

# ENHANCED BIOMASS TECHNOLOGY



2018

This information was last revised March 2018

# GLOBAL TRENDS as it affects tire recycling

## NATURAL RUBBER PRICES

- The price of natural rubber keeps increasing.
- Natural rubber is a key component in making tires.
- Therefore . . . recovering some of that rubber to be used again in new tires will be a great cost benefit.
- . . . Recycling some of that rubber and blending it with recycled plastics will be a big environmental benefit . . . thus . . . making a used tire increasingly more valuable.



# GLOBAL TRENDS as it affects tire recycling

## GLOBAL WARMING

Impacts every daily process in our lives driving us toward better energy efficiency.



## THE THREE R's . . . REDUCE, REUSE, RECYCLE

Maximize the inherent value in recycled products

### DON'T "burn" tires

It takes 140,000 BTU's to make one (1) pound of tire. You can only regenerate 14,000 BTU's per pound of tire when burning them. What a waste of energy !



### DON'T "bury" tires



### DON'T just make "crumb rubber"





## PRIMARY TURNKEY CRYOGENIC tire recycling

Our PRIMARY CRYO SYSTEM is designed to process 3+ million tires per year. Each system is sold with an integrated shredder and/or granulator.

Typical primary crumb is separated into:





## FINE MESH

- **STANDARD FINE MESH** is 20 mesh through 80 mesh (.75 mm through 0.425 mm)
- Ambient systems are limited to 30 mesh
- Our cryogenic process produces crumb with rounded edges which flows most smoothly than sharp edged ambient crumb
- Higher value output per dollar of input



## VERY FINE MESH

- **VERY FINE MESH** is 30 mesh through 100 mesh (0.6 mm through 1.149 mm)
- Ambient systems are limited to 30 mesh
- Our cryogenic process produces crumb with rounded edges which flows most smoothly than sharp edged ambient crumb
- Even higher value output than FINE MESH



## BLENDING

- Blends recycled tire into **CRYO CRUMB RUBBER** with post industrial and post consumer recycled plastic to produce a Thermoplastic Elastomer (TPE) without any additives.



**\$60,000,000/yr**



**10 to 15 year global off-take agreement**

**with**

**TAKE or PAY**

**. . backed by a LETTER OF CREDIT (LC)**

**. . . Can generate approximately \$60 million USD  
per year in revenue.**

# RUBBER ASPHALT

- A time **TESTED PROVEN SOLUTION**
  - over 30 years for all climates
- Proven alternative to costly reconstruction
- Uses 1,000 tires per lane mile in pavements 1" thick



## ADVANTAGES OF RUBBER ASPHALT PAVEMENT STRATEGIES

- More abrasion resistant
- Reduced oxidation
- Increased fatigue resistance
- Can reduce thickness
- Reduced construction time/Increased safety
- Savings in energy and natural resources
- Lower maintenance cost

**ADVANTAGES**





## PRE-BUILDING THE CALIFORNIA TURNKEY SYSTEM

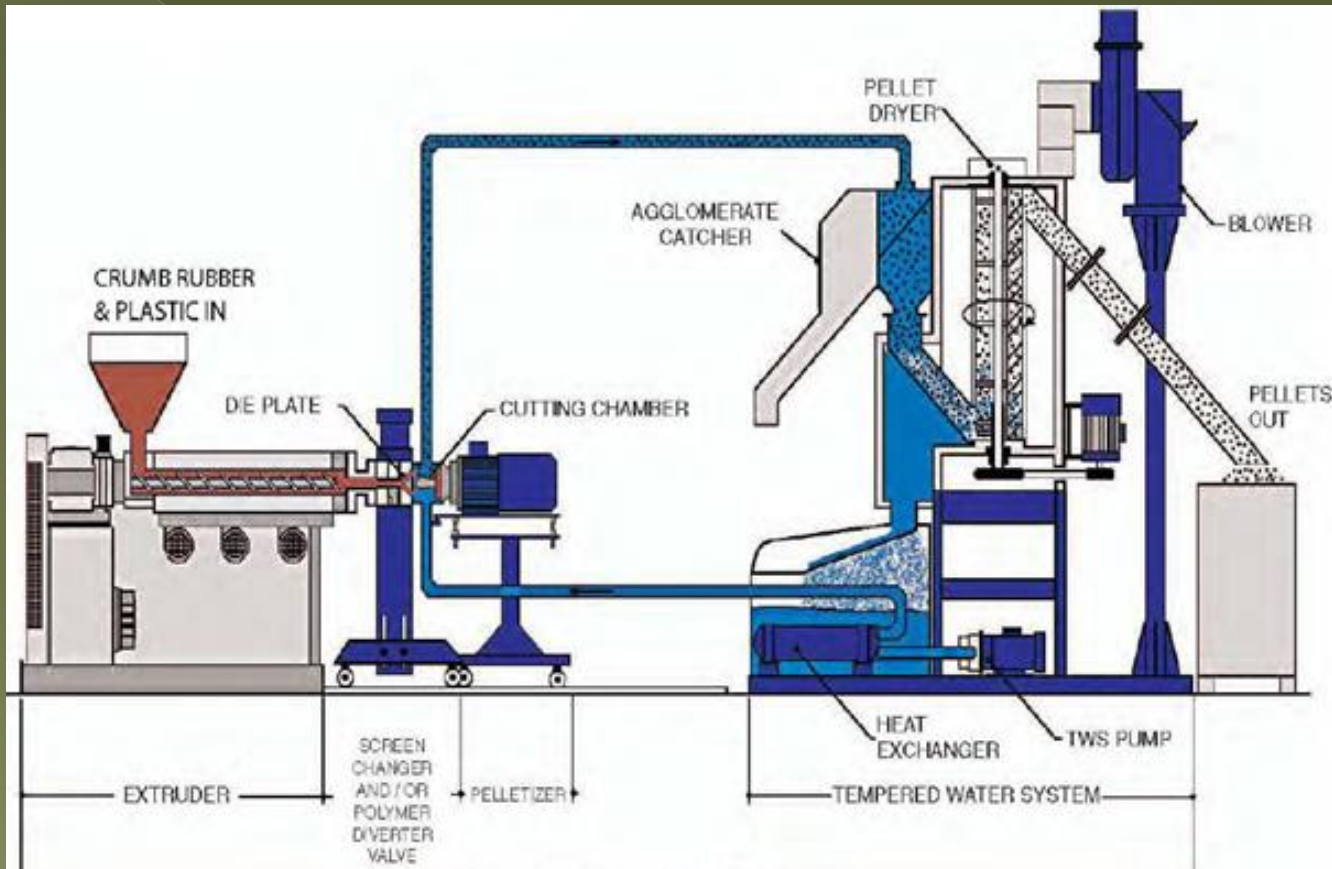


## **DOES NOT EMIT ANY POLLUTANTS . . . into the environment**

- Will reduce pollution by using more recycled rubber and more recycled plastic
- Will divert rubber from TIRE DERIVED FUEL (TDF) due to the higher value stream
- Exhibits the same properties of rubber and plastic but with broader application and versatility.
- Uses 30-mesh and finer cryogenic rubber tire crumb as an input along with recycled post industrial plastic.
- Rubber blend percentages can be from 10% to as high as 80% rubber depending on customer requirements.
- Can either be pelletized for injection molding or extruded.

## RUBBER & PLASTIC ARE BLENDED

using a high-speed, high horsepower, patent pending blending unit.



- Hourly production rates can be from 2,000 lbs to 7,000 lbs per hour

## INJECTION MOLDING OUTPUTS – feature a Pelletizer and a Dryer

Profile materials like artificial lumber:

- a Profile Die is added along with
- a Melt Pump
- a Puller
- a Cooling Trough and
- an Automatic Cut-off Saw



Photos from pre-production plant  
in Michigan, USA

# OPERATING

Enhanced Bio-Mass Turn-Keys will utilize as Feedstocks about Five Hundred (500) Car Tires per-Hour-Basis – which amounts to 4.5/5MT per hour @ inputted-basis.

Electrical Consumption @2,160KW per Hour.

Operating Personnel: One (1) Foreman

Three (3) Shredder/Granulator Operators @per-shift-basis

One (1) Fine Mesh Operations @per-shift-basis

One (1) General Helper

Three (3) Blender Operators @per-shift-basis

Three (3) General Helpers

Recommended Building Size: 100,000 sq. ft. (to accommodate the machinery, storage of raw materials and finished product.





# PRODUCTION FLOW



Products produced with recycled crumb rubber use less materials and often outperform the conventional or standard solutions.

Our 60,000 square foot facility is equipped with state-of-the-art equipment that can process up to 5 metric tons of product per hour. Operating 24 hours a day Monday through Friday gives us the capability to fulfill the largest of orders and run a clean & efficient business.

## Common Ground Rubber Uses

- ✓ *Synthetic Turf*
- ✓ *Playground Surfacing Products*
- ✓ *Sports Fields*
- ✓ *Rubberized Asphalt*
- ✓ *Colorized Mulch*

Ground rubber from whole tire recycling can provide your business with reduced production costs compared to higher cost virgin materials.



## YARD: INCOMING TIRES

Sorting, Staging for Shredding etc . . .



## TIRES “LACED”

In trailers for maximum capacity



## TIRES ORGANIZED

For Shredding



## SORTING

Some are “culled” & sold



# LOADING

Tires onto the Shredder



# SHREDDER

infeed Conveyor





# SHREDDER & GRANULATOR

To shred tires & then remove most of the steel & fibre



## RUBBER & WIRE

Before final separation

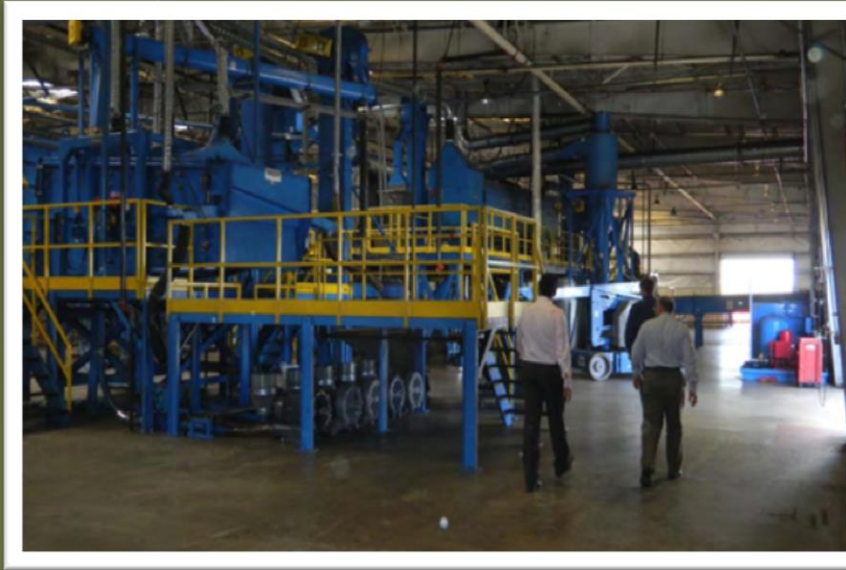


## STEEL SEPARATION

In the Liberator



# PRIMARY SYSTEM





## **FREEZE TUNNEL & ELECTRICAL PANELS**



## INJECTION MOLDING BENEFITS

- Lower Processing Temperatures than virgin plastic resins, saving on electricity costs
- Mold Cycle Times can be consistently be reduced by 15% to 25% for the Injection Molder
- Cools rapidly and evenly throughout the molded part



# INJECTION MOLDING BENEFITS

- **LOWER RAW MATERIAL COST** due to the lower cost of recycled rubber compared to the cost of virgin rubber in other TPE's (ThermoPlastic Elastomer).
- **MORE PARTS PRODUCED PER HOUR** with the same number of machines.
- **CAN BE PAINTED** with oil, latex or epoxy paints.
- **LOWER UTILITY COSTS** and **LESS FLOOR SPACE** over time.

Pre-production plant  
in Michigan, USA



# EXTRUDED PRODUCT BENEFITS

- Lumber & wood replacement products DO NOT EXPAND or CONTRACT like plastic or wood fibre composite products.
- Decking will outlast the surrounding deck structures
- Testing concludes that there is no migration of nails or screws for 25 years.
- Will NOT Splinter, Warp or Rot.
- UV, Termite and Skid Resistant

Pre-production plant  
in Michigan, USA



## POTENTIAL APPLICATIONS - ASTM specifications available

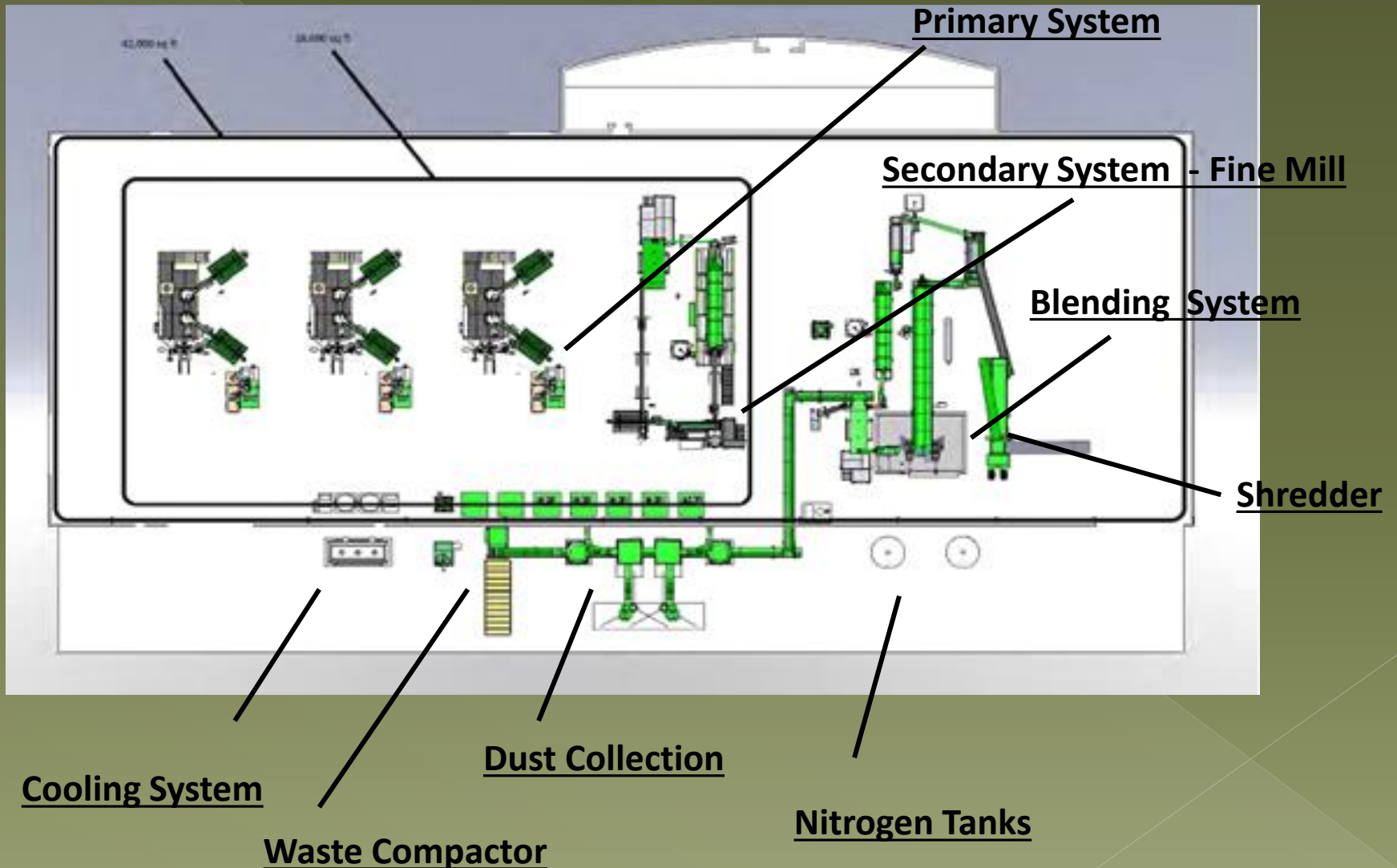
Automotive Black Plastics	Truck Bed Liners	Home & Garden Plastics
Electronics	Trash & Garbage Cans	Housings
Knobs	Outer Shells	Running Boards
Cowlings	Bins	Toolboxes
Lumber	Marine Decking	Casings
Posts	Pipe	Marine Products
Railroad Ties	Skid Plates	Conduit





## THERMOSPLATIC ELASTOMER (TPE) – LAYOUT

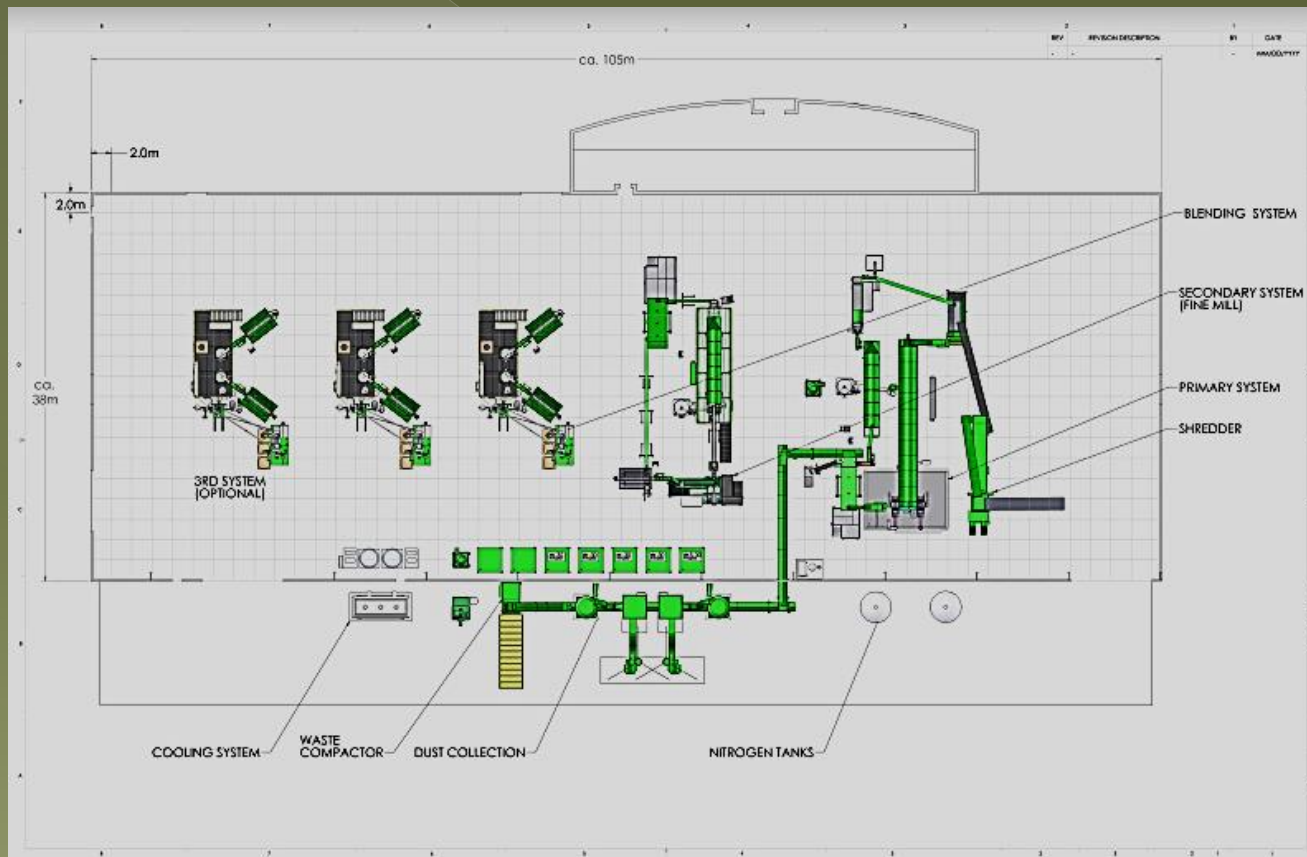
Plan view showing the square footage required for an integrated Fine Mesh & three XyCom TPE blending lines added that could be added to an ambient plant.





Here is a Typical Layout – with 3D (following next page) of a Plant with the Complete System of Primary Cryogenics, fine mesh cryogenics, and then 3 blenders.

It is well spaced out, and the only other piece of equipment that needs to be added here is the granulator that fits right after the shredder on the very right hand side of the drawing.

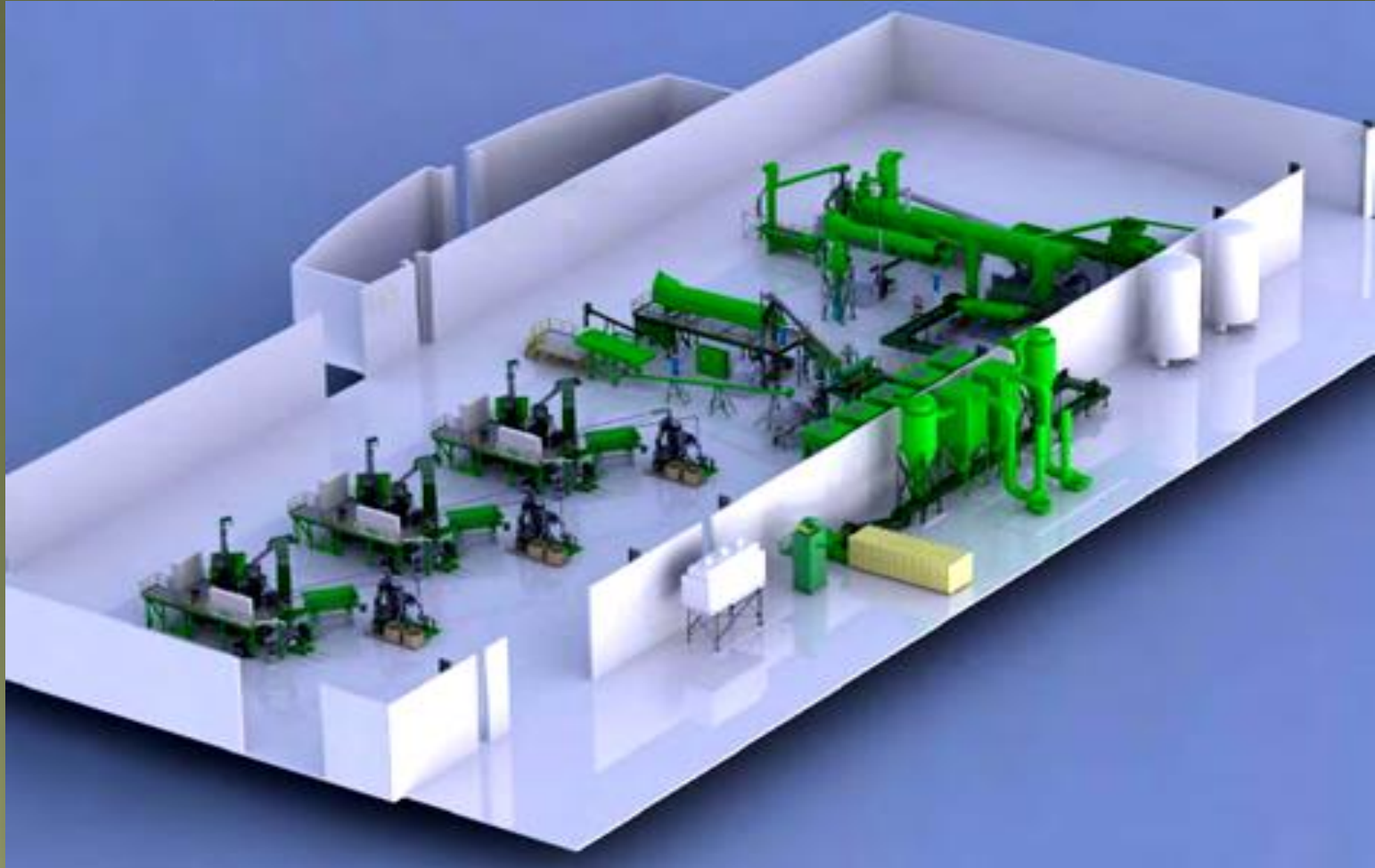


The Hammermill Pit is at the end of the Primary Freeze Tunnel opposite the Nitrogen Tanks - which are shown on the outside of the building at the bottom of the drawing.

This layout is to scale and each square is 2M X 2M.

## 3D MODEL

of an integrated Primary, Fine Mesh & three TPE blending lines



## BACKGROUND

When broken down a typical North American tire consists of approximately:

- 70% rubber
- 22% fiber and
- 8% steel (by weight)

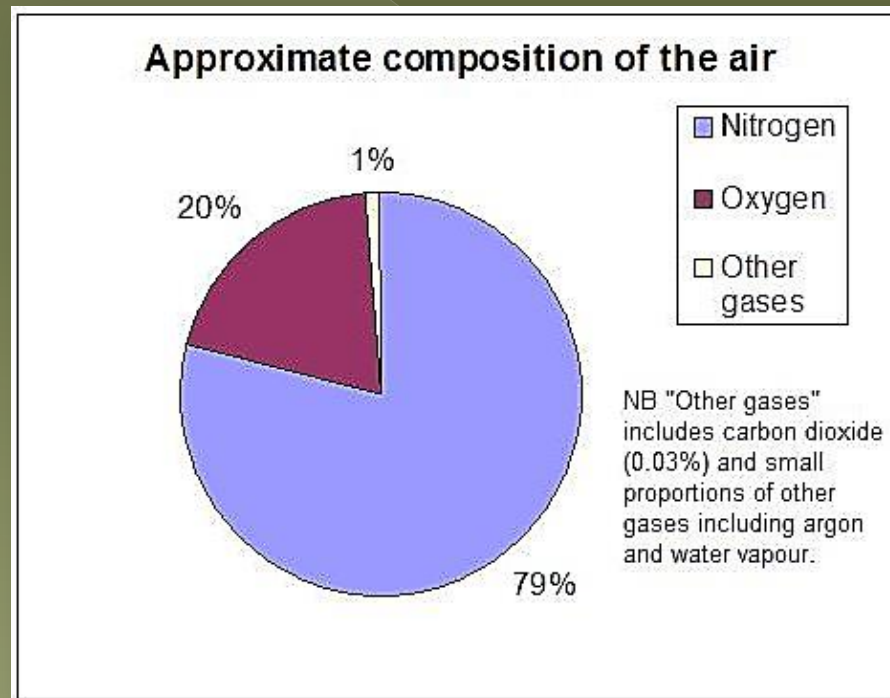
All materials are considered to be “non-hazardous” by North American Standards.

## COLLECTION SYSTEMS

Fine material collected throughout the dust collection system consists of approximately 37 microns (0.037 mm) and finer dust. This dust is a combination of nylon/rayon tire fiber, trace amounts of very fine tire rubber and trace amounts of other dust collected throughout the process. Through timers on the dust collectors, the fine dust is allowed to enter air locks which in turn transport waste material onto a conveying system into the compactor. Bag specification for exhausted air to the atmosphere from dust collectors is clean to 99.99% to two (2) microns (0.001”).

## EMITTED NITROGEN

Immediately upon exposure to the atmosphere any liquid nitrogen (LIN) from either cryogenic systems reverts back to its gaseous state. Since LIN is derived through the process of compressing ambient air which in turn is 79% nitrogen, any emissions from the system are simply discharged back to the atmosphere.







## FINAL SCREENING

separating cryo crumb rubber into various sizes & sending to storage bins



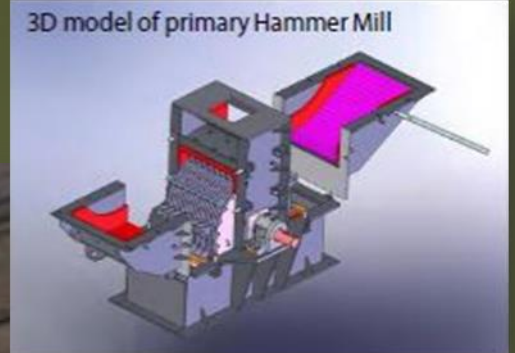


## PRIMARY SCREENER

Separating rubber from fibre & steel



## OUTSIDE THE HAMMER MILL ROOM



## FILLING “FIELDTURF” BAGS for sports surfaces applications





## SCALPING OFF THE FIBRE



## MASTER CONTROL PANEL

HMI & PLC – complete process with one-button start-up & shut-down





## RUBBER MAT PRODUCTION



## **RUBBER BUFFINGS**

**from truck tires ready for coloured mulch application**



## **COLOURED MULCH**

**with artificial grass in the foreground**



## STEEL COLLECTION FOR RECYCLING



## DUST COLLECTION SYSTEM



## **NITROGEN STORAGE SYSTEM (optional)**

**Nitrogen Tanks per ongoing Turn-Keys should be factored @ 50,000Litres per and Nitrogen supplier suggests that an additional tank also be added for Logistics – given usages of just-in-time Nitrogen deliveries and @90,000+ Litres Daily (which can also be Supplied by Nitrogen Supplier) – that will Alleviate for Purchase/Maintenance etc. by In-Country and @Monthly Rental Basis.**



## TAKE OR PAY

Letters of Credit (L/C's) for Enhanced Bio-Mass are Issued via HSBC/Barclays'/J.P. Morgan/Bank of America – and for Term @\$1M+USD Weekly for Take-or-Pay which amounts to \$600,000,000+USD and/or with Optionable @Fifteen (15) Years, which is \$900,000,000+USD.

For the Equipment Order-Ups with Export Bank Operations per USA/Canadian Manufacturing Ops./Patents: it will be Deutsche Bank as Commercial Bank of Record for Construction/Equipment.

Build/Order-Up Time is about Six (6) Months.

We'll typically then Organize @:

\$5 MUSD for Month #1

\$10MUSD for Month #2

\$15MUSD for Month #3

with Residual for Month #4 @ \$20 M

Banks/In-Country then get Benefits of Cash Flows accordingly.

**Note: Will take on a pre-pay basis and add draft of LC to be opened**



# LETTER of CREDIT

**TAKE-or-PAY & LETTER of CREDIT(s)**

**ex-HSBC/BARCLAYS'/BANK of AMERICA/J.P. MORGAN et al**

**IRREVOCABLE REVOLVING DOCUMENTARY LETTER OF CREDIT**

**SEE SEPARATE PRESENTATION  
for details**

## AVAILABLE OPTIONS

Utilizing Oversized Tires from Heavy Duty Trucks, Mining & Construction Industries etc . . .

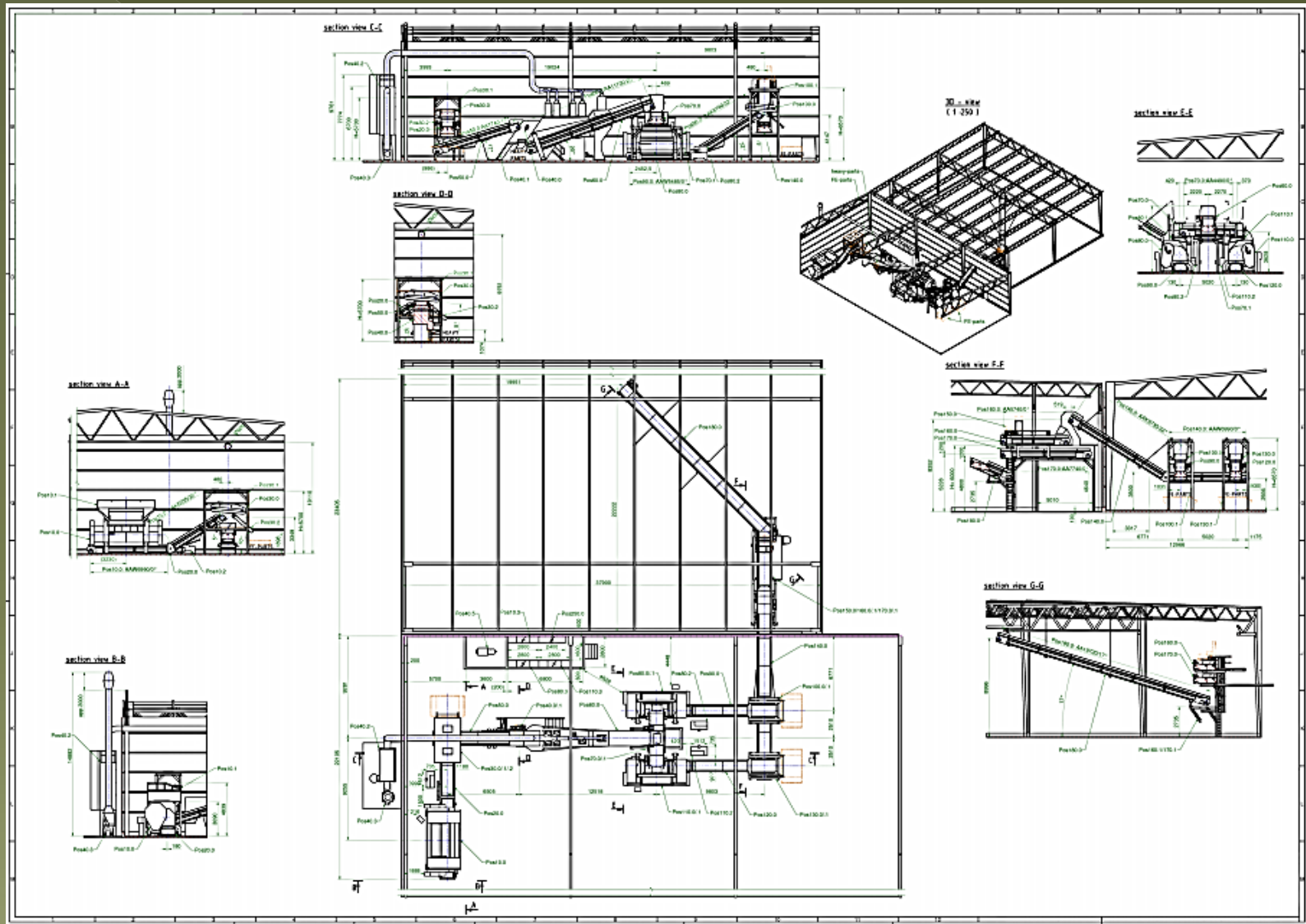
Construction of a Canadian Green Energy Technology Enhanced Bio Mass Power Plant – utilizing the “Dust Collection” for a 100% Green Energy Plant.

Transportation of Nitrogen.

Construction of Nitrogen Storage System.

In Tandem option(s) . . . (see separate presentation).

**FOR THE LARGER UNITS @25/50/100MW - and for Bio-Mass, the PRC Ops. had Required for Fixed Units @Standard FCL Design-Build Application(s) as per below:**



## SUMMARY

Cost = \$50M as a turnkey operation

Owner has a choice to **“Take or Pay”** product:

**TAKE:** Owner can take product and sell as they wish.

**PAY:** Product is committed for purchase for next 10 to 15 years by FCL via an LC. The owner can take the LC to the bank to give a comfort level to the bank with the knowledge that the product is already committed for purchase.

Additional Options available (see separate presentation)