My name is Bob Swenson and I am with Global Titanium of Detroit, Michigan. Our titanium scrap business started back in the 1950’s. We have been a producer of ferrotitanium for 12 years. Our products are mainly used as alloying additives in steel, stainless steel, superalloys, and aluminum. We also do a lot of processing of ingot quality turnings for the titanium metal producers.

The scrap products come in the form of solids, cobbles, turnings, and briquettes. The processing includes 100% inspection, chemical analysis, and sorting; and then various sizing and cleaning processes.

We also produce titanium metal powders by using the hydride dehydride process. We start with hydriding the titanium raw material which can be either sponge or wrought titanium metal, then crushing, then dehydriding, and then final sizing.

For the ferrotitanium, we produce the 2” steel mill size which is used as a bulk addition in the production of ultra low carbon steels. We also produce the 10 mesh fines which go into cored wire that is used as a final trim addition into steel.
In my discussion today, I am going to address six subjects:

1. The use of titanium as an alloy addition.
2. 70% ferrotitanium.
3. Off-grade sponge.
4. 35% ferrotitanium.
5. The ferrotitanium market – last year and this year
6. The future for ferrotitanium.

There are four major uses of titanium as an alloying additive. Ferrotitanium goes into ultra low carbon steels for automobiles and appliances, titanium scrap products for stainless steel used in automobile exhaust systems, titanium scrap and sponge used in aluminum for various grain refining applications, and titanium scrap used in superalloys for high temperature applications.

The market size of these applications for the world wide free market is significant. Today in 2010, I estimate the consumption of scrap into ferrotitanium for steel is about 45,000 MT, titanium scrap products for stainless is about 6,000 MT, titanium for aluminum is about 3,000 MT, and titanium for superalloys is about 2,000 MT. This totals to about 56,000 MT, which is about 120 million pounds of titanium units that are used to make ferrotitanium or used directly as an alloying additive.

A few years ago, this quantity was nearly 70,000 MT, which is about 150 million pounds. Keep this in perspective when considering today’s worldwide market for mill products at about 200 to 250 million pounds per year.
The 70% grade of ferrotitanium is by far the major product that is used as an alloying additive. And, the supply and demand issues for ferrotitanium influence all parts of the titanium industry. It is produced in North America where there are three producers, and just recently a fourth has announced a new production facility, the United Kingdom where there are four major producers, and then Russia, the Ukraine, China, and Japan, where there are a number of producers. Russia is by far the biggest part of this group that participates in exporting to the free market.

The worldwide production capacity is sufficient so that the market is well supplied and it is highly competitive. There are also a number of traders that participate consistently in the distribution system.

The pie chart shows that ferrotitanium production by region around the world. For North America – 30%, for the United Kingdom – about 45%, and for the rest it is about 25% – which is mainly Russia.

The most common grade is the 70% ferrotitanium, and as the term implies there is 70% titanium contained in the alloy. It is made from variety of mixed alloy titanium scraps. These alloys include primarily 64, and mixed with 6242, 6246, 1023, and so forth.

Next, there are some special grades of ferrotitanium that require low aluminum. These products require use of commercially pure titanium scrap and off-grade sponge to help lower the aluminum content.

And, there is a 35% grade which is made from the mineral illmenite.
The 70% ferrotitanium products work well to utilize the by-products from the titanium industry that are not suitable for recycling. This includes new production scrap for mixed grades of turnings and solids; then there is mill scrap that is not usable because of alloy type or form; demolition scrap that comes from used airplanes and chemical equipment, off-grade sponge, and excess stockpile materials.

The stockpile materials were available in the past when Russia was selling ferrotitanium, sponge, and scrap back in the 1990’s. And, when the DLA was selling sponge in the early 2000’s. Now the stockpiles have been depleted.

The 70% grade is made from scrap. It takes about 1 pound of scrap to make 1 pound of Ti contained in the finished product. The overall cost of the product is mostly variable. It is a commodity and it is priced at whatever it needs to be based on supply and demand.

When there is an oversupply of scrap, prices will go very low. And if there is an undersupply, prices will go as high as necessary; to make sure the titanium units are available for the steel industry.

Several times I have mentioned off-grade sponge. The off-grade sponge can have a high iron content, or a high salt content, or it can be fines from the crushing processes with high oxygen. Based on the forecast of sponge production required to make ingots, which is in the range of 150,000 to 250,000 metric tons per year, there will be about 20,000 to 25,000 MT per year of off-grade sponge available for 70% ferrotitanium or for direct alloying additions. Not all of the off-grade sponge from Russia and China and Japan is available to the free market.
The next subject is the 35% ferrotitanium. There are several producers mainly in Brazil, China, India, and Russia. The raw materials used to make the 35% grade include ilmenite, aluminum scrap that is used as the reductant, steel scrap, and the slag components.

There are about 9 pounds of raw materials required to produce 1 pound of titanium contained in the finished product. The costs of these raw materials are fairly stable and as a result the cost of the product is mostly fixed. For the price, it requires a minimum level to cover its more stable fixed costs. And, we find that it cannot compete with 70% grade when the prices for scrap get really low.

The ferrotitanium business can be characterized best by the US Steel industry, and this situation is similar on a world wide basis. This graph shows the weekly steel production in the United States from 2005 to 2010. The typical historical number was about 2.1 million tons per week. After the economic crash at the end of 2008, the weekly steel production fell to less than 1 million tons.

During 2009 and into 2010, the steel industry slowly climbed out of a deep hole. The production is now about 1.7 million tons per week. The automobile production followed a similar pattern, and so did the ferrotitanium business.

During 2009, steel production fell to about 40% of the pre-crash levels. The automobile production fell to rate of 6.0 million units per year, which was also about 40% of the pre-crash levels. There was a worldwide reduction and consolidation of inventory. Demand for ferrotitanium plummeted and prices
fell by 70% to their lowest levels ever. By the end of 2009, the demand for all of these products had improved substantially.

During 2010 the economy has continued to improve. Steel production has recovered to about 80%. Automobile production has recovered to about 80%, which is a rate of 12 million units per year. And the demand for ferrotitanium has also returned to the 80% level. The slow climb out of the deep hole has resulted in current pricing that is very similar to the pre-crash levels.

This next graph shows an index for the ferrotitanium market pricing for the 20 year period from 1990 to 2010. This graph tells the great story about the market conditions of ferrotitanium. Beginning in 1990, the use of ferrotitanium grew rapidly with a new application in ultra low carbon steels for cars. However, the pricing was very stable with an average price of just below $2.00 per pound from 1990 all the way through 2003. This is where the index was set at 100. During this period, even though there was increasing demand, the market was artificially supplied by titanium from the stockpiles in Russia and later in the United States, and this kept the prices at the low levels.

By 2004 and 2005, the titanium industry was beginning another upward cycle. And the stockpile materials were gone. Prices peaked in 2005 and the index shows that prices were nearly 9 times the prior 13 year average. During that time, there was a great incentive to produce and use the 35% grade of ferrotitanium. It was a big cost savings for the steel companies, and it was available at an index level of about 300, and it contributed to the decline in prices for 70% ferrotitanium.
Next, there was the great recession of 2009. Demand plummeted, and prices fell to their lowest levels ever. The index shows 60. Finally, in 2009 and 2010, there was a recovery in the market to the pre-crash pricing levels.

As we look into the future, there are several issues for supply and demand. First, from the supply side. There are a lot of airplanes to be built and there will be a lot of scrap generated. There will also be more sponge produced, which will provide off-grade sponge into the free market. And, if needed, the 35% ferrotitanium is available to fulfill any shortages.

Second, from the demand side. The need for scrap for ferrotitanium and alloying additions will recover to its prior levels of about 70,000 MT per year. The titanium industry will work hard to maximize the use of scrap in their hearth furnaces. And, the use of buy-back programs will continue to expand.

As we look into the future, I can make several conclusions. The industry will run efficiently with good utilization of scrap and sponge. An oversupply of scrap for ferrotitanium is unlikely because of the emphasis on the buyback programs and use of free market scrap to make ingots. And, if there is shortage of scrap, this would cause prices to firm and encourage greater production of sponge. And next, the 35% grade of ferrotitanium will be available and it may find its home in the marketplace and prevent prices from going too high. And of course, the ferrotitanium industry will never run out of scrap.

However, we can also consider the situation where there may be an oversupply of scrap for ferrotitanium; and this would cause prices to be lower. Lower prices will provide a greater incentive for the use of buy-back programs and
free market scrap for making ingots. The lower prices would also discourage sponge production. Following these reactions in the marketplace, we would begin to see prices firm for both scrap and ferrotitanium.

So then, if all of this happens, we might be right back where we started from, and then the cycle will continue until something happens in the future that we are not expecting!

This is the end of my presentation. Thanks for your time and attention.
2010
International Titanium Association
Orlando, Florida

Ferrotitanium
Global Titanium Inc.
Detroit, Michigan, USA

www.globaltitanium.com
Ti Scrap Products

- Solids
- Cobbles
- Turnings
- Briquettes

100% inspection and chemical analysis, sizing, and cleaning
Titanium Powder (HDH)

- Ti Powder
  - 60 mesh x Down
  - 100 mesh x Down

Hydriding – sponge or metal, then crushing
Dehydriding – then final sizing
Ferrotitanium

- 2” for Bulk Addition at Steel Mills
- 10 mesh powder for Cored Wire

Complete scrap processing for all raw materials
Complete crushing capability for all sizes
1. Ti for Alloying Additions
2. 70% FeTi
3. Off-Grade Sponge
4. 35% FeTi
5. The FeTi Market
6. The Future for FeTi
Ti for Alloying Additions
2010 Worldwide Free Market

- **FeTi** for ultra low carbon steel
  - Flat roll for automobiles and appliances
  - 45,000 MT

- **Ti scrap** for stainless steel
  - Automobile exhaust systems
  - 6,000 MT

- **Ti scrap and sponge** for aluminum
  - Various grain-refining applications
  - 3,000 MT

- **Ti scrap** for superalloys
  - Various high temperature applications
  - 2,000 MT

**TOTAL**

56,000 MT

(120 million pounds)
FeTi 70% Production Available for the Free Market

- **North America (3)**
  - Global Titanium
  - RTI – Galt Alloys
  - Metalliage

- **United Kingdom (4)**
  - London and Scandinavian Metallurgical
  - F.E. Mottram
  - Transition International
  - Cronimet Metals and Alloys

- **Russia, Ukraine, China, Japan**
  - VSMPO
  - Ukrainian Industrial Group
  - Various others
  - Traders
Ferrotitanium Products

• **Standard Grade 70% FeTi**
  – Made from mixed Ti alloy scraps

• **Special Low Al Grade (s) 70% FeTi**
  – Made from mixed Ti alloy scraps, CP scrap, and off-grade sponge

• **35% FeTi**
  – Made from the mineral ilmenite
Raw Materials for 70% FeTi

- New Production Scrap (mixed solids and turnings)
- Mill Scrap
- Demolition Scrap
- Off-Grade Sponge
- Stockpile Materials (1990 to 2005 – Russia and US)

- Made from Scrap (1 Pound per Pound Ti)
- Mostly Variable Cost
- Price – a Commodity, whatever it needs to be, at Low and High prices
World Wide Sponge Total Production
(MT per Year)

- 2005: 200,000 MT (Actual)
- 2015: 300,000 MT (Forecast)

Sponge for Making Ingots

Off-Grade Sponge
Raw Materials for 35% FeTi

- Illmenite
  (FeTiO$_3$ mineral)
- Al Scrap
- Steel Scrap
- Lime
- Fluorspar

- Made from a Mineral
  (9 Pounds per Pound Ti)
- Mostly Fixed Cost
- Price – there is a minimum, it cannot compete with 70% FeTi at Low prices
US Weekly Steel Production

2005 to 2010

(000’s of Tons)

Week of January 3, 2009 = 866,000 tons

Typical = 2,100,000 tons per week

Figures from the American Metal Market
2009 FeTi Market

- Steel production fell to 40% of Pre-Crash levels
- Automobile production fell to 40% (rate of 6.0 million units)
- Worldwide reduction and consolidation of inventory
- Extreme weakness in demand for FeTi
- Prices fell 70% – lowest level EVER !!!!!

2009 Pricing

Pre-Crash Level → BIG DROP → LOW ! → Slow Climb
2010 FeTi Market

- Steel production recovered to 80% of Pre-Crash levels
- Automobile production recovered to 80% (12.0 million units)
- Demand for FeTi returned
- Prices recovered to the Pre-Crash Level

2010 Pricing

Slow Climb ➔ Pre-Crash Level
The Complete Story of FeTi

1990 to 2010

(1990 to 2003 Index = 100)

Figures from the Ryan’s Notes
FeTi Supply and Demand

- Lots of airplanes to build
- Lots of scrap will be generated (ie: 787 and 350)
- More off-grade sponge will be generated
- 35% FeTi will be available (if needed)
- Scrap needs for FeTi and alloying additions will return to prior levels (70,000 MT)
- The titanium ingot producers will maximize the use of economical free market scrap
- The buy-back programs will expand
The Future for FeTi

Conclusions

• The industry will operate efficiently with good utilization of scrap and sponge

• An oversupply of scrap for 70% FeTi is unlikely because of the emphasis on the buy-back programs and the use of free market scrap for producing ingots.

• An undersupply of scrap for 70% FeTi would cause prices to firm and would encourage greater production of sponge

• The 35% FeTi may find its home in the market place and prevent prices from going too high

• The FeTi industry will never run out of scrap
The Future for FeTi

Conclusions

- HOWEVER;
- IF there is an oversupply of scrap for 70% FeTi, prices will be lower
- Lower prices are an incentive for buy-back programs and greater use of free market scrap for producing ingots
- Lower prices could discourage production of sponge
- These reactions will cause prices to firm for 70% FeTi
The Future for FeTi

Then the cycle continues,

Until something unexpected happens!
The End

Thanks for you time and attention.