With reaction conditions of chemical production processes becoming more arduous in terms of temperature, pressure and concentration of the reactants, more sophisticated materials in the construction of Chemical plant is necessary.

Titanium provides resistance to attack of: sea-water; moist chlorine; metallic chloride; chlorite and hypochlorite solutions; nitric and chromic acids; sulphides; organic acids; and many industrial gaseous environments. This makes titanium the ideal material for the construction of a wide range of chemical equipment. TiFab has a long history in this market sector. The following are the specific products fabricated in Titanium or Titanium clad which are supplied:

* Vessels
* Reactors
* Shell & Tube Heat Exchangers
* Titanium pipe spools
* Condensers
* Agitators

Most types of chemical plant can be made in titanium, including reaction vessels in solid, lined, or explosion-clad construction, agitators, gas scrubbing plant, and piping. Oil & Gas and Chemical plant equipment manufacturers include titanium among their standard ranges of materials.

Market trends will be presented on the growth of both the domestic and international markets which have resulted in a variety of experiences each differing based on the destination point of the equipment. This paper presents an overview on the use of Titanium in these respective market sectors with brief references to some of our experiences on the recent projects we have completed.
Titanium in Oil & Gas and Chemical Industries

Presented by:

Charly Hulswitt
Titanium Fabrication Corporation
Overview of Titanium in Chemical and Oil & Gas Market Sectors

- Increasingly arduous process conditions
- Titanium provides resistance to attack of:
  - Sea Water
  - Moist Chlorine
  - Nitric & Chromic Acids
  - Sulphides
  - Metallic Chlorides
  - Chlorite and Hypochlorites
  - Organic Acids
  - Many Industrial Gases
Overview of Titanium in Chemical and Oil & Gas Market Sectors

This makes Ti the ideal material of construction for a wide range of equipment. TiFab has had a long history in this market sector fabricating items such as:

- Vessels (columns, tanks, drums)
- Reactors
- Heat Exchangers
- Pipe and Fittings
- Surface Condensers
- Agitators & Mixers
Sample Ti and Ti Clad Equipment in Chemical/Petrochemical/Oil & Gas Sectors

Vessels / Columns

- Epi-chlorohydrin production
- 20 ft Dia. by 138 ft tall
Sample Ti and Ti Clad Equipment in Chemical/Petrochemical/Oil & Gas Sectors

Reactors
- Rubber production
- 8 ft Dia. by 11 ft tall (3/8” thick)
- Titanium Grade 2

Tanks
- Chlorine Production
- 7 ft Dia. by 16 ft (1/2” thick)
- Titanium Grade 7
Sample Ti and Ti Clad Equipment in Chemical/Petrochemical/Oil & Gas Sectors

Shell & Tube Heat Exchangers

- PTA plant (purified terephthalic acid)
- 60” Dia. by 30 ft long
- Ti tubeside, CS shellside

- LNG production
- 65” Dia. by 40 ft long
- Ti tubeside, CS shellside
Sample Ti and Ti Clad Equipment in Chemical/Petrochemical/Oil & Gas Sectors

Pipe & Fittings

- FPSO ship (Oil & Gas)
- Ti pipe because of saltwater
- SS backing flanges
Sample Ti and Ti Clad Equipment in Chemical/Petrochemical/Oil & Gas Sectors

Steam Surface Condensers (for steam turbine driven compressors)

- Refinery Application
- Ti tubes and Waterboxes
- Ti clad CS tubesheets
- CS shell
Market Sector Trends

Preface:

- At TiFab, we are not tied into one specific market.
- Each of our 3 locations is strategically located to help us be a market share leader in industrial Ti and Zirc.
- Therefore we should be as well equipped as anyone to comment on oil & gas and chemical market sector trends.
Market Sector Trends

On one hand:

- From 2005 to 2008, the % of our sales from O&G/Chemical sectors has gone from a majority of our business - down to roughly 50%.
Market Sector Trends

However....the past 3 years have brought steadied growth in the Ti industrial market.

- Record sales each year 2005, 2006, 2007
- Therefore the volume of sales (in $) for O&G/Chemical sectors has increased over this time span (even though it has become a smaller percentage of our business line)
- The reason the % has decreased for O&G/Chemical markets over this time is rise in other sectors for TiFab (Mining and Military for example).
Looking Forward – Oil & Gas

- After nearly 20-year break from grass-roots refineries in U.S., several projects are under construction and others in the works.

- Amount of FPSO (Floating, Production, Storage, Offloading) and GBS (Gravity Based Systems) oil projects continue to increase both in North America and worldwide.

- Continued growth in Middle East offshore work and Canadian Oil Sands
Looking Forward – Chemical Industry

- Decreased cost of Ti over past 12 months has helped keep it competitive with alternate metals (esp. nickel alloys)
- Major Ti markets (such as PTA, Chlorine derivatives) continue to increase capacity worldwide
- Higher cost of maintenance is becoming more important to plant managers every year. Long term cost benefit of Ti in chemical plant maintenance is helping to increase volume demand.
- 2009 and 2010 coming back to reality somewhat, but will still be relatively strong years
Conclusion

- Potential applications for Ti in Chemical and Oil & Gas industries will grow steadily over the next 5 to 10 years.

- With domestic economy presently turning downward, overall volume of Ti demand in these sectors will shrink over next few years.

- However, the bottom of this expected downturn cycle will still be higher than the peak of the previous cycle from 6-10 years ago. The “valley” will still exceed demand from the past 30 years...due to emerging global markets in Asia and Middle East, and renewed focus on long-term maintenance in plants in North/South America and Europe.

- The bar has been set higher for this market sector the past 2-3 years; and it will not likely be until the next cycle upturn until it is raised again.
Questions / Comments