rubbintec
Driving Circularity

Waste tires aka end-of-life tires ("ELT) are a huge environmental problem. According to the DEEP website, it's estimated that each year Connecticut produces approximately 3.41 million ELT.

Currently, most Connecticut ELT are being shipped as tire-derived fuel (TDF) to paper mills in Maine, where they are incinerated for energy recovery.

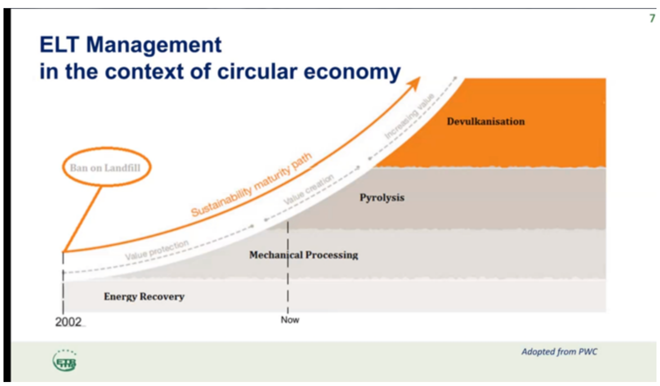
Connecticut State statute defines tires as a "special waste" as opposed to municipal solid waste (MSW). Connecticut no longer permits the landfilling of waste tires, either whole or in pieces. CT's Current Solution is not sustainable:

The CMMS states that "Connecticut should have sufficient in-state capacity for recycling, processing and disposal to manage waste generated within the state. Self-sufficiency in managing solid waste represents good public policy for Connecticut for many reasons, including decreasing the carbon footprint of waste, controlling costs, and avoiding risks associated with exporting solid waste."

Currently, Connecticut does not have sufficient in-state capacity for recycling and processing of ELT as its exporting the problem.

ELT is a huge environmental problem for our land, water, air and public health. Each year, the problem gets worse. This is due in part because over time there are less uses for ELT. Many jurisdictions are now planning to ban the use of crumb rubber in playgrounds and as infill for fields such as soccer fields. There is a good chance that TDF will be banned, since tires burn and emit similar pollutants and emissions as coal. Also, what will the State of Connecticut do if one or more paper mills are closed in Maine? Currently, Connecticut is exporting most of its ELT to Maine. Over time it's likely that ELT will become a significant problem for Connecticut as TDF and the use of crumb rubber as infill in fields are likely to be banned. ELT should be viewed as a valuable resource that can be upcycled into rubber that can be used as a secondary and circular material in roads, roofing and general rubber products such as shoe outsoles, automotive parts (gaskets, belts) conveyor belts, general rubber products and even new tires. The only true way to upcycle ELT is devulcanization, a process that reverses the vulcanization or curing process that Charles Goodyear invented in the late 1830s. It should be noted that the world's rubber industry was founded in Connecticut, which is often referred to as the birthplace of the rubber industry. During World War I the U.S. Rubber Company operated 30 plants in Connecticut that produced boots, tires, hoses, and other rubber goods for the US government. The U.S. Rubber Company purchased the Harford Rubber Works in 1917 to monopolize the industry. Shortly thereafter, the rubber industry moved to Akron, Ohio. Since Connecticut founded the rubber industry, it seems fitting that Connecticut should be place that solves the waste tire disposal problem. And the best way to solve the problem is through a manufacturing recycling process called devulcanization.

Devulcanization is considered to be the highest value-added solution for disposing of tires, since it permits the creation of secondary materials from all the components of a tire.

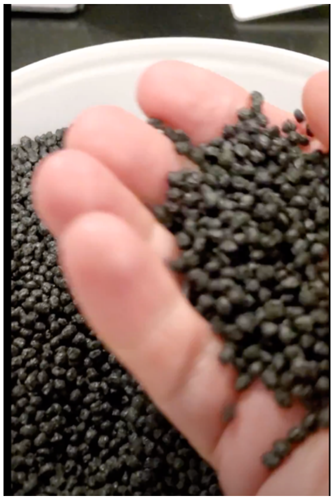


From a chemical point of view, devulcanization is the breaking of monosulfidic (C-S), disulfidic (S-S) and polysulfidic bonds (Sx) that cross link the main polymer chains, creating a three-dimensional network. By breaking the crosslinks that create a three-dimensional structure which plasticizes the vulcanized ground tire rubber, the processibility of the rubber polymer is regained, the mechanical properties are improved and the resulting devulcanizate can be used as a circular material to make new, high quality rubber products.

Devulcanization is a superior process to pyrolysis, another tire disposal solution, because with devulcanized all of the materials of the tire are recovered and upcycled while with pyrolysis, only the carbon black is recovered. The rubber is converted into oil and gas.

Rubbintec proposes that a devulcanization plant be built in the State of Connecticut. Rubbintec has already built and is operating a 5,000 metric ton plant in Europe, where it has proven the technology and tested its products. An ideal application for devulcanized rubber is to use it as an "asphalt modifier" in roads and roofing materials. Rubbintec proposes the following idea. Rubbintec will build a 5,000 ton per year plant, if the State of Connecticut agrees to purchase the product for roads. The devulcanized rubber would become 15% to 20% of the liquid asphalt binder, which translates into about 0.75% to 1.0% of the entire road when you take into account the aggregate (i.e., rock, gravel and sand). Alternatively, our devulcanized rubber (ELTC) can replace an impactful amount of aggregate. CTDOT currently purchases a petroleum derived polymer modifier known as an SBS (Styrene-Butadiene-Styrene). Among other things SBS reduces temperature susceptibility, deformation, and pavement cracking. Rubbintec's devulcanized material called ELTC, for "End-of-Tire-Compound", has comparable properties as SBS. ELTC is less expensive than SBS and is a Circular Material. According to a Life Cycle Assessment that Rubbintec commissioned, (available upon request) ELTC has 90% less carbon intensity as SBS. In fact, when you take into consideration the steel and fiber recovered, and the SBS and asphalt cement avoided, ELTC has a negative carbon intensity of about 1.3 tons of CO_2 per ton. This compares to SBS which has a CO_2 footprint of about 1.2 tons of CO_2 per ton of SBS. Attached is Rubbintec's Life Cycle Assessment. Devulcanized rubber in general, and ELTC in particular should not be confused with crumb rubber modifiers. Crumb rubber modifiers are still cross-linked or vulcanized. Devulcanized rubber is not crosslinked and is a polymer that behaves similarly to SBS. The major problem of crosslinked or "vulcanized" crumb rubber for pavement is that it settles, has poor storage stability and has poor solubility. It doesn't mix or adhere well to the asphalt. Devulcanized rubber addresses all of the drawbacks of crosslinked crumb rubber while maintaining the advantages of crumb rubber such as road noise reduction, resistance to deformation, cracking and rutting.

See pictures below of Rubbintec's ELTC devulcanized polymer material.



Rubbintec proposes building a 5,000 ton / year devulcanization plant to supply Connecticut and neighboring states with an asphalt modifier product. To obtain financing for the plant, CTDOT would have to require Rubbintec's devulcanized rubber as a component of the pavement design for some of its roads and a CTDOT asphalt contractor would have to enter into an off-take agreement with Rubbintec. But it can work with any CTDOT preferred contractor. Attached are independent test results of Rubbintec's asphalt modifier product. Rubbintec is confident that CTDOT will be impressed with these results and will understand that 15% - 21% content in asphalt of Rubbintec's product can substitute for SBS that is currently used in Connecticut roads.

Rubbintec's European plant was commissioned in May 2022. See the next page for pictures.

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The following is a [link](https://photos.app.goo.gl/pg4H9NW4GBymFK9y5) to our equipment operating: https://photos.app.goo.gl/pg4H9NW4GBymFK9y5

The following is a link to our equipment in Europe: https://photos.app.goo.gl/uRH2oXiur5kKiU689

Site Characteristics and Facility Details

Below are regarding site characteristics and facility details.

1. What type of solid waste processing operation are you interested in developing in Connecticut? Rubbintec is interested in developing a 5,000 ton per year devulcanization plant to upcycle ELT for asphalt pavement applications and other applications (roofing materials, tire retreads, conveyor belts, new tire filler, rubber mats)

2. Please describe in detail the technology proposed, and potential capacity and throughput in tons per day and tons per year. Please describe how your project is consistent with the State's solid waste hierarchy and the state's goal of 60 percent diversion from landfill and combustion.

Rubbintec's plant would process about one ton per hour or 16 hours a day. In a 320-day year, this equates to 5,000 tons per year. Rubbintec has patented and developed its own proprietary devulcanization process. It uses a twin screw extruder as the main equipment. Rubbintec's process and formulas results in high quality material that can be used in many applications.

3. What kinds of site characteristics are needed for your operation? a. Acreage needs b. Utility connection availability needs and facility usage requirements including, power, water, sewer, and gas c. Access needs including transportation modes and proximity requirements (road, rail, port, etc.) Two acres of land are needed and 750 kW of electricity. The plant consumes very little water as the little water that's required is recycled in a closed loop. No gas is needed except to heat the facility for workers during cold weather. Ideally the site should be close to a rail line. If that's not possible, then a major highway for truck transportation is sufficient.

4. What are the input and output requirements to make development feasible? a. Inputs i. What type of feedstock is required for your facility? ii. Are there any specific characteristics needed to make the feedstock viable or processing limitations (e.g., food scraps must be source separated)? iii. What are the tonnage/ volume needs to make your facility viable? Provide a range or a minimum if applicable. iv. Can you provide tip fee estimates? b. Outputs i. What are the outputs of your process (e.g., electricity, renewable natural gas, compost, baled material, etc.)? ii. What minimum revenues or revenue guarantees do you need for these outputs?

The main feedstock input required is crumb rubber (20 mesh) also known as ground tire rubber. For asphalt applications, any type of tire feedstock is acceptable including truck tires and passenger car tires.). Other inputs include, electricity, recycled plastic, waste oil, and a devulcanization agent (0.3% by weight). It should be noted that about 10% - 20% of Rubbintec's ELTC product is made from waste plastic. This means that Rubbintec is also recycling plastic. Rubbintec can use polypropylene, polyethylene or polyurethane as well as mixed plastics. To make the plant economically viable, the volume should be a minimum of 3,000 tons per year. Rubbintec should be able to source the crumb rubber from one of the three tire volume reduction plants in Connecticut including.

- Lakin Tire East, Inc. in West Haven, (203) 932-5801;
- Empire Tire of Edgewater II, LLC, Inc. in Plainfield, (860) 564-8811; and
- Don Stevens Tire Co. in Southington, (860) 621-3256.

5. What are the environmental attributes associated with your facility? a. Air emissions, and mitigation thereof b. Discharges, including where discharges will occur and mitigation of discharges c. Waste material or residuals and description of disposal of such materials d. Beneficial uses e. Other The Rubbintec manufacturing process has no waste material. The main piece of equipment that is used is a twin screw extruder. The extruder includes degassing equipment that removes all emissions. There is, however, a slight odor that is emitted. It's the smell of rubber or tires. Some odor leaks out of the building, even with the best ventilation system. The site should be in a place where the odor wouldn't bother anyone. All water is recycled in a closed loop system. A standard carbon filter system is used.

6. Please describe how the project will minimize negative environmental and health impacts of waste management, including minimizing greenhouse gases. Community Benefits.

Rubbintec's products would reduce the amount of CO_2 in SBS modified asphalt for Connecticut roads by 95%. . Rubbintec's ELTC product will substitute SBS, the polymer used by CTDOT. SBS has a carbon footprint of 2.5 tons of CO_2 per ton of SBS. See attached Life Cycle Assessment ("LCA") which includes an analysis of all environmental impacts. The paper mill plants that currently incinerate Connecticut's ELT are emitting pollutants and emissions including CO_2 equivalent greenhouse gases. The trucks that transport the tires to Maine are emitting CO_2. As mentioned above, Connecticut could potentially have a problem if Maine bans the use of TDF. Also converting ELT to TDF for energy recovery is not recycling and is not circular. In February 2023, the Connecticut River Conservancy made the following statement:

> *The tire crisis is twofold: illegal tire dumping plagues our public lands, and the primary scrap tire end use, burning tires for fuel, is not sustainable.*
>
> *Connecticut drivers produce roughly 3.5 million scrap tires per year and each year, volunteers in our Source to Sea cleanup take to their rivers to remove many of these illegally dumped tires; to-date, volunteers have retrieved over 13,900 tires from the Connecticut River Watershed. In recent years, volunteers have pulled hundreds and, in*

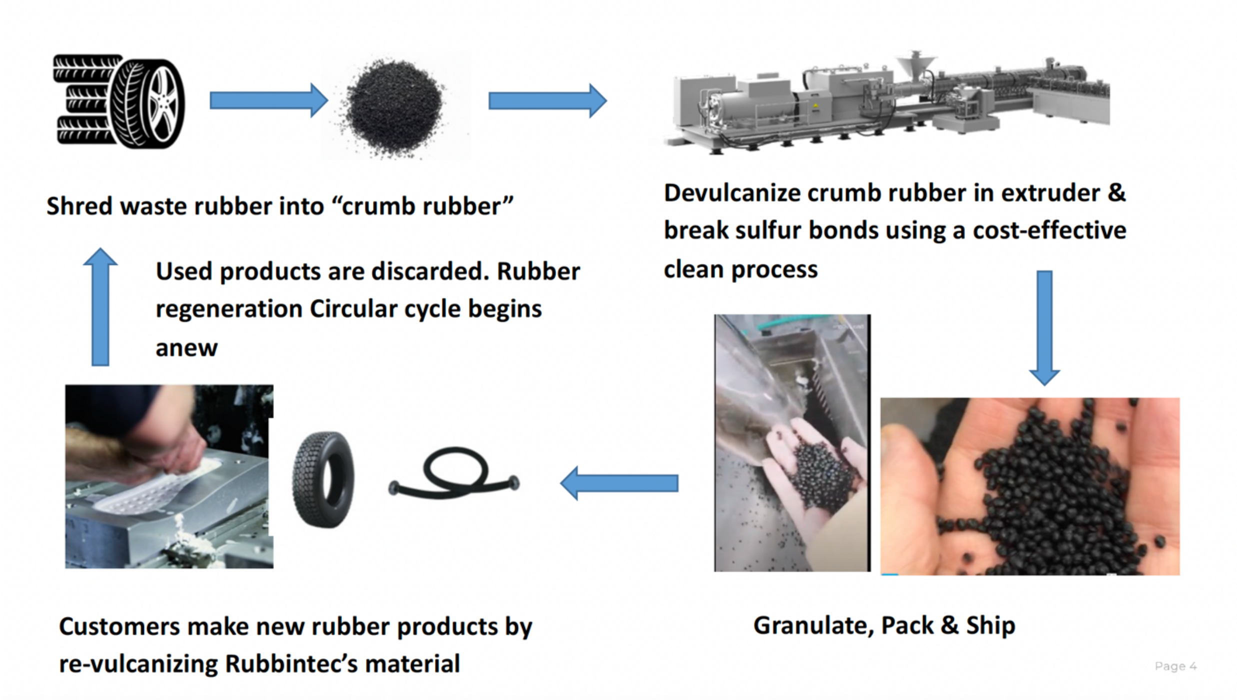
some cases, thousands of tires out of rivers during this event, signaling an ongoing problem with the management of scrap tires. While commendable progress has been made to reduce illegal tire stockpiling, this should not be conflated with illegal tire dumping; to assert that illegal tire dumping is no longer an issue, is to deny the reality of volunteers and public servants doing the work on the ground.

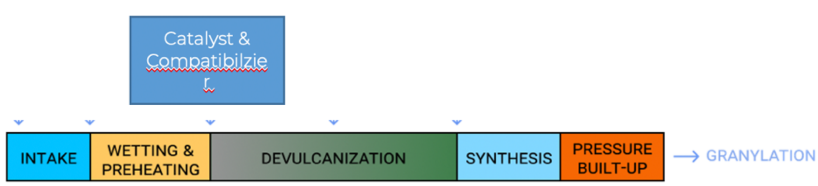
Scrap tires have profound costs for the environment. Tires dumped onto our public lands and into our waterways leach toxic materials into soil and water; they create fire hazards and attract vermin and mosquitoes, which pose human health threats. In a 2020 study of the cause of acute mortality of adult coho salmon, scientists identified tire-derived chemicals as the sole cause of mortality. For tires that do make their way through the disposal system, most of these will be trucked to Maine to be burned as tire derived fuel (TDF) at cement kilns or pulp mills. The language proposed in HB 6486 states that businesses that use scrap tires to "recover energy or produce energy" – in other words, TDF- are considered "recyclers." This is misleading and disingenuous. We urge the committee to prohibit TDF as a form of recycling – as seen in HB 5139 which states "'Recycling' does not include the use of incineration for energy recovery."

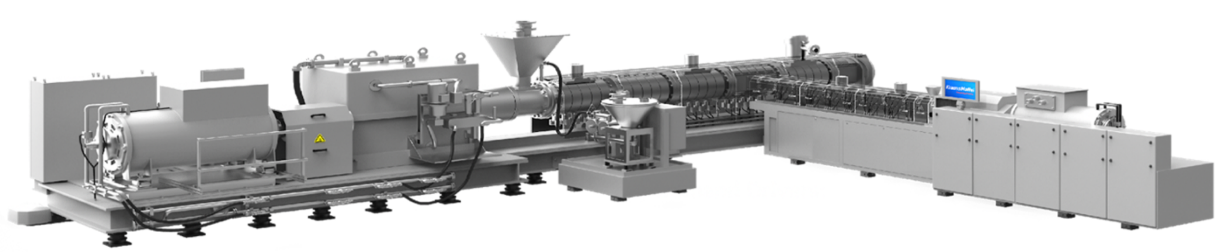
7. Please describe host community benefits that would be provided as part of your project, and how those benefits would be shared or realized including job creation and workforce training opportunities. Developer Experience . The plant is largely automated. About two workers are needed per shift. There would be 4 shifts, which equates to 8 workers total. In addition, the plant would require a manager, logistics person and controller. In sum, a total of 11 workers. If Rubbintec can't get 20 mesh from one of the three ELT volume reducers, it would have to shred the tires, which would require an additional 9 workers. Rubbintec would need a license from DEEP to shred the tires.

8. Please describe the project team's background and experience developing waste infrastructure projects, including the proposed technology, and your track record for successful development and/or operation. Please provide information on applications of the proposed technology demonstrating how widespread and how the technology has been proven through other development projects. Financing Arrangements.

As mentioned above, Rubbintec built and is now operating a plant in Europe. The plant was built with a combination of European Union funding and matching funding from private equity. The team now has experience in building a plant. Members of the team did not hire an EPC contractor (Erection, Procurement & Construction) to procure the equipment and construct the plant. Rubbintec acted as its own EPC. Rubbintec has the option of hiring an EPC contractor for a Connecticut based plant. Conventional project financing is the best way to build a plant in Connecticut. Rubbintec has relationships with about a dozen equity and debt funders who are looking to finance circular economy projects. Financing is not a problem, provided CTDOT facilities off take agreements for the asphalt modifier product. The technology is patented. The inputs are added to the extruder. A combination of optimal high temperature, optimal shear and the devulcanization agent plasticizes the rubber (i.e. breaks the sulfur crosslinks that bridge the rubber polymer chains, which in turn restores its processability and significantly improves is properties (i.e. makes the rubber compatible and cohesive with asphalt and increases its tensile strength so that the upcycled rubber can be used to make shoe outsoles, tire treads, new tires and other general rubber products such as conveyor belts.







9. Please describe the preferred and acceptable financing arrangements contemplated for the project, including contemplated financing, development, ownership, and operation of the facility; and needed commitments (including duration thereof) from municipalities and other entities with respect to tip fees, and the marketing of other materials and byproducts of the project. Project financing is preferred. To make that possible, we would need a feedstock agreement with one of the three tire volume reducers or we would need our own tire disposal license from DEEP. We would also need an off-take agreement with CTDOT. A tipping fee from the State of Connecticut would also improve margins, but it may not be necessary as long as CTDOT pays a fair price for the ELTC asphalt modifier product. The State of Connecticut or any Connecticut municipality could become an owner of the project along with Rubbintec.

10. Does the project contemplate any energy or environmental attribute offtake agreements under state jurisdiction, or federal funding of any type? No.

11. How will the proposed financing arrangement ensure stable and competitive pricing for municipalities? Rubbintec is willing to sign a long-term agreement protecting CTDOT or any other Connecticut government buyer. Or an off-take agreement could use an index to adjust prices.

12. Within what approximate time frame (years) of contract execution would the project be able to commence operation, assuming timely state and local approvals? The project could commence within one year of the signing of an off-take agreement. The equipment can be delivered in 6 to 9 months. A full equipment list can be made available upon request. It took one year for the project in Europe, and that was in late 2021 when there were many shipping delays.

13. Please provide information on technology performance guarantees by the technology provider or project developer. The extruder equipment manufacturer is willing to guarantee productivity and performance. Rubbintec would also give a guarantee of technology performance and productivity. The project financing lenders are concerned about the same issue. DEEP could send a consultant to the European plant as part of due diligence.

APPENDIX 1

Pavement Test Data

Asphalt Classification Summary

wood.

Client:	Rubbintec, Inc.	Wood Job No.:	17-2021-4216
Project Name:	Asphalt Binder Testing Services	Date Reported:	05-21-2021
		Material:	Asphalt-Rubberized Binder CRA Type 1 Blend
Contact:	Mr. Marty Kalin		

		Project No.:	np
		Sample ID:	80/20 Trial Blend
		Wood Lab No.:	2153913
		Date Received:	05-06-2021
		Sample Date:	05-19-2021
		Sample Type:	Lab Blend
Tests on Original Asphalt-Rubber		SPEC	
Viscosity, 350°F (177°C), Pa.s	ASTM D7741	1.5-4.0	1.5
Penetration, 39.2°F,200g, 60 sec., 0.10 mm	ASTM D5	10 min.	20
Ring and Ball Softening Point, °C	ASTM D36	57 min.	66.1
Resilience, 77°F, %	ASTM D5329	30 min.	40

Remarks:

Specifications refer to ADOT standard specifications section 1009 - Table 1009-2 for a CRA Type 1.

Blend Components:

80% HollyFrontier PG 64-16 (Wood #2052802)
20.0% (by total weight of binder) Rubbintec, Inc. ELTC asphalt modifier (Wood #2153653)
(20.5% by weight of asphalt)

Reviewed By:

Brian A. Waterbury, Bituminous Laboratory Manager

Asphalt Classification Summary

wood.

Client:	Rubbintec, Inc.	Wood Job No.:	17-2021-4216
Project Name:	Asphalt Binder Testing Services	Date Reported:	05-21-2021
		Material:	Asphalt-Rubber Binder Blend
Contact:	Mr. Marty Kalin		

		Wood Lab No.:	2153913
		Sample ID.:	80/20 Trial Blend
		Date Received:	05-06-2021
		Sample Date:	05-19-2021
		Sample Type:	Lab Blend
Tests on Original Asphalt	Test Method	Spec	
Apparent Viscosity at 135°C, Pa-s	AASHTO T316	3.00 max,	*4.353
Dynamic Shear, G*/sinδ, kPa *(1)*	AASHTO T315		
76°C		1.00 min.	3.48
82°C			1.92
88°C			1.12
94°C			0.68
Pass/Fail Temp., °C		Report	89.3
Tests on Residue from RTFO	AASHTO T240		
Mass Change, %	AASHTO T240	1.00 max.	-0.521 (Loss)
Dynamic Shear, G*/sinδ, kPa *(1)*	AASHTO T315		
88°C		2.20 min.	2.52
94°C			1.50
Pass/Fail Temp., °C		Report	89.7
Tests on Residue from PAV @ 110°C	AASHTO R28		
Dynamic Shear, G*sinδ, kPa	AASHTO T315		
34°C *(specified temperature, -22 Grade)*		5000 max.	749
31°C *(specified temperature, -28 Grade)*			1,055
Pass/Fail Temp., °C		Report	16.2
Creep Stiffness, S, at 60s, MPa	AASHTO T313		
-12°C		300 max.	88.7
-18°C			176
Pass/Fail Temp., °C		Report	-22.7
Slope, m-value	AASHTO T313		
-12°C		0.300 min.	0.304
-18°C			0.262
Pass/Fail Temp., °C		Report	-12.6
Performance Grade	AASHTO M320		PG 82-22
True Grade			PG 89-22

Remarks: *(1) Gap on DSR for Orginal and RTFO was increased to 2.5 mm for testing.*

Blend Components: **Does not meet required specification.*

80% HollyFrontier PG 64-16 (Wood #2052802)

20.0% (by weight of total binder) Rubbintec, Inc. ELTC asphalt modifier (Wood #2153653)

(20.5% by weight of asphalt)

Reviewed By:

Brian A. Waterbury, Bituminous Laboratory Manager

Asphalt Classification Summary

wood.

Client: Liberty Tire	Wood Job No.: 4975-10-6095
Project Name: Asphalt Binder Testing Services	Date Reported: 04-09-2021
	Material: Asphalt -Rubber Binder Blend
Contact: Mr. Doug Carlson	

		Project :	Blend Development
		Wood Lab No.:	2153672
		Sample ID.:	78.7/21.3 Blend
		Date Received:	04-05-2021
		Sample Date:	04-06-2021
		Sample Type:	Lab Blend
Tests on Original Asphalt	**Test Method**	**Spec**	
Separation (Visual Observation)	TEX 540C	Negative	Negative *(1)*
Separation (Softening Point Difference), %	TEX 540C	4.0 Max.	0.6 (NEG)
Softening Point (Top), °F		Report	153
Softening Point (Bottom), °F		Report	154
Separation (Softening Point Difference), °F	ASTM D7173	Report	4.0
Softening Point (Top), °F		Report	153
Softening Point (Bottom), °F		Report	157

Remarks: *(1) Negative; Upon visual inspection, no clumping of polymer observed on the surface, only minor skin was observered on the surface and negative for change in consistency at the bottom of the sample.*

Blend Components:

78.7% HollyFrontier PG 64-16 (Wood #2052802)

21.3% Rubbintec, Inc. ELTC asphalt modifier (Wood #2153653)

(27.1% by weight of asphalt)

Reviewed By:

Brian A. Waterbury, Bituminous Laboratory Manager

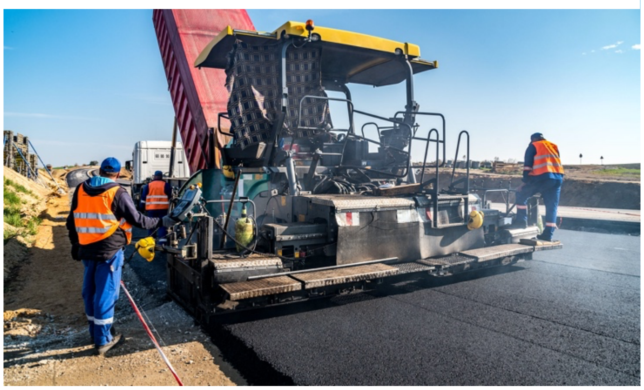
ELTC

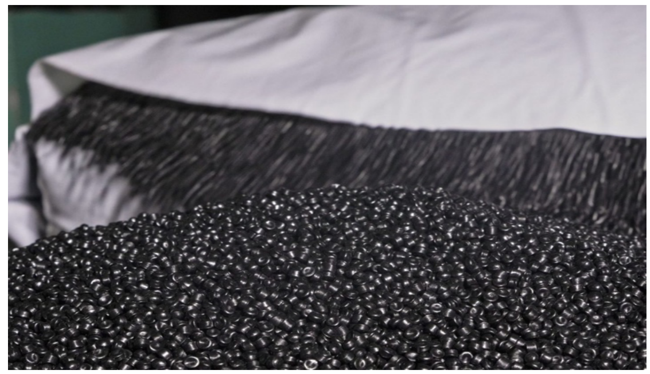
(End-of-Life-Tire Compound)

rubbintec
Driving Circularity

A Green
Polymer Bitumen Modifier

Upcycled From End-of-Life Tires
95% Less Carbon Footprint than SBS





"ELTC" is a polymer bitumen modifier made from devulcanized crumb rubber with and without thermoplastics . ELTC is a sustainable, upcycled "Circular" material.

Rubbintec Inc. • + 1 202 271 0328 • sales@rubbinteinc.com

Rubbintec's Proprietary Devulcanization Process Upcycles End-of-Life-Tires into a Storage Stable, Bitumen Polymer Modifier Material

Using its proprietary breakthrough devulcanization process, Rubbintec upcycles waste tire rubber, producing a product line of storage stable "Circular" polymer asphalt modifiers for pavement and roofing materials. Rubbintec's compounds have a CO_2 equivalent footprint that is 95% less than polymers such as SBS and virgin rubber. (LCA available upon request). Rubbintec's products are called "ELTC", which stands for End-of-Life-Tire Compound. ELTC has comparable properties to SBS when used as an asphalt modifier, albeit at different loading and with less blending time. Devulcanization breaks sulfur bonds that crosslink polymer chains, converting rubber, which is a thermoset, into a thermoplastic polymer which has excellent compatibility with asphalt.

The following are advantages of the ELTC asphalt modifier (ELTC-AM-P):

- Circular Polymer Material from the Upcycling of end-of-life-tires with and without thermoplastics
- ELTC can be used as a copolymer with SBS
- Less expensive than SBS, albeit with different loading
- Excellent resistance to thermal and fatigue cracking
- Resistance to deformation/rutting at high pavement temperature
- Reduced road noise
- Better traction resulting in better road safety
- High chemical compatibility & solubility with asphalt – excellent cohesion properties
- With a 20% blend, a PG 64-16 asphalt binder is upgraded to a PG 82-22 PMB Performance Grade / PG89-22 PMB True Grade
- Unlike crumb rubber (GTR), ELTC does not settle on the bottom of the tank

ELTC PROPERTIES

Property	Test Method	Units	Specification	
Total Extractables	RT 05	%m	<=1.0	
Volatile Matter	RT 04	%m	<=1.0	
Ash ET	ISO 247	%m	<=1.3	
Specific Gravity	ISO 2781		1.15 – 1.2	
Granule Size			3 mm - 5 mm	

Classifications and Grades

ELTC-PAM-10 (Bitumen Pavement Applications) – (See ELTC polymer modified asphalt binder technical specification on page 4)

Rubbintec supplies different variations of its ELTC-PAM product based on customer requirements. Depending on desired performance, ELTC-PAM can be used to make a 90%/10%, 85%/15% or 80%/20% polymer modified asphalt binder (PMB) blend. The "10" designation refers to the amount of thermoplastic material that is mixed with the crumb rubber. The form factor is a 4mm – 6mm pellet.

ELTC-PAM -20 (Bitumen Pavement Applications) – (See ELTC polymer modified asphalt binder technical specification on page 4)

Rubbintec supplies different variations of its ELTC-PAM product based on customer requirements. Depending on desired performance, ELTCPOAM can be used to make a 90%/10%, 85%/15% or 80%/20% polymer modified asphalt binder (PMB) blend. The "20" designation refers to amount of thermoplastic material that is mixed with the crumb rubber. The ELTC-PAM-20 has a higher softening point (above 80mm) and lower penetration at 25°C (40mm^{-1}*)* The form factor is a 4mm – 6mm pellet.

ELTC-PAM-30 (Bitumen Pavement Applications)

Rubbintec supplies different variations of its ELTC-PAM product based on customer requirements. Depending on desired performance, ELTC-PAM can be used to make a 90%/10%, 85%/15% or 80%/20% polymer modified asphalt binder blend. The ETLC-PAM -30 is a mixture of devulcanized rubber and ELT fiber. This material is expected to be released in the 4th quarter of 2023. The form factor is a 4mm – 6mm pellet.

Packaging

Below are independent test results of an asphalt binder blended with Rubbintec's ELTC-PAM-10 polymer modifier (80%/20% blend)., which upgrades a PG 64-16 unmodified asphalt binder to a PG 82-22 PMA Performance Grade and a PG 89-22 PMA True Grade modified asphalt binder.

Tests on Original Bitumen	Test Method	Results	Spec- CRA Type 1
Separation		Negative	
Viscosity, 350°F (177°C), Pa.s	ASTM D7741	1.5	1.5 – 4.0
Penetration, 39.2°F,200g, 60 sec., 0.10 mm	ASTM D5	20	10 min
Ring and Ball Softening Point, °C	ASTM D36	66	57 min
Resilience, 77°F, %	ASTM D5329	40	30 min
Tests on Original Bitumen			
Apparent Viscosity at 135°C, Pa-s	AASHTO T316	4.53	3.0 max
Dynamic Shear, G*/sino, kPa (1)	AASHTO T315		
76°C		3.48	1 min
82°C		1.92	
88°C		1.12	
94°C		0.68	
Pass/Fail Temp., °C		89.3	Report
Tests on Residue from RTFO	AASHTO R2B		
Mass Change, %	AASHTO T240	-0.521 (loss)	1.00 max
Dynamic Shear, G*/sino, kPa (1)	AASHTO T315		
88°C		2.52	2.20 min
94°c		1.50	
Pass/Fail Temp., °C		89.7	Report
Tests on Residue from PAV (8) 110°C			
Dynamic Shear, G*sino, kPa			
34°C (specified temperature, -22 Grade)		749	5000 max
31°C (specified temperature, -28 Grade)		1.055	
Pass/Fail Temp., °C		16.2	Report
Creep Stiffness, S, at 60s, MPa	AASHTO T313		
-12°C		88.7	300 max
-18°C		176	
Pass/Fail Temp., °C		-22.7	Report
Slope, m-value	AASHTO T313		
-12°C		0.304	0.3 max
-18°C		0.262	
Pass/Fail Temp., °C		-12.6	Report
Performance Grade	AASHTO M320	PG 82-22	
True Grade		PG 89-22	

Tests performed by Wood Environment & Infrastructure Solutions Inc., Phoenix Arizona. Results available upon request.

The Specifications "Spec" refer to ADOT standard specifications section 1009 - Table 1009-2 for a CRA Type 1

Blend Components: 80% Holly Frontier PG 64-16 (Wood #2052802)
20.0% (by total weight of binder) Rubbintec, Inc. ELTC asphalt modifier (Wood #2153653)
(20.5% by weight of asphalt)

rubbintec
Driving Circularity

Rubbintec Equipment & Facilities

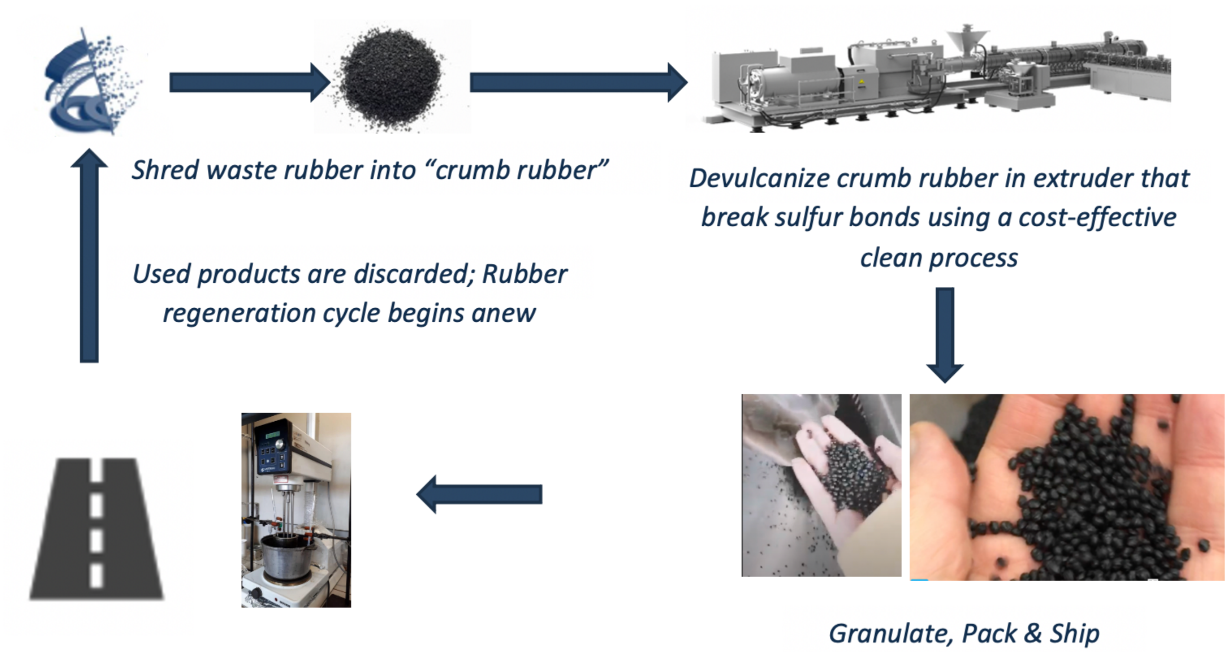
Video of Rubbintec/Polylema's Devulcanization Plant

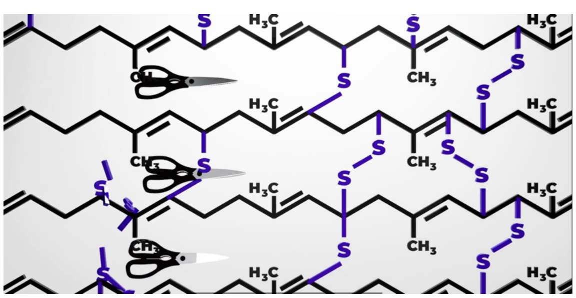
https://vimeo.com/705462850/3bc7df5418

Driving Circularity

Rubbintec's Selective Devulcanization Process
Not all Devulcanization is the same

Devulcanization Regenerates Rubber from End-of-Life-Tires to Make New Products and is the Only True Eco-pathway





Devulcanization is the scission of sulfur-sulfur bonds (S-S) and sulfur-carbon (S-C) covalent bonds that cross-link the main rubber polymer chains. Rubbintec's proprietary "selective" devulcanization process upcycles vulcanized waste rubber into a desirable storage stable asphalt modifier without degrading the polymer

Contact Information

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