

“Processing Scrap Tires for Market Applications”

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Multiple Stage Process

- Collection
- Shredding
- Wire Liberation/Separation
- Fiber Removal
- Coarse Ground Rubber 1/2" to 4 mesh
- Ground Rubber (aka Crumb Rubber) minus 4 mesh to 40 mesh. Note: **Approximate Limit of Ambient Capability**
- Fine Grind (minus 40 mesh to 80 mesh)
- Ultra-fine Grind (anything smaller than 80 mesh)
- Packaging



Market Driven ???

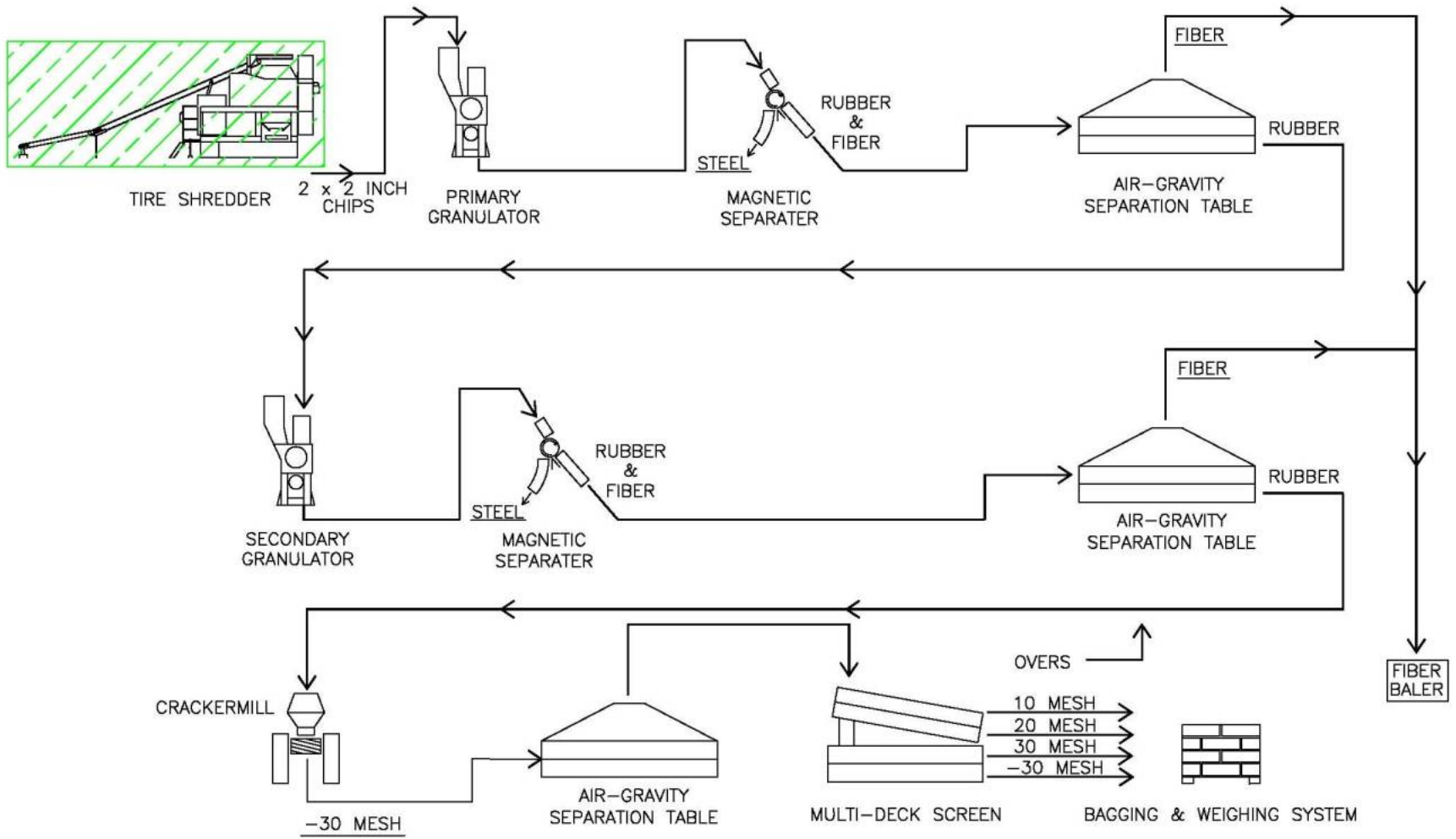
- Each Stage is Driven by a Market
- Each Stage is Driven By Unique Characteristics, Specifications or Requirements.
- Other Considerations
 - Location
 - Transportation
 - Quality Issues
 - Safety Issues
 - Housekeeping Issues
 - Equipment
 - Maintenance Costs
 - Operating Costs



COLLECTION

- Pick up / Delivery of Tires
- Grading / Sorting
- Sale / Export of Good Used



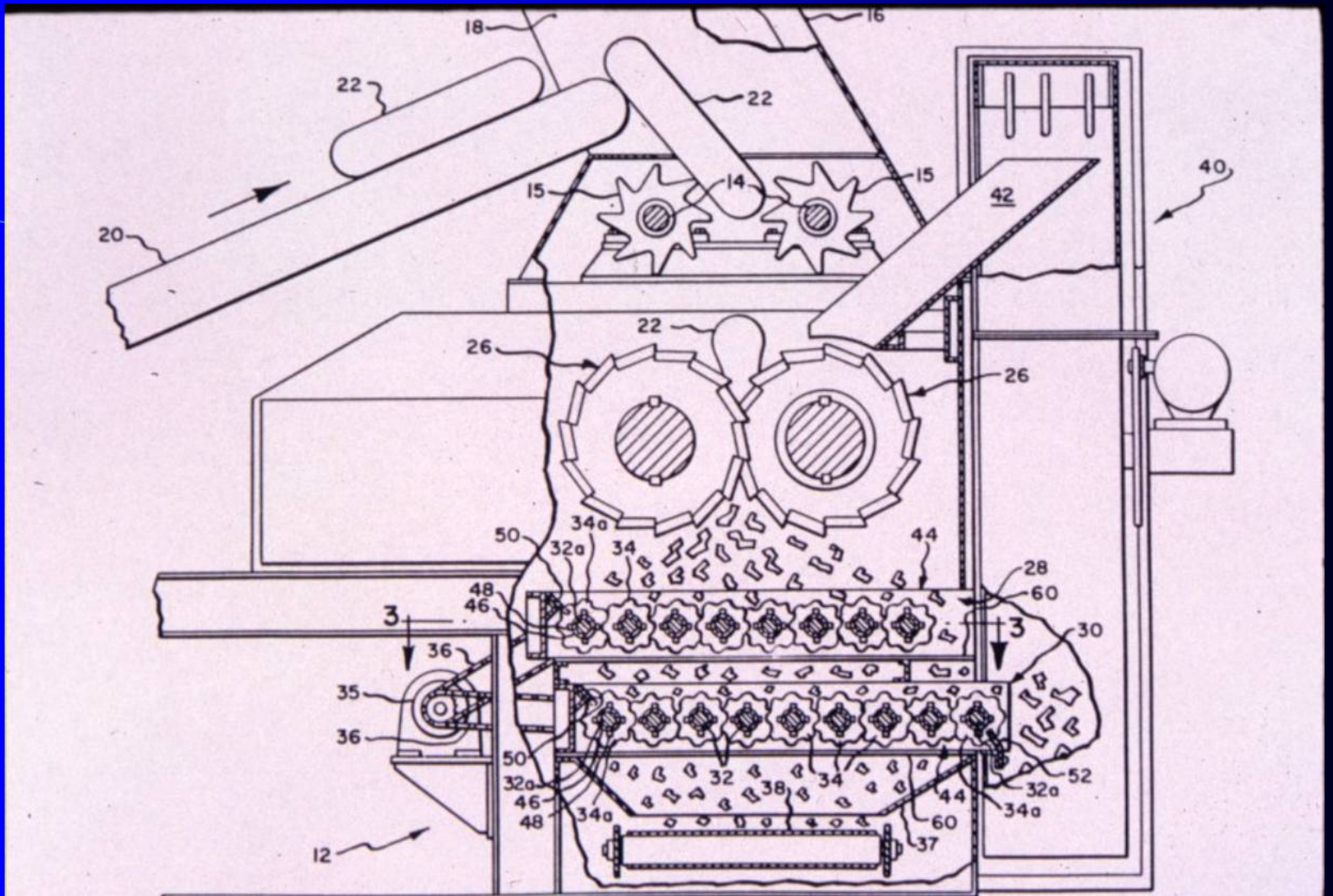


SHREDDING

- Simply Defined

- Process Whole Tires to a Reduced Size
- Use single or counter rotating shafts with knives affixed to each shaft that perform the cutting
- Utilize screening system to screen acceptable size product away from the system while re-circulating oversized material back to the shredder for additional reduction
- Oversize tires require pre-shredding

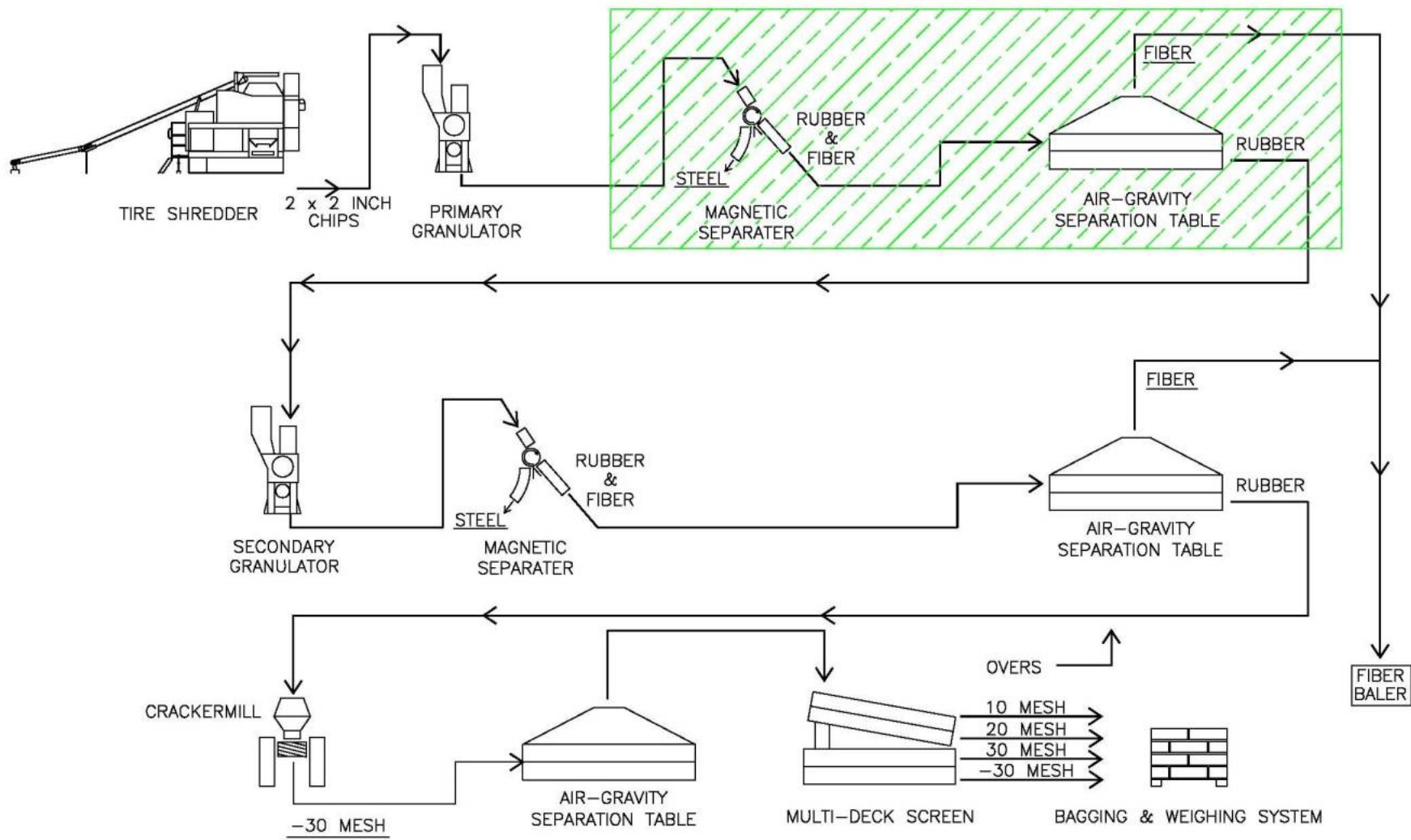




SHREDDING - Unique Considerations

- End Use / Markets / Product Quality = VALUE
 - TDF (Tire Derived Fuel)
 - Cement Kilns, Paper & Pulp Mills, Industrial Boilers, Utility Boilers, Steel Mills - Carbon
 - TDA (Tire Derived Aggregate)
 - ADC, Drainage Material, Lightweight Fill
 - Feed Stock – Ground Rubber Production
- Type/Size of Tires Being Processed
- Equipment Options
 - Knife Tolerances, Knife Material
 - Screen Size and / or Type
- Operating / Maintenance Cost





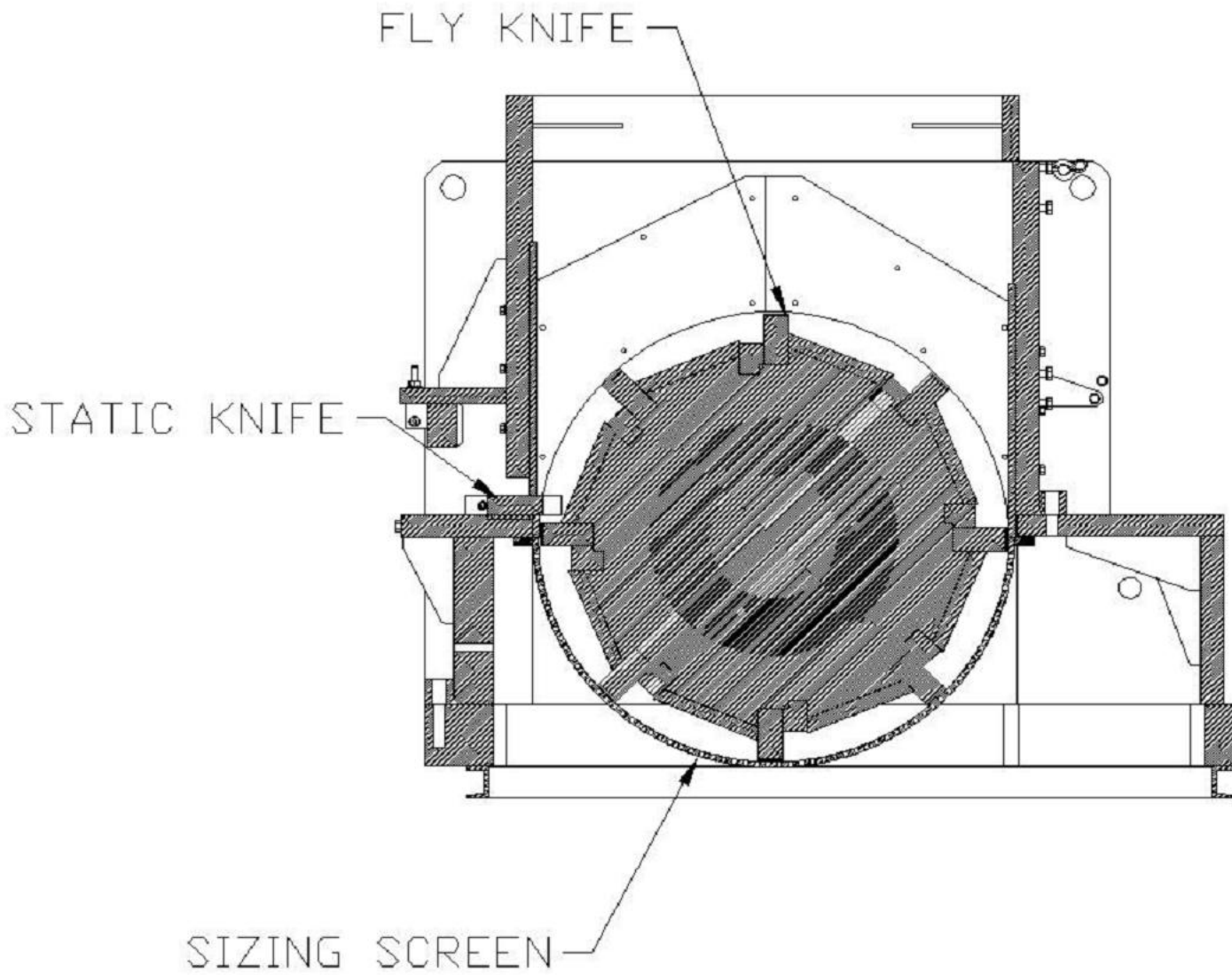
Wire Liberation / Separation & Fiber Removal

Objective – Clean Steel Liberation / Removal

➤ Primary Granulator

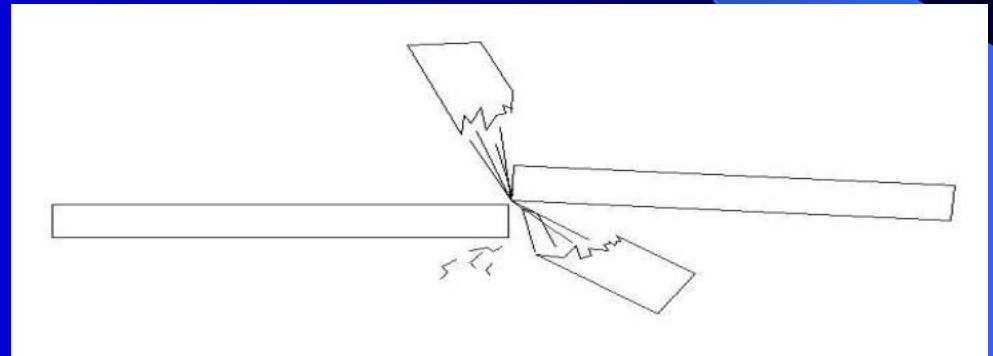
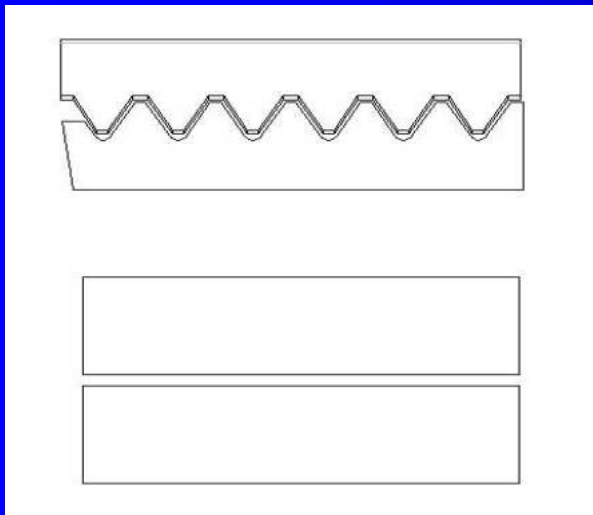
- Processes shreds/chips with steel to while liberating 95+% of the steel reinforced wire
- Machine uses rotary/fly knives that come in close contact with a stationary knife. This close contact creates a cutting and tearing effect that liberates the steel and nylon
- An internal screen is used for size control
- During this process some of the nylon cord is liberated as well





➤ Styles of Granulator Knives

- Straight knife and serrated knife technology
- Knife to knife tolerance is much larger compared to shredder or secondary granulator. This promotes the ripping and tearing of the wire and nylon from the rubber



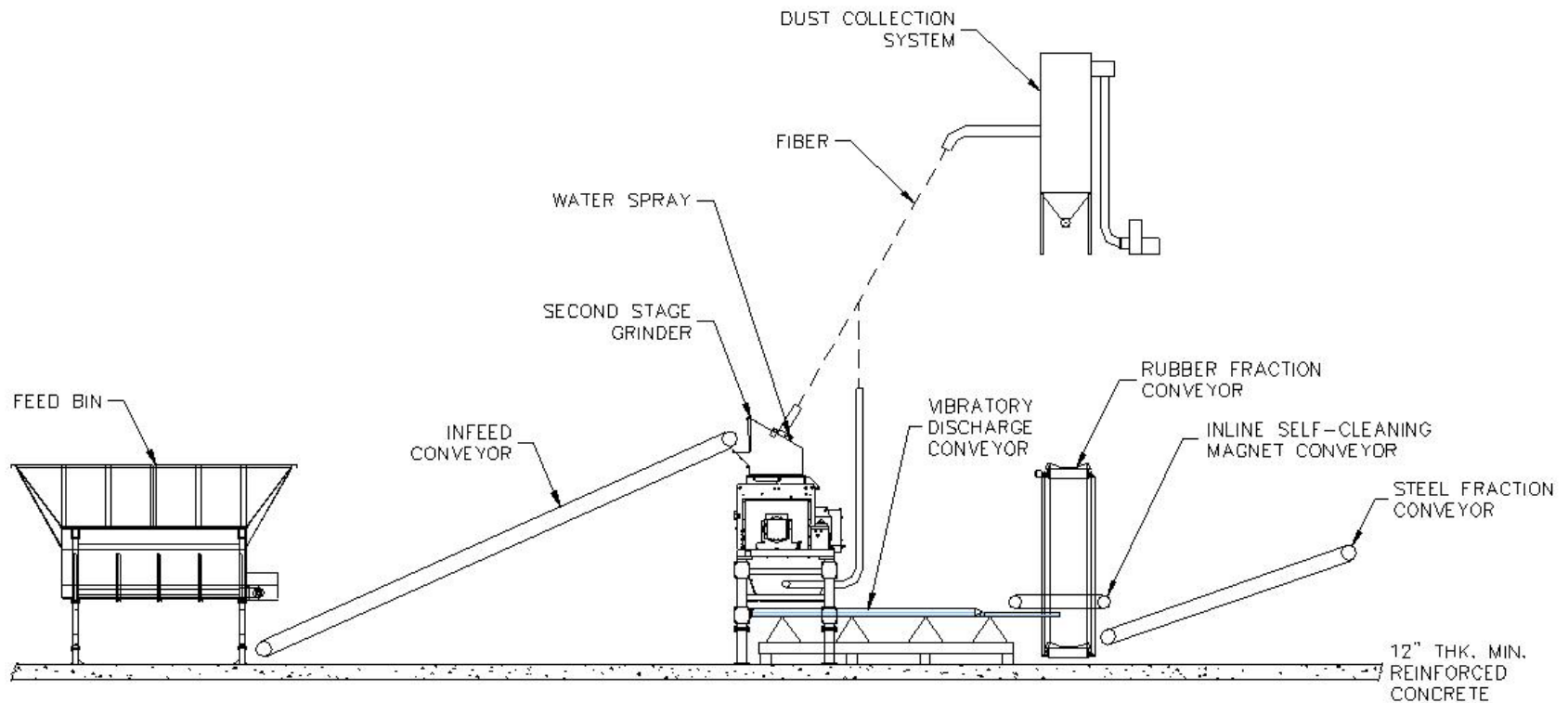
Primary Granulator

- Selection Criteria

- End Use - Markets
- Knife Design – Linear Inches of Cut
- Available Screening Area
- Bearings - Inboard vs. Outboard
- Pinch Points - Maintenance / Heat
- Wear Areas - Maintenance / Downtime
- Operating / Maintenance Cost



Wire Liberation / Separation & Fiber Removal



Wire Liberation / Separation & Fiber Removal

CONSIDERATIONS

- Clean separation of Steel, Rubber & Fiber
- Fiber Removal
- Product Quality
- Market Driven, ie.
 - Mulch
 - Wire Free TDF
 - Playground



Objective - Clean Wire



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Wire Cleaning and its Benefits

1. Steel is converted from a waste to a commodity, ie: an expense is converted to a revenue
2. Increased rubber recovery



Wire Cleanliness

Two Most Known Systems

Action



Bi-Metal



FIBER REMOVAL

FIBER AND MORE FIBER

- WHY ALL THE FUSS OVER FIBER SEPARATION?
- IF YOU PROCESS 100% RADIAL TRUCK TIRES THERE IS VERY LITTLE CONCERN WITH FIBER CONTENT.
- BUT, IF YOU ADD PASSENGER TIRES TO THE MIX!!!!



FIBER REMOVAL

1. FIBER SEPARATION IS NOT ACHIEVED WITH A SINGLE MACHINE
 - AIR SYSTEMS AND FILTERS
 - ILLUTRIATORS
 - GRAVITY TABLE SEPARATORS
 - MULTIPLE PICK UP POINTS THROUGHOUT THE PROCESS
2. FIBER CONTAMINATION WILL AFFECT STEEL VALUE



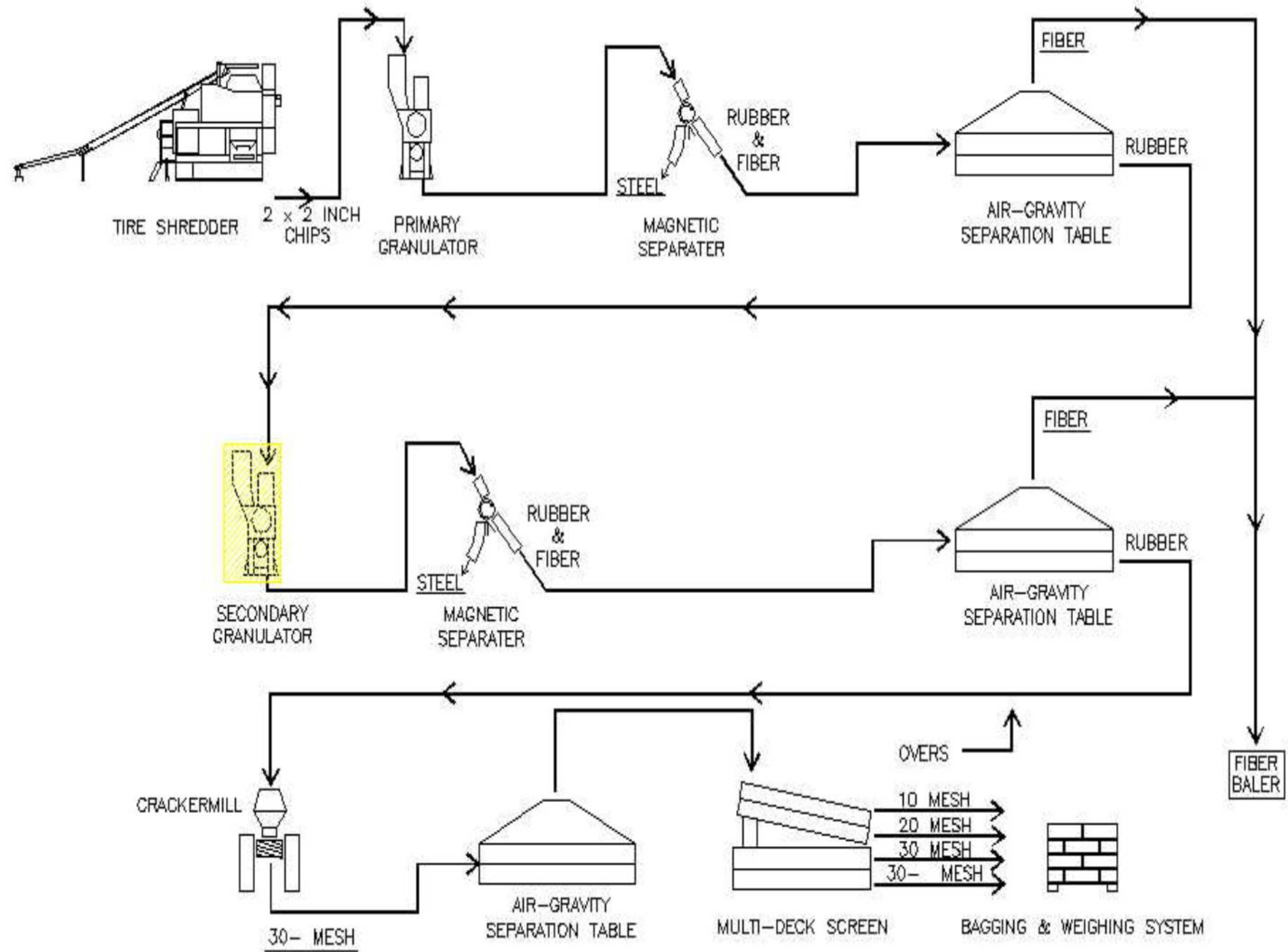
AIR SYSTEM



METAL SEPARATION



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Ground Rubber

- 4 Mesh to 40 Mesh

- Secondary Granulator – High Speed
- Refining Mill – Cracker Mill
- MARKET DRIVEN
- What Equipment is used at these Stages Depends on YOUR Market





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METAL SEPARATION



AIR SYSTEM



FIBER SEPARATION & DE-STONING



CLEANING UP THE CRUMB RUBBER

- AFTER THE FIBER IS OUT, DON'T OVERLOOK THE STONES, LEAD PARTICLES, BRASS PARTICLES, AND OTHER CONTAMINANTS
- DENSITY SEPARATORS ARE REQUIRED TO PRODUCE CLEAN CRUMB FOR MOLDED PRODUCT AND PAVING APPLICATIONS



STAGE 6 - Packaging



Quality? Quality? Quality?

- Market Specifications
- Transition to Process Manufacturing
- Maintenance / Housekeeping
- Safety
 - Results of Quality Initiatives
 - Eliminate Waste
 - Reduce Failures & The Costs Associated



Questions???

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