

WP1: Year round cultivation, automated harvesting, and storage/transportation of seaweed

SIOEN, ECN, DTI, SAMS, AU



WP1: Objectives



This work package targets the advanced, large scale and year round cultivation of red, green and/or brown seaweeds as raw material for the advanced onshore biorefinery processes towards the next generation of transportation biofuels. Focus will be on:

- ✓ Large scale cultivation of red, green and/or brown seaweeds (up to 1000 m² of substrate).
The substrates will be deployed in large test cultivation areas, i.e. the 20 ha available in Denmark and 17 ha in Scotland.
- ✓ High yield rotating crops (min. 25 kg ww/m²/year)
- ✓ Determination of the seasonal variation of sugars contents of the year around cultivation of selected species
- ✓ A conceptual fast, automated harvesting process (min. 1000 m²/hr)
- ✓ Temporary on-site storage (with a maximum loss of 5% biomass over 6 weeks of storage)
- ✓ Large scale seaweed transportation (25 m³ flexible storage tank filled with seaweeds being transported over a distance of 1 NM at sea)





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WP1: Overview

WP1: Year round cultivation, automated harvesting, and storage/transportation of seaweed

Partners involved: SIOEN, ECN, DTI, SAMS, AU

Period: M1 – M44 (Jan 1, 2016 – August 31, 2019)

Tasks:

Task 1.1: Advanced, large scale and year round cultivation of red, green and/or brown seaweeds via rotating crops (M1-M44; SAMS, AU, SIOEN, DTI)

Task 1.2: Fast, automated harvesting process (M7-M44; DTI, SAMS, AU, ECN, SIOEN)

Task 1.3: Temporarily storage and transportation of harvested seaweed (M19-M44; SIOEN, ECN, SAMS, AU, DTI)





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Task 1.1: Advanced, large scale and year round cultivation of red, green and/or brown seaweeds via rotating crops

Timing: M1 - M44

Partners involved: SAMS, AU, SIOEN, DTI

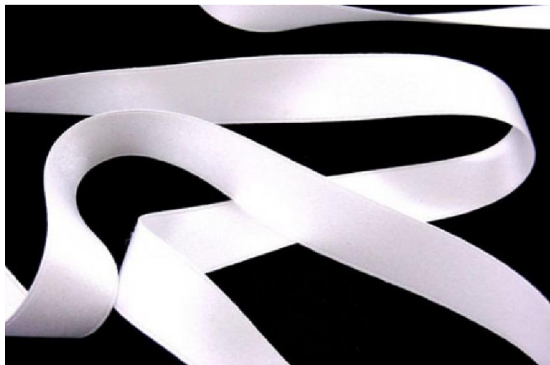
- Cultivation in Scotland and Denmark
- Browns, reds and/or greens
- Up to 1000 m² of effective cultivation area (1D and 2 D substrates)
- Year round => rotating crops => at least 25 kg per m² per year
- Biodegradable substrates, cost reduction, combined crops, etc.



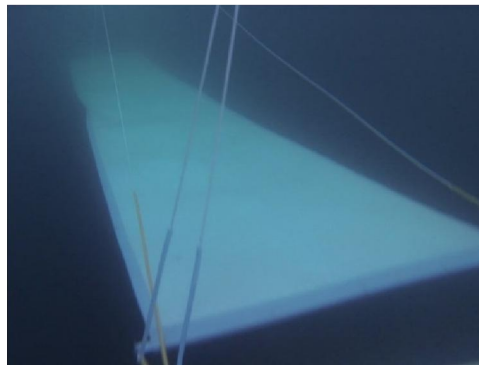
AlgaeTex products



- Advanced textiles for seaweed cultivation
- Patented by SIOEN Industries
- Available as:



Ribbons with various widths
(min. 2 cm width)



Substrates:
24 x 3 m
10 x 2.4 m
others



Nets and grids



Task 1.2: Fast, automated harvesting process

Timing: M7 - M44

Partners involved: DTI, SAMS, AU, ECN

- Automated harvesting of seaweeds on 1D and 2D cultivation substrates
- Develop fast harvesting process up to 1000 m² per hr
- Develop IPR



Task 1.3: Temporarily storage and transportation of harvested seaweed

Timing: M19 - M44

Partners involved: SIOEN, ECN, SAMS, AU, DTI

- Demonstrate seaweed storage in flexible storage bags up to 25 m³
- At least 6 weeks storage time at sea with minimum loss of biomass
- Demonstrate transport in seaweed storage bag over a distance of 1 NM
- Pretreatment of stored seaweed in flexitanks via ensilage



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WP1: Deliverables

- D1.1: Report on advanced, large scale and year round rotating crop cultivation of red and brown seaweeds, yielding at least 25 kg ww/m²/year (SAMS; M44)
- D1.2: Demonstration of an efficient harvesting system for large scale harvesting resulting in a fast, automated harvesting process of at least 1000 m²/hr (DTI, M44)
- D1.3: Report on long term storage and large scale seaweed transportation (SIOEN; M44)
- D1.4: Seaweed samples sent to partners (DTI, AU, SAMS; continuous)



WP1 activities so far ...

Meetings so far:

- WP1 meeting on October 7, 2015 in Grena (DK)
- WP1 skype meeting on November 13, 2015
- WP1 workshop on December 2 + 3, 2015 in Oban (SCO)



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Selected seaweed species:

Alaria esculanta

SAMS

Sacharina latissima

SAMS, AU

Fucus vesiculosus

AU

Gracilaria vermiculophylla

AU

Palmaria palmata

SAMS

Ulva lactuca

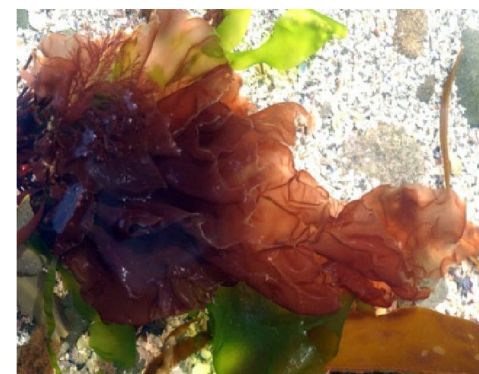
SAMS

Porphyra umbilicalis

AU

Saccorhiza polyschides

SAMS

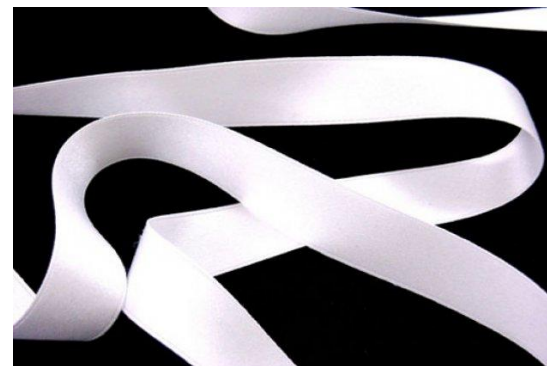




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Y1 cultivation at sea:

- Traditional rope system
- AlgaeTex 5 cm ribbons



Seaweed	Expected harvest (kg ww)	When in 2016
<i>Alaria esculanta</i> SAMS	100	June
<i>Sacharina latissima</i> SAMS	100	June
<i>Sacharina latissima</i> AU	100	June
<i>Fucus vesiculosus</i> AU	100	June
<i>Gracilaria vermiculophylla</i> AU		
<i>Palmaria palmata</i> SAMS	20	May
<i>Ulva lactuca</i> SAMS	20	May
<i>Porphyra umbilicalis</i> AU	5	Aug
<i>Saccorhiza polyschides</i>	20	Aug





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Small scale tests with alternative cultivation substrates:

	Product code	Product description	Color	Weight (g/m ²)	Quantity
1	AlgaeTex G1	fabric reinforced nonwoven	white	500	small pieces
2	AlgaeTex G2	fabric reinforced nonwoven	white	500	ribbons on roll
3	G7650	single side PVC coated fabric	yellow/white	550	ca. 1-2 m ²
4	PES fabric	Polyester fabric; 1100 dtex; 7,5 x 6,5	white	150	ca. 1-2 m ²
5	PP ribbon fabric	Polypropylene ribbon fabric	white	50	ca. 1-2 m ²
6	PP fabric	polypropylene fabric; 930 dtex; 7 x 8	white	..	ca. 1-2 m ²
7	S5351	PU coated PES fabric	white	190 g/m ²	ca. 1-2 m ²
8	PES nonwoven	PES nonwoven	white	..	ca. 1-2 m ²
9	PLA nonwoven	PLA nonwoven	white	..	ca. 1-2 m ²
10	PA nonwoven	PA nonwoven	white	..	ca. 1-2 m ²
11	PP nonwoven	PP nonwoven	white	670	ca. 1-2 m ²
12	Jute nonwoven	Jute nonwoven	brown	530	ca. 1-2 m ²





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Outlook to coming 6 months

- Deployment of traditional ropes and AlgaeTex ribbons (5 cm) at sea
- Tests with alternative textiles in combination with different seaweed species
- Prepare for summer crop
- Supply seaweed biomass to partners



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