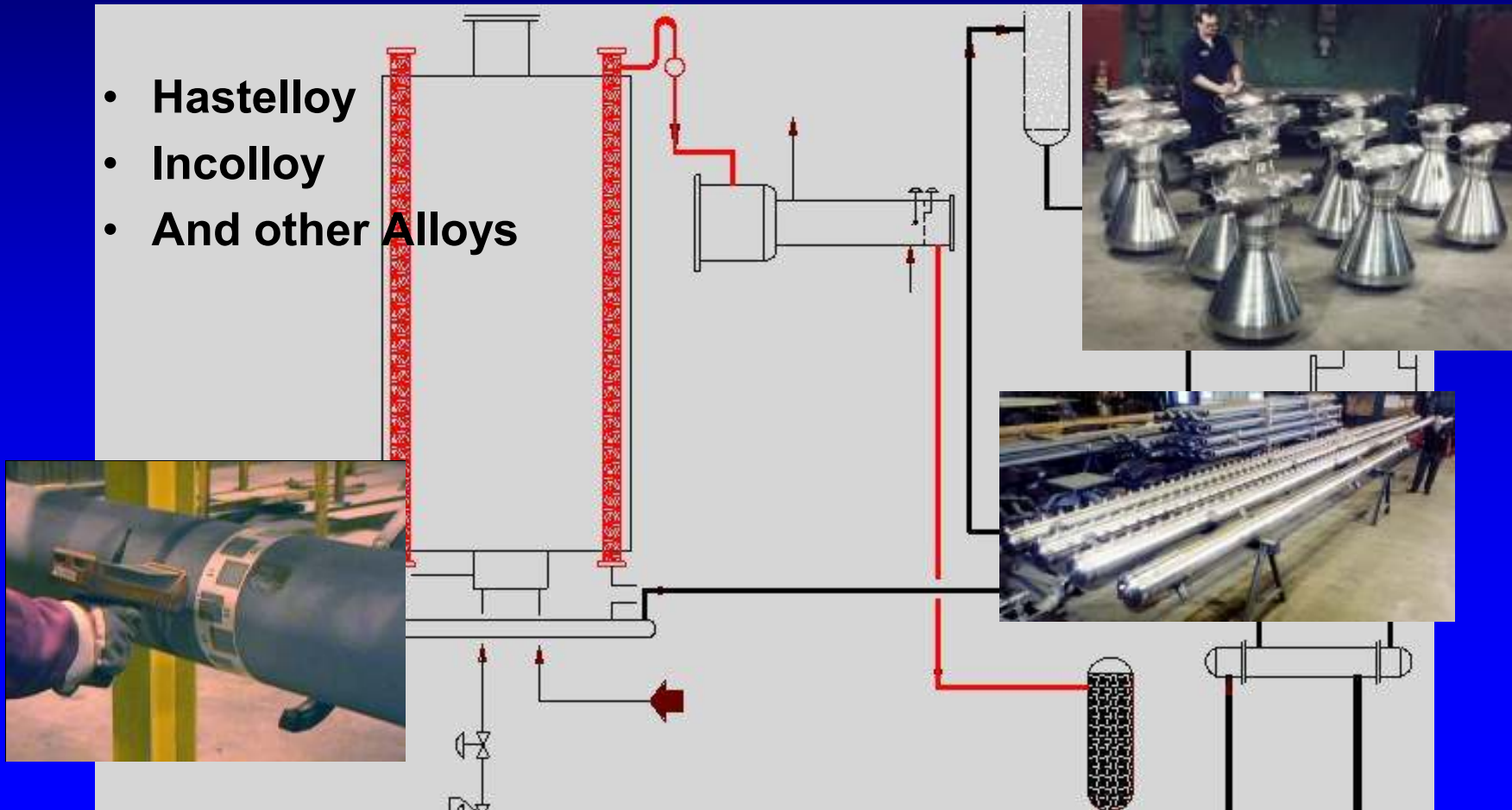
Key Features of the H₂ Plant



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
99.999+**



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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