Recycling Mining Tires

The Monster OTR’s that Challenge Today’s Tire Processors
The “End of Life” OTR (US Market)

• OTR’s represent just 1% of the tire industry in unit volume, but 15 to 20% in total weight.
• The tire recycling industry is addressing the challenge to manage this tire flow to recover and recycle the significant volume of high quality rubber and the tons of high carbon steel found in these BIG LUGS of the Tire Industry.
• As tire industry professionals we must improve the recovery of these valuable resources to become more sustainable!!!
Current OTR Market (cont’d)

- Since 2010, the OTR market for OE and Replacement has remained steady at slightly more than 3 Million units.

- The majority of these are Grader, Haulage and Industrial vehicle sizes.

- The focus of today’s presentation is the Large (heavy duty) OTR segment which represents about 300,000 units/year.

- These tires range in weight from 300 pounds for a 24 inch tire to over 14,000 pounds for a 70/70- 57 inch size!
Current OTR Market (cont.)

• The 300,000 Heavy Duty OTR market includes:
  – Construction segment (25” and below) 77%
  – Aggregate segment (29” – 49”) 15%
  – Mining segment (51” and up) 8%

➢ Note that the mining segment of 8% represents 45% of the scrap tires by weight!

- Bias ply represents 30% / Radial Ply 70%
- OE shipments 33% / Replacement market 67%
Before “End of Life”

• **Tire Repair is Recycling and extends OTR Life!**
  - Thousands of OTR’s are damaged every week
  - The majority of these very expensive tires are repaired and placed back into service. Most can be repaired multiple times

• **Tire Retreading is Recycling and extends OTR Life!**
  - 70% of OTR tires removed from vehicles and equipment with the intent to retread are retreaded
  - Current costs to retread are 30%-50% the cost of a new tire and last over 80% as long
  - It is estimated that retread plants produced a total of 615 large OTR retreads per day last year.
Approach to Processing Mining Tires

- Market – Front End Supply
- Logistics
- Capacity
- Capital Investment
- Operating Costs
- Market – Back End Demand
Stockpiled Mining Tires – Real World

Storage
Logistics
Contamination
Degradation
Challenges Facing the OTR Tire Recycling Industry

- **Transportation Costs**...... special width permits, trucks limited to 4-5 OTR’s due to weight.
- **Handling Equipment**....... to safely and effectively load and unload OTR tires.
- **Processing Equipment**..... to down size and prepare material for shredding or other uses.
- **Large Space**....................to store scrap tires, operate equipment, inventory finished product
- **Trained employees**........... to safely manage the flow of these over weight tires.
- **Sustainable markets**.......for the processed OTR material.

Significant capitol expenditures.
Breakdown of OTR tires – 59/80R63 and the 70/70/57’s

59/80R63 – 13ft tall and 10,000 lbs worn out

70/70-57 13 ft. tall and 13,500 – 14,000 worn out

59/80R63 – Bead Section, 3 inches in diameter.

70/70/57 Bead Section

59/80R63 Steel Bead

70/70R57 13-14 inches of solid Rubber in the shoulder of the tire.
Loading/Unloading Equipment Needed to effectively handle the OTR Tires

Tele-handler with / 8 foot forks

Tire Handler / Attachment

STAGING OF TIRES by Weight and size
Transportation
Transportation requiring Special width permits
Initial Size Reduction???
Initial Size Reduction

First Cut
Removing the Bead Prolongs shredder life
And delivers a recyclable grade high carbon steel
The hydraulic system can pull the bead bundles “clean” from tires with a 25” rim opening as well as up to 63” radial tires.
Bead Removal for Steel Recovery

• The OTR bead is made of high carbon steel

• Modern equipment removes the bead leaving a 95% clean steel material.

• Today’s market for clean wire is about $125/ton

• Giant OTR’s yields about 500 pounds of wire
Downsizing using a bagel cut....
Half the Size – Half the Weight
Sections

The Titan II

[Image of a Titan II construction vehicle]
Downsized Sections for Better Handling and Processing
Reducing into various size sections makes them easier to feed into shredders and causes less blade wear (time & money)
Initial Primary Shredder

“Size Does Matter”
Multiple Machines for Reduction & Production
Capital Investment – $2-4 Million

Primary Shredder

Secondary Shredder

Oversized Material Returned for Further Processing

Sizing Shredder

Classifier

Accepts

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Processing Yield (What’s in the tire)

• **Ontario Tire Stewardship Off the Road Yield Study, draft Feb 2016 by Envise**

• Yields of materials from OTRs vary
  – Rubber: 43-71% (giant OTRs are high rubber)
  – Steel: 9-57% (industrial tire category is high steel)
  – Fabric: 0-32% (Ag and large OTRs are high fabric, giant OTRs are zero fiber)

• Depends on the exact OTRs
Back to the U.S., we can do better than this!

Far too many OTR’s are found in vacant desert lots along major highways, while others are buried or abandoned in mines.
A Few Examples of OTR Processing in the States

• Massachusetts: F&B makes dock bumpers, rollers, blade and bucket wear pads.
• Michigan: Entech downsizes OTR’s into playground material, TDF and TDA.
• Minnesota: Liberty Tire sections and shreds to produce TDF, TDA and ballistics material.
• South Dakota: Wenzel Construction makes livestock water tanks, bale feeders, barn scrapers
• Utah: Western Tire produces mulch and livestock water tanks
Where are the Fed’s and Regulations?

• Current Federal Policy allows the disposal of solid waste on Federal land. The U.S. Bureau of Land Management continues to review this policy.

• The U.S. Forest Service and U.S. Bureau of Land Management are conducting research to determine available alternatives to landfilling.

• Discarded tires are deemed a solid waste under current U.S. EPA regulations.

• The U.S., Canada and global mining industries have undertaken green initiatives which include cleaning up waste and discarded materials (tires) from mine sites.
What about Canada’s Market?

• OTR’s represent about 15% of the total Canadian tire supply by weight.

• Although there is no common approach to tracking OTR’s across the Provinces, best estimates based on available data indicate that 50 to 60% of Canadian OTR’s are collected and processed into tire derived products.

• Perhaps Canada is one of the leading OTR recyclers in the world.
Around the Provinces

• **Ontario:**
  The Ontario Stewardship Board is well funded, allowing processors to absorb the high processing costs from handling, size reduction and possible debeading to covert about 90% of the scrap OTR’s into crumb rubber.

• **Alberta:**
  - Ft. McMurray - Green Carbon (Thermal Vacuum Process)
  - Edmonton – Liberty Tire Recycling
    Shears into smaller 250lbs. sections, then shreds into TDF, TDA, small amount of mulch.
Continuing Around the Provinces

• British Columbia
  ➢ Vancouver - Liberty Tire Recycling
    Shears, Shreds into TDA, Mulch, Crumb

• Manitoba
  ➢ Provincial program provides financial support to produce Tire Derived Aggregate for construction projects, water troughs, snow plow blades, dock bumpers, and mulch

• Quebec
  ➢ Provincial program does not collect mining tires. Mines deliver to processors. One company, Animat designed equipment to process OTR’s to allow the OTR rubber to be incorporated into their crumb rubber production.
Manitoba Cows Enjoy OTR Recycling
A closer look at......
Thermal Vacuum Process
FT. McMurray, Alberta May 2016
Titan Tire Reclamation Corp.

• Reactor separates oil, carbon black, steel, gas

According to Titan, a 59.00R63” mining tire yields:
• 500 gallons of renewable blend oil
• 4000 pounds of carbon black
• 2000 pounds of steel
• 3,267,333 cu. ft. of syn gas (which provides energy to run the reclamation system)
More Thermal Vacuum News

• Developed in Rome, GA by Green Carbon, a subsidiary of OTR Wheel Engineering.

• Titan Tire Reclamation Corp, a subsidiary of Titan International, uses the Green Carbon process to convert Canadian scrapped mining tires into valued products.

• Titan expects to have reactors operating in Chile, to serve the copper mining industry, and Australia, to serve coal and other ore mining, in the next couple of years.
Kal Tire

• Partnership with Liberty in Alberta
• Pyrolysis plant in Chile
Latin America

• **Extended Producer Responsibility (EPR) in Chile, Peru and Columbia**
  - Draft Regulations to EPR Law Published in Chile.
  - Revised solid waste laws incorporating EPR in Peru.
  - Eagle International from Dakota City, Nebraska is selling equipment in Brazil and Chile.
What is EPR?

• An alternative solid waste management system where product manufacturers bear responsibility for their products at end of life.

• Differs from Product Stewardship where producers engage to assure the sound management of their end-of-life products.

• Rather puts all the responsibility – financial, operational, reporting – all of it - on the product manufacturers.
OTR Recycling in Chile
The
Chuquicamata Copper Mine
Chuquicamata Mine Chile

- Equipment in place to remove the bead, bagel cut and section the tires.
- Planning to expand this technology to additional Codelco mines.
- Currently considering the implementation of a pyrolysis process to recover raw materials.
- Have 30,000 tire inventory of scrap OTR’s needing processing!
- The steel material in these stockpiled tires has a value of about $1M!!!
Markets in Chile

- Currently producing crumb rubber that is used in rubberized asphalt.

- The steel removed is sold to steel mills.

- Pyrolysis process is in the plans.
Anglo American Mine South Africa

• The contracted tire recycler in South Africa is Redisa.

• The company owns and operates equipment that removes the bead and downsizes into sections.

• This operation which has ties to the government, is considering introducing the pyrolysis process.
Markets in South Africa

• The OTR downsized material is used for tire derived fuel to produce electricity. The electrical grid in South Africa is very weak causing periodic outages. The use of tire derived fuel is a significant benefit.

• The pyrolysis system is being planned.
What is Pyrolysis?

• The pyrolysis method for recycling scrap tires is a technique which heats whole or shredded tires in a reactor vessel containing an oxygen free atmosphere. In the reactor, the rubber is softened after which the rubber polymers break down into smaller molecules of the original components, producing oil, gas and char (carbon black filler). The minerals that were part of the tire are removed as solid ash.
What’s new in Australia?

Perth-Western Australia:
Tytec Recycling announced that they are planning to provide the mining and Ag segments of the market a way to convert scrap tires into renewable energy sources. The technology comes from Green Distillation Technologies Corporation based in Melbourne.

The process converts OTR tires into high quality steel, diesel oil and carbon. Tytec refers to the process as “Destructive Distillation” and indicates that the reactors operate at a much lower temperature and pressure, differing from pyrolysis. Their plans are to open a recycling center in 2017.
A Brief Update from Japan

According to the Japan Automobile Tyre Manufacturers Association (JATMA)

- About 60% of the Tyres generated in Japan are used as fuel (TDF). The largest users are pulp and paper companies.
- Heavy machines are used to cut OTR tyres into downsized sections where they are shredded into 2 Inch fuel size chips.
- The bead sections are cut from the tyres and recycled in electric arc furnaces by steelmakers.
European Technology

• Big Tire Recycling Company BTRC in Belgium
• Ultra High Pressure Water jetting to disassemble OTRs
• Produces crumb rubber and clean steel and fiber
Recyclers today are managing OTR’s in many valuable ways:

- OTR’s become dock bumpers, wear pads, livestock water tanks, bale feeders, feed bunkers and ballistics chips for gunnery ranges.
- Additionally, processors are using the rubber as fuel, civil engineering chips, rubber asphalt roads and landscaping.

These well established markets are valuable to the recycling industry.

However, if we are going to increase the level of OTR recycling; we must stop stockpiling and burying.

Investments in processing equipment, technologies and markets are necessary.
Managing “End of Life” OTR’s

◆ When we as an Industry begin to think of scrap or “end of life” OTR’s as a resource whose raw materials are just waiting to be mined, rather than waste that needs to be managed, then we have a thought process that opens up a whole range of challenges and significant opportunities!

◆ The days of OTRs becoming stock piles at the mine site or in vast open fields are about to end. Better solutions are being developed to remove the high quality steel, down size the tire at the job site for easy transport and shred the tire into manageable processing sizes to produce safe handling smaller sections for processing. Instead of tire dumps and landfills, we see roads, playgrounds, products and sporting fields.