

SUSTAIN STUDIOS

About the company:

Sustain Studios was founded in 2019 with the goal of creating innovative and sustainable solutions for the plastic, composite, and textile industries. Our process starts by collecting agricultural waste biomass from farmers, roasters, and brewers. We work directly with our processing partners to divide and pulverize the waste which is then infused into new materials making them stronger, safer and biodegradable/compostable.

As we move forward, we plan to be at the cutting edge of sustainability. Turning agricultural waste into high performing natural material solutions. We strive to service any market interested in working with our materials and to help us create the perfect solution for your business we offer custom formulation services. Our material range covers everything from high performance industrial uses to home or marine compostable packaging and everything in between.



HEMP

DESCRIPTION

This Hemp polypropylene (PP) combines hemp with one of the most widely used plastic resins in the world, to create a heavy industrial plastic that is also at the forefront of sustainability.

SUSTAINABILITY

Hemp core holds up to 70 percent cellulose, the highest known among any plant on earth. It can grow in a wide range of climate and soil conditions, maturing in just 60 to 90 days. One ton of hemp can absorb up to 1.6 tons of carbon dioxide from the air, creating a closed carbon cycle during photosynthesis. It requires roughly a quarter of the water consumption of traditional crops, while returning more nutrients back into the soil.

Due to its availability, wood pulp cellulose is currently the most common bio-filler on the market. When making a direct comparison between the two, you can see sustainability weighs heavily in hemp's favor. Not only does it take a fraction of the time to grow, but hemp also has 30 percent more cellulose per pound than wood, and harvesting hemp does considerably less environmental damage than traditional logging.

PLASTIC

Hemp's bio-filler performance-enhancing qualities are clear to see. When mixed with polypropylene at a 20 percent fill rate, the hemp filler increases heat resistance, flexural strength, tensile strength, tensile elongation, and specific gravity. Sustain Studio's hemp PP can also be combined with other fillers, such as glass, which will increase stiffness and rigidity for heavier industrial applications.

Us

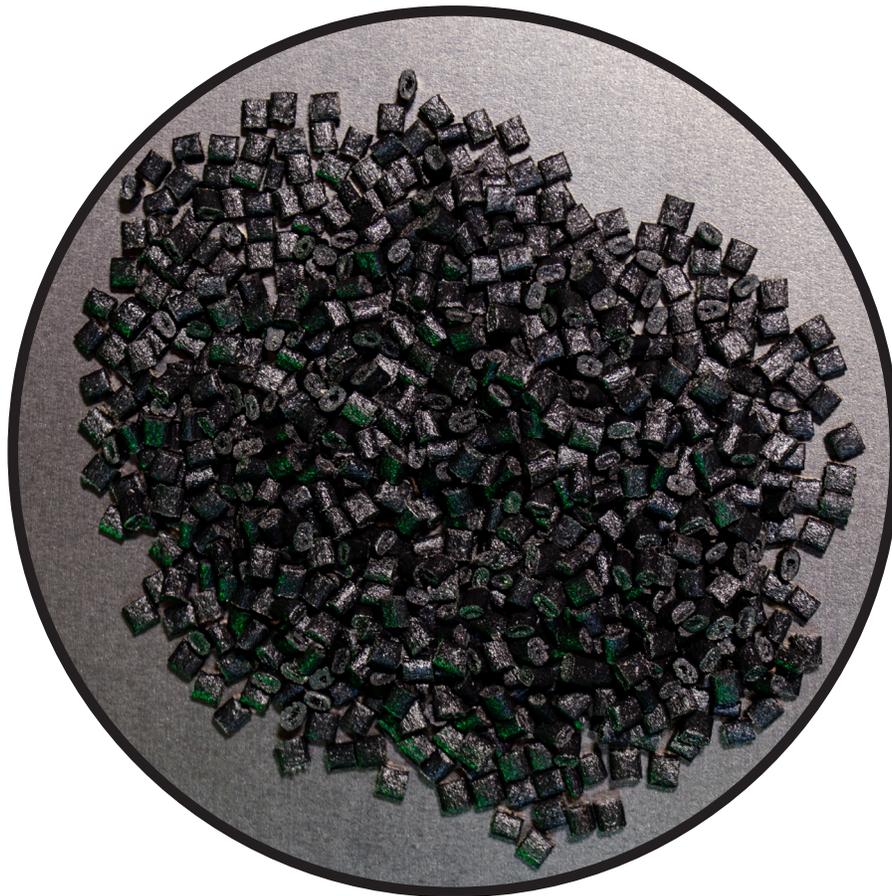
Beyond our hemp PP, we can custom formulate with any necessary resin.

COLLECTING RAW HEMP FROM FARMERS

Collection begins at the end of the 60 to 90-day harvest. As the buds are trimmed for CBD, the plant's remaining stalk is bailed up. The hemp stalk is then decorticated, which separates the tough woody inner "hurd," from the soft fibrous exterior "bast". After decortication, the materials are sent to our processing facility to be pulverized.

PROCESS HURD INTO POWDER

Once at the processing facility, the hemp hurd is then fed into a state-of-the-art processor, which uses sound waves, vibrations, and vortex eddies to micronize the biomass and remove up to 98 percent of the moisture from the material. The micronized powder is then poured into humidity-controlled containers, where it awaits shipment to the compounder's.



COMPOUND POWDER

At the compounder's, the micronized powder is loaded into an extruder, along with the resin of choice and other potential fillers, and chemically compounded into plastic. The plastic comes out of the extruder in long strands and is run through a cold water bath conveyor system.

EXTRUDE FINAL

Once the plastic has been pulled from the cold water bath it is pelletized and packaged.

80% HM PP 20% HEMP

Impact Results

Method Name: ASTM D256

Impact Resistance ft-lbf/in	Impact Strength kJ/m ²
0.649	
0.640	
0.676	
0.631	
0.623	
Average	0.644

MI Results

Set Temperature °C	Capture Load kg	Flow Rate g/10-min
230	2.16	9.07
230	2.16	9.09
230	2.16	9.37
230	2.16	9.56
Average		9.27

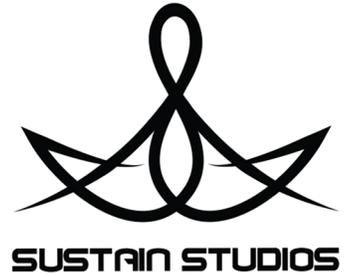
Type: ASTM D638 - Extensometer

Chord Mod psi	Ultimate Stress psi	Elongation %	Yield Strain %
262000	4170	8.27	
211000	4120	4.92	
267000	4180	7.26	
371000	4110	10.1	
276000	4100	7.13	
Average	277000	4140	7.54
SD	58100		

Type: Flexure ASTM D790

Chord Mod psi	Ultimate Stress psi	Elongation %	Yield Strain %
260000	6570	10.0	
245000	6440	10.0	
245000	6440	10.0	
260000	6340	10.0	
247000	6340	10.0	
Average	251000	6420	10.0
SD	7870		

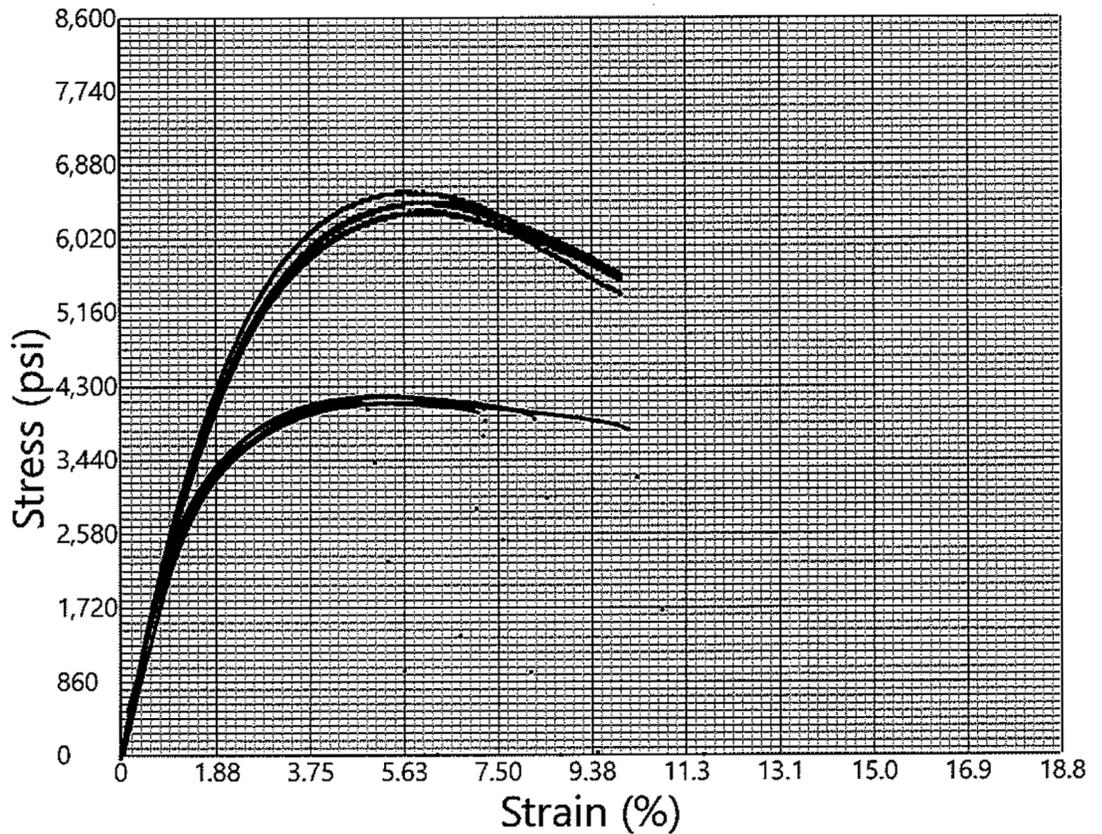
Sustain Studios
6588 Center Industrial Dr, Suite X
Jenison MI 49428



ASTM Output

Grade Name: EVNIROPRO 2010HM20
Lot Number: 588048
Test Date: 06/26/2020
Specific Gravity: 0.96
Gardner: 64 Delta E:
Ash: 1.20 Delta L:
Durometer: Mold Shrink: 0.0118

Tester: Tom Griffin



80% HM PP 20% HEMP

LOT NUMBER 591244

DATE TESTED JULY 20, 2020

GRADE TYPE



PRODUCT CHARACTERISTICS

MATERIAL STATUS	ACTIVE	FORM	PELLET
AVAILABILITY	NORTH AMERICA	COLOR	
FEATURES	GENERAL PURPOSE	USES	INJECTION MOLDING
FILLER / REINFORCEMENT			
TESTING PERFORMED BY	JAMES CRAFT	TESTING VERIFIED BY	BILL THOMPSON

PHYSICAL

VALUE

UNIT

METHOD

ASH CONTENT	1.55	%	ASTM D5630 / ISO 3451
MELT FLOW RATE	8.37	G/10MIN, 230C/2.16KG	ASTM D1238 / ISO 1133
MOLD SHRINK	0.010	FLOW	INTERNAL METHOD
SPECIFIC GRAVITY	0.99	G/CM ³	ASTM D792 / ISO 1183

MECHANICAL

FLEXURAL MODULUS	325000	PSI	ASTM D790
FLEXURAL STRENGTH	6850	PSI	ASTM D790
TENSILE ELONGATION @ BREAK	4.67	%	ASTM D638
TENSILE STRENGTH	3960	PSI	ASTM D638

IMPACT

GARDNER IMPACT	32	IN-LB	ASTM D5420 GB RING OUT
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COFFEE

DESCRIPTION

Coffee chaff is the flaky outer shell of the coffee bean, which falls off during the roasting process. Most roasters see these paper-like shells as a nuisance and waste product with no apparent value. The end result is usually shipped to a landfill along with the other trash from the roaster. Millions of pounds of chaff go to waste every year simply because there didn't appear to be a use for it. Recently, we've partnered with Caribou Coffee because we believe chaff can be key in the development of a more sustainable single-use plastic. When chaff is mixed with various plastic resins, it not only makes the final product lighter, but it also brings with it a natural

COLLECT RAW CHAFF FROM ROASTERS

Working with our local coffee roasters, we've developed a simple and easy collection system that saves chaff from ending up in landfills. When the roasting process begins the chaff is separated from the bean and collected in one of our food grade containers placed beside the coffee roaster. Once the container is full it is sent to our processing facility.

PROCESS CHAFF INTO POWDER

Once at the processing facility, the coffee chaff is then fed into a state-of-the-art processor, which uses sound waves, vibrations, and vortex eddies to micronize the biomass and remove up to 98 percent of the moisture from the material. The micronized powder is then poured into humidity-controlled containers, where it awaits shipment to the compounder's.



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Re: Comparison of Mechanical Properties – Polypropylene filled with Coffee Chaff

Properties	Test Method	Copolymer Polypropylene	15% Coffee Chaff in PP	25% Coffee Chaff in PP
			L200603-B1	L200603-B2
Flexural Modulus, psi	ASTM D790	160000	181400	227000
Tensile Strength@yield, psi	ASTM D638	3050	2445	2370
Elongation at yield, %	ASTM D638	5	4.3	2.8
Elongation at break, %	ASTM D638	na	30	13
Specific Gravity g/cc	ASTM D792	0.900	0.9484	0.987
Izod Impact, ft.lb/in	ASTM D256	4.31	1.714	1.269
Melt Flow Index 230C/2.16Kg, g/10min	ASTM D1238	18	18.97	20.37