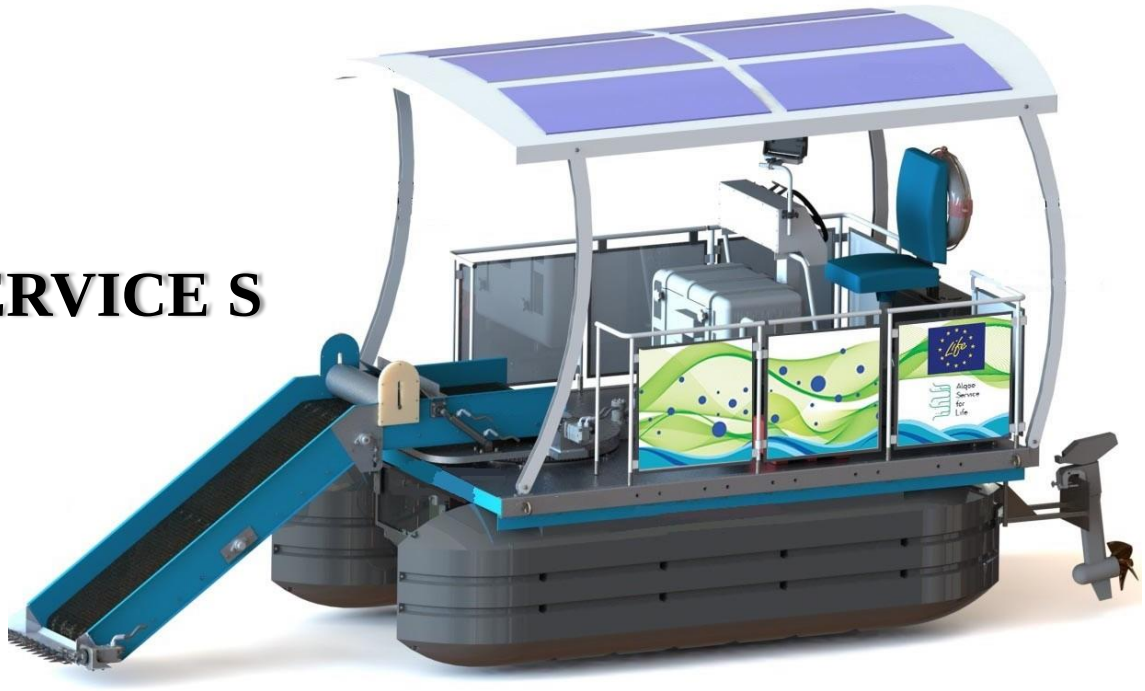
ALGAE SERVICE S

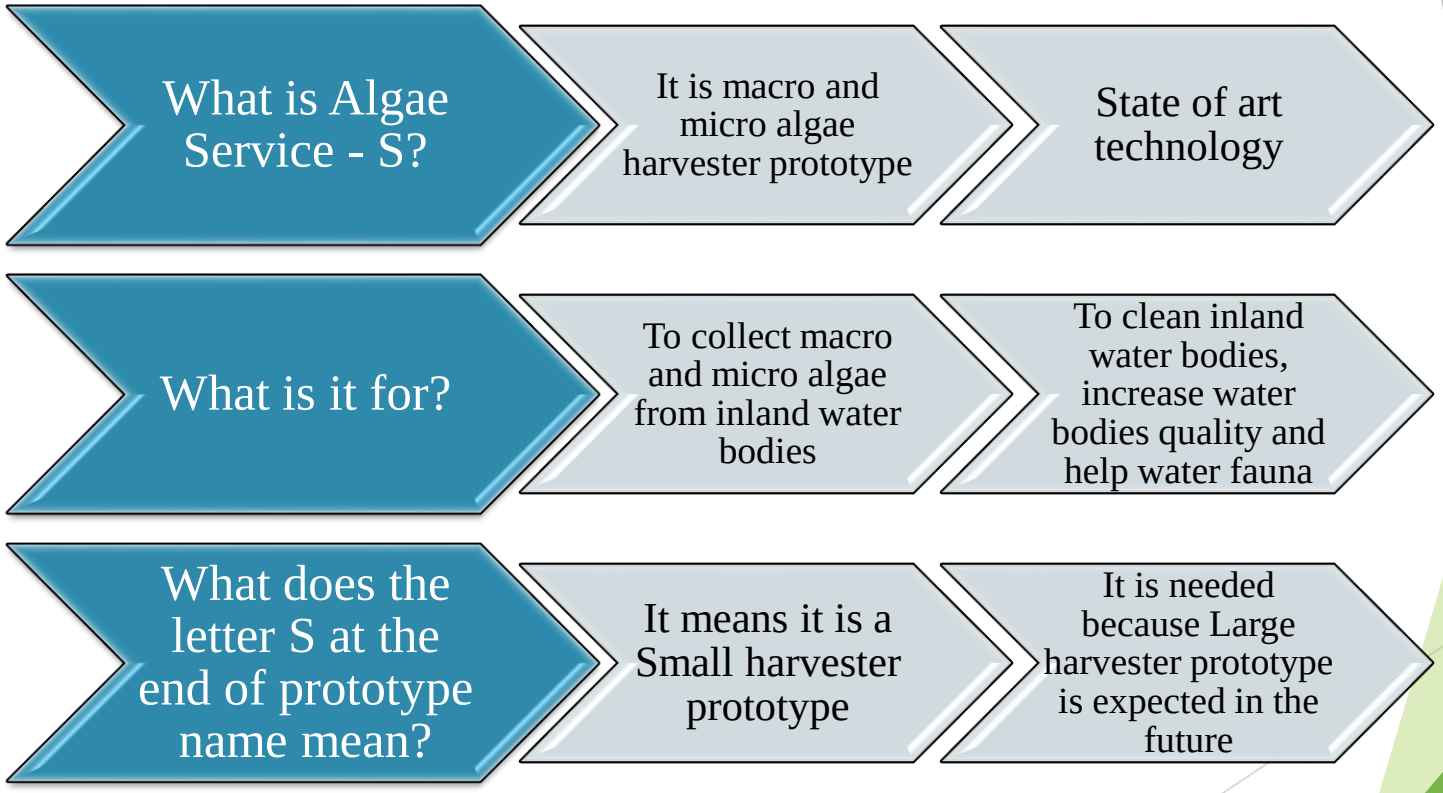


Project title:
ALGAE – ECONOMY BASED ECOLOGICAL SERVICE OF AQUATIC ECOSYSTEMS
(**LIFE17 ENV/LT/000407**)

2020.08.12

Algae service - S (AS-S)

Most popular questions and answers:



Algae Service – S creation timeline

Projection

Work done:

– 500 technical drawings
– 300 engineering work drawings (dxf files)
– Hydraulic calculations
– Hydrostatic stability calculations
– Electric scheme preparation
– Prepared building project

Manufacturing

Work done:

– Selection of needed equipment
– Selection of proper materials
– Manufacturing of separate parts: front head, rotation mechanism, press conteiner, pontoons, control panel, roof, sides.
– Instalation of eco friendly equipment: biodiesel engine, electric engines, solar panels.

Receiving of permits

Work done:

– Prepered and approved patent
– Approved building project
– Building supervised by authorities
– Registration of AS-S
– Registration of AS-S trailer
– First and annual technical inspections

Testings and improvements

Work done:

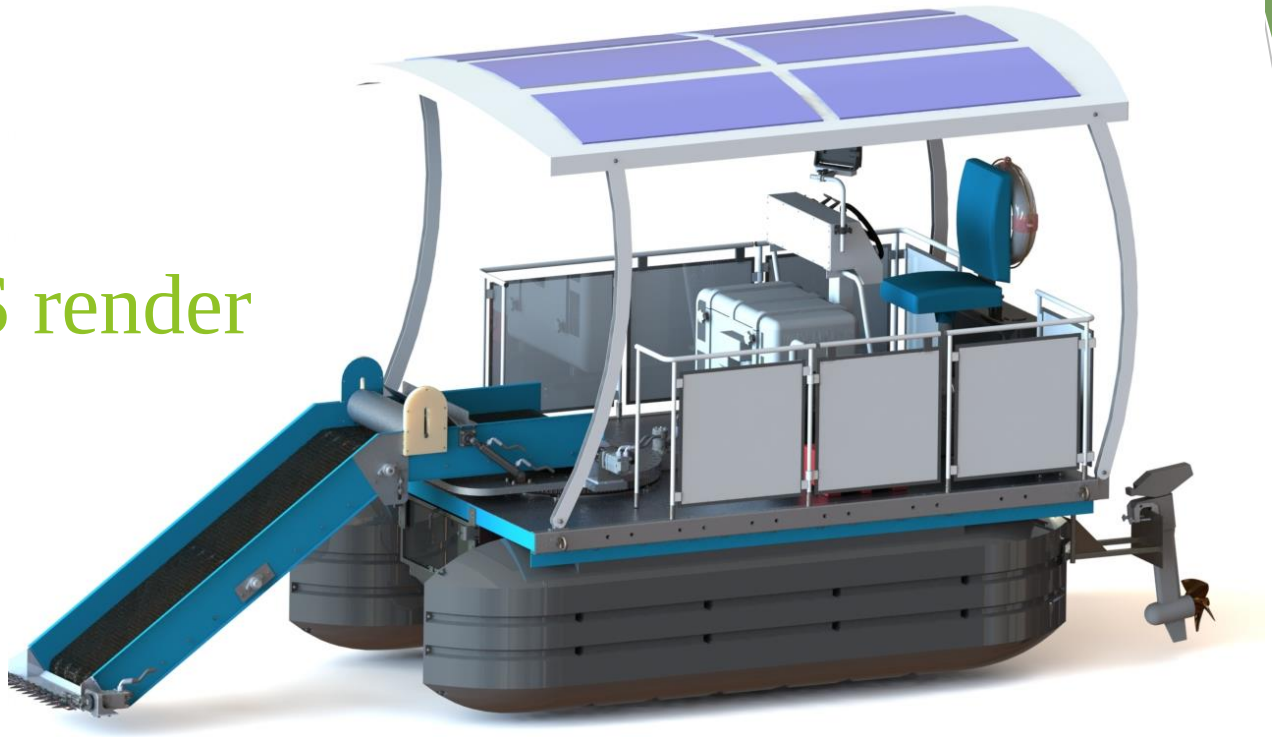
– up to 100 separate parts testings
– more than 10 testings in 3 different water bodies
– more than 20 corrections and improvements on separate parts
– more than 5 different designs

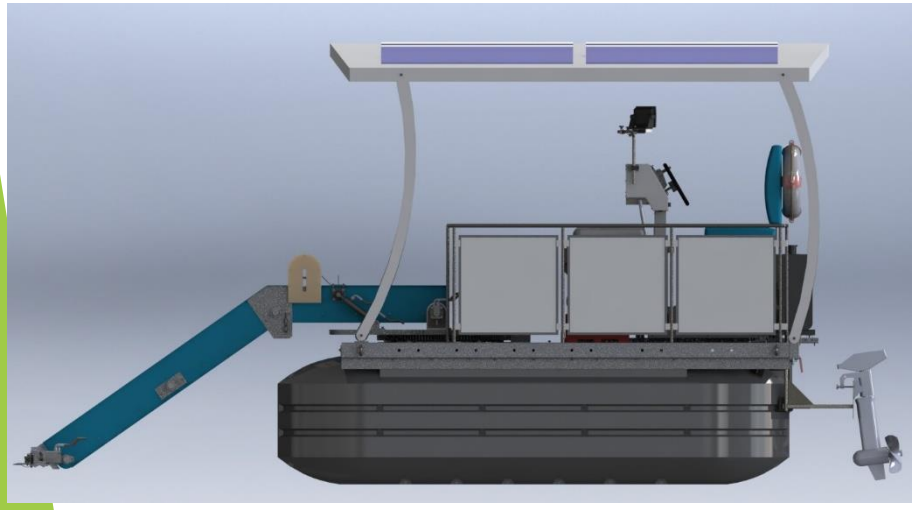
Exploitation

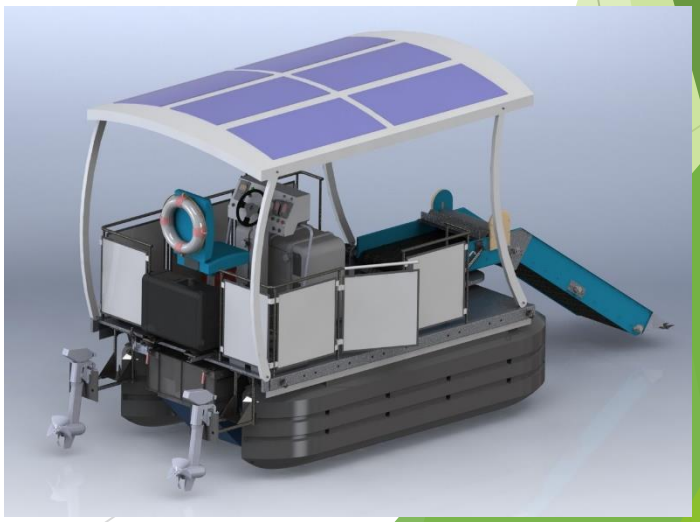
Work done:

– Prepared full safety equipment and manual instructions
– Manufactured and tested algae unloading
– Macroalgae collection in Kaunas lagoon
– Microalgae collection in Kaunas lagoon
– Accumulated solar power

AS-S render







Technical specification

Length Over All, m	7.69
Length without conveyor, m	3,5
Width Over All, m	2.45
Height, m	up to 3.5
Height to the top of the guard, m	2.13
Guard/sides height, m	1,0
Weight, kg	2500
Speed, km/h	10
Capacity, kg	1500
Maximum draft, m	0,55
Minimum freeboard	0,47
Electric engine power, kW	2,0; 2,0
Number of electric engines, pc	2,0
Biodiesel engine power, kW	36.6 – 45.5
Maximum number of operators	1
Maximum number of passengers	0
Transporter speed, m/s	0.1 – 0.3

Basic parts of AS-S

Eco-friendly parts:

- Electric engines, 2 pcs
- Biodiesel engine
- Solar panels, 6 psc
- Electric bateries, 2 psc
- Echo-sounder

Parts, which makes AS-S *State of art technology*:

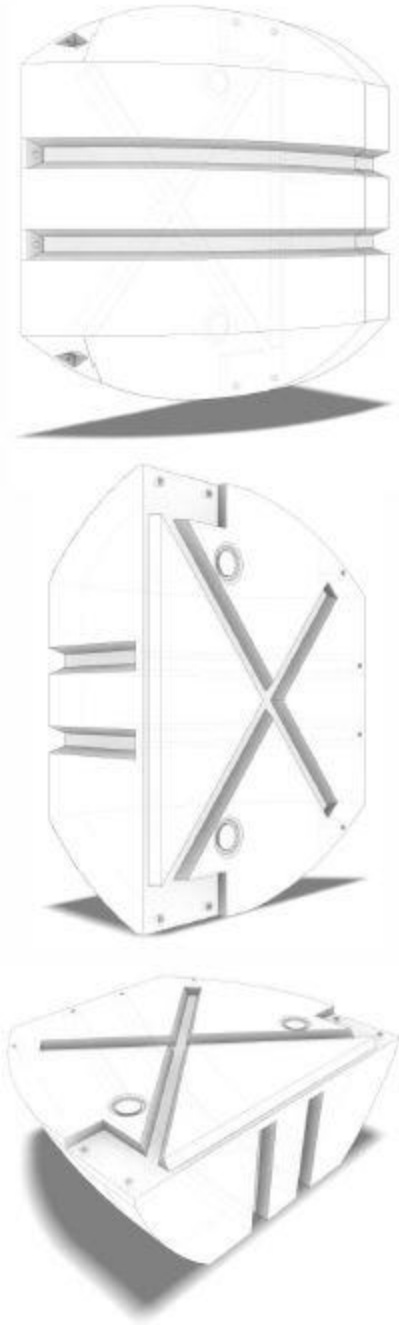
- Sideways front head moving wheel
- Universal up-down/left-right moving front head, with changeable mesh
- Pressconteiner (main)
- Perforated box on wheels (opptional)
- Scissors
- Biodiesel engine positioning rails

Other basic parts:

- Pontoons
- Platform
- Control panel

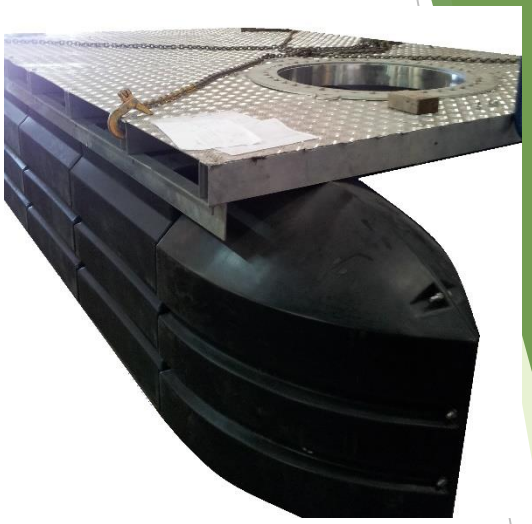
Pontoons

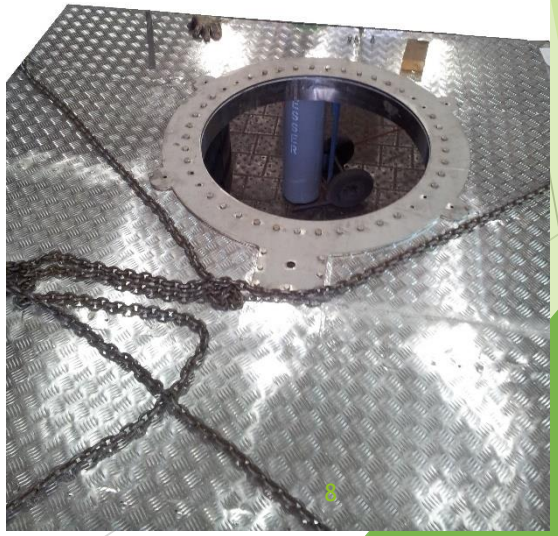
- AS-S pontoons are made from 5 pairs of segments on each side.
- In complete AS-S pontoon consist of **20** separate segments
- 3 segment pairs on each side are square and 2 on each side has rounded ends
- One segment lenght/width/height: 800 / 375 / 1000 mm
- Material: Polyethylene
- Colour: black
- Foaming: none



Platform

- Platform width with pontoons: 2500 mm
- Material: stainless steel
- Surface made rough with special pattern, to avoid slips when wet
- Unusual, unique hole was made in platform in order to target collected biomass to collection space – pressconteiner
- Colour of platform is natural steel grey, both sides of platform are white
- On platform only one operator is required





Electric engines, 2 pcs

- Model: Torqeedo Cruise 2.0 RL
- Improved robustness and improved corrosion protection
- Emergency magnetic stop key
- Steering: Provision for connecting to standard

One electric engine specification:	
Input power in watts	2000
Rated voltage in volts	24.0 - 25.9
Propulsion power in watts	1120
Comparable petrol outboards (propulsive power)	5 HP
Comparable petrol outboards	69 HP
Cut-off voltage	Li 21 V PB 18 V
Maximum overall efficiency in %	56
Total weight in kg	16.2
Max propeller speed in rpm	1300
Control	Remote throttle / Tiller
Tilting/Trimm device	Manual
Stepless forward / reverse drive	Yes

Electric batteries, 2 psc

- Model: Torqeedo Power 24-3500
- High-performance lithium battery 3,500 Wh
- Energy power density to 138 Wh / kg
- Weight is just 25.3 kilograms
- 12 hours to fully recharge with the standard 350 watt charger
- Optional 1700 watt fast charger recharges under 2 hours
- Waterproof to IP67
- Including battery management system with integrated protection against overcharging, short circuit, deep discharge, polarity reversal, overheating and submersion

Biodiesel engine

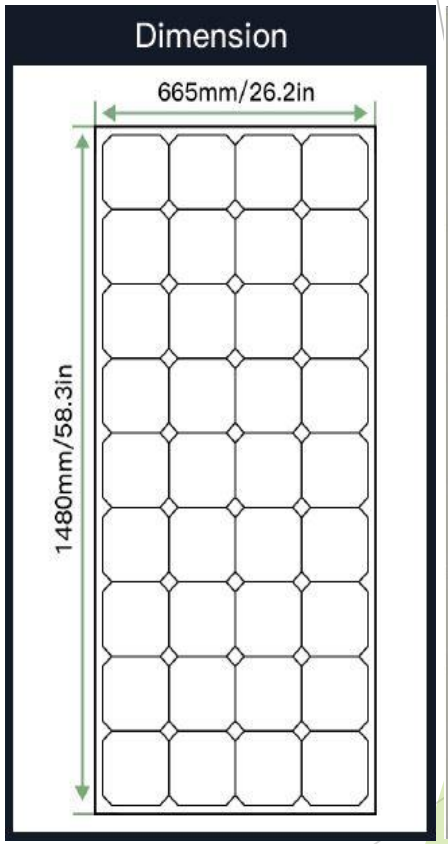
- Perkins 404D-22T Industrial Biodiesel Engine
- 36.3-45.5 kW (48.7-61 hp) @ 2600-3000 rpm
- The 4 cylinder 404-22 model sits at the top of the 400 Series engine range
- It combines high performance, low operating costs and a compact package
- A powerful but quiet 2.2 litre turbocharged unit delivering impressive performance with low operating costs
- Designed to meet EU Stage IIIA/U.S. EPA Tier 4 Interim equivalent emission standards

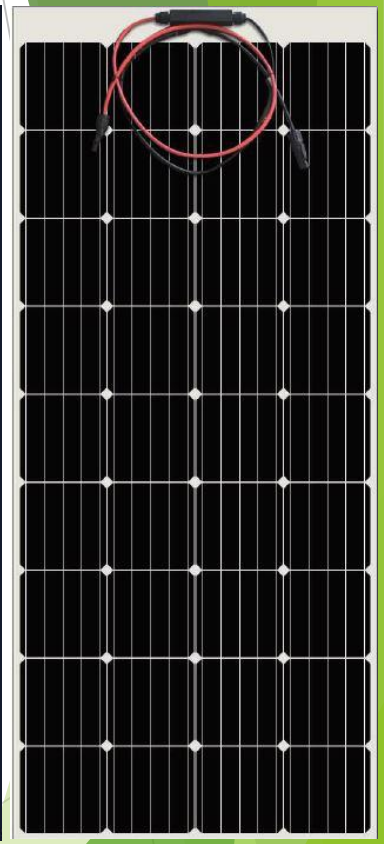
Engine dimensions without hood	
Length	661 mm
Width	489 mm
Height	698 mm
Dry weight	194 kg

Solar panels

- Mono semi Flexible Solar panels
- One weight only 3.2 kg
- Only 3 mm thick

Max Power	Pmax	160 W
Max Power Voltage	Vmp	18.0 V
Max Power Current	Imp	8.9 A
Open Circuit Voltage	Voc	21.6 V
Short Circuit Current	Isc	9.7 A
Maximum SystemVoltage		600V
Series Fuse Rating		10 A
Cell Efficiency		18.56 %
Number of Cells in Series		36
Cell dimension		156 x 156 mm
Max Power tolerance		+ (0~5 W)





Echo-sounder

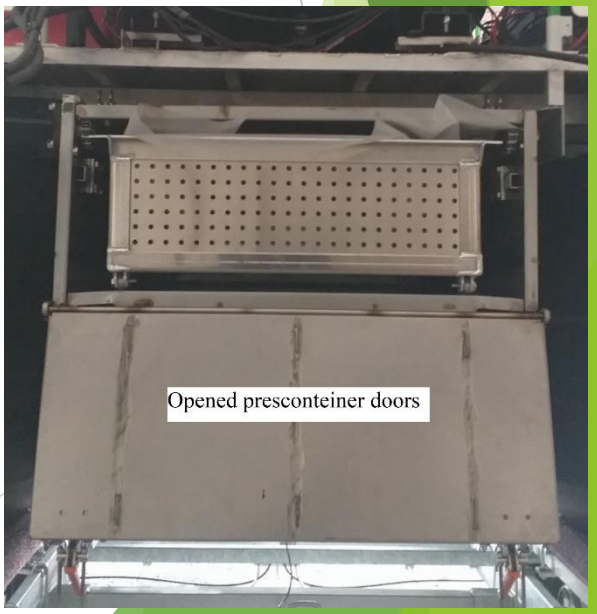
- Model „Garmin Striker plus 9SV“
- Echo sounder indicated AS-S harvesters location
- Shows water body bottom relief
- Integrated GPS receiver allows to mark waypoints, create routes and see the speed of the harvester
- Bright, perfectly readable sunlight 9 "screen and intuitive operation
- The Garmin CHIRP is a traditional beam that produces clear images and perfectly distinguishes objects.
- The „CHIRP ClearVü™“ and „CHIRP SideVü™“, which represent what is under the ship to a depth of 229 m in near photographic quality.
- And finally - Wi-Fi connection to access the „ActiveCaptain™“ app to receive smartphone notifications

Rotating front head

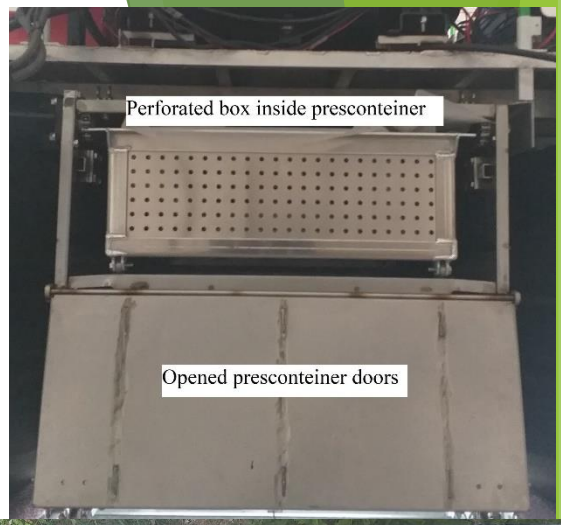
- Front head can move up / down
- Because of extraordinary engineered rotation wheel, front head can move sideways and reach algae from sides and shores, without swimming closer and moving whole harvester
- Front head was mainly created to collect macroalgae, so it has rough steel mesh with small spikes to catch macroalgae, hold its weight and draw to collection space.
- At the end of front head there is stainless steel scissors to cut long macroalgae mats and to reach them under the water.
- Whole front head construction is made from steel in order to increase quality, exploitation time and resistance to mechanical and/or nature forces.
- Front head is versatile, because it can be used to collect microalgae. With minor mesh changes and water suction equipment additions AS-S harvester front head can collect microalgae.
- **Because of this universal front head ability, AS-S harvester is adaptable to work in various inland water bodies, which makes it superior comparing to other harvesters on the World market.**

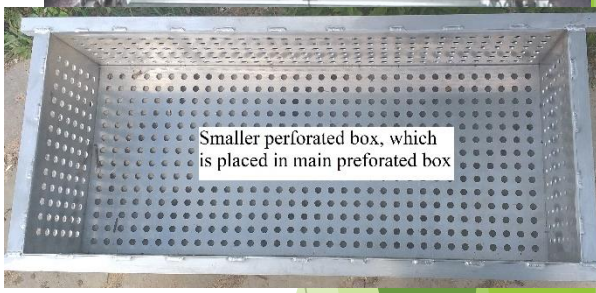
Presconteiner (main)

- Presconteiner **is patented, state of art technology, which can not be found in any harvester around the world**.
- This conteiner is build to collect mainly macroalgae.
- Presconteiner is placed between pontoons under the platform
- Volume of presconteiner is 0.6 m^3
- Collected macroalgae are transfered to presconteiner through the hole in front head‘s rotary wheel
- In order to collect more macroalgae than any other similar harvester in the market, presconteiner was made with chain piston to press macroalgae.
- With chain piston technology macroalgae can be pressed various times inside presconteiner and can be pushed out of conteiner to collection place. **Whole process is fully automated and controlled from main panel.**
- Presconteiner has door at the end of harvester, which can be opened, when discharging collected biomass. Other times it should be closed.

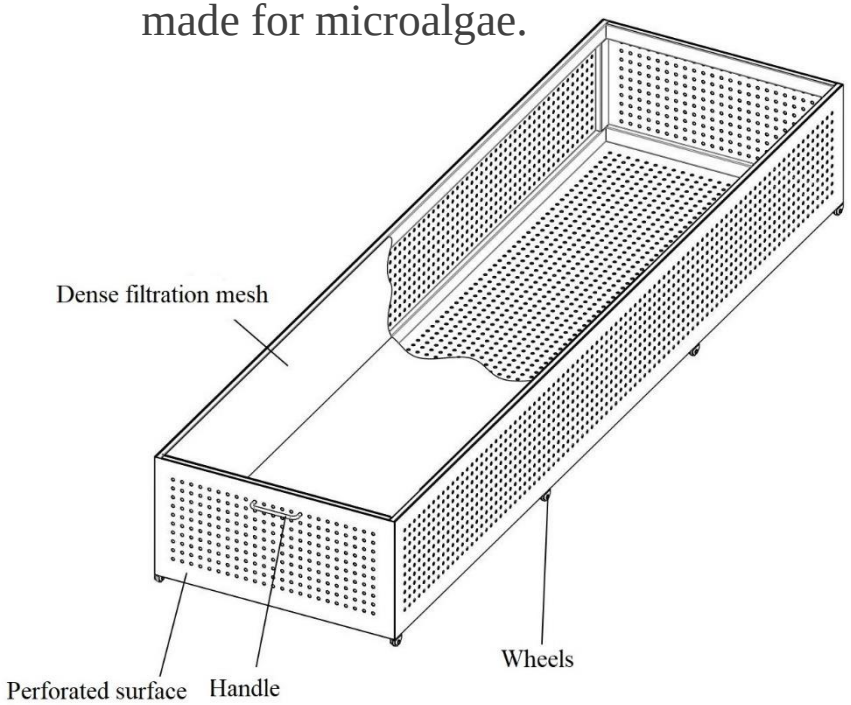


Perforated box on wheels (opptional)





- Metal perforated box is made as an option to collect microalgae
- Microalgae is very liquid consistence and small in size, thus chain piston can not press them. For this reason, perforated box with dense mesh inside of it was made.
- Perforated box is made from 2 perforated boxes, first one is smaler with rare mesh so collect large weeds and organisms, second one is bigger, takes whole presconteiner size and is made for microalgae.



- Main perforated box has 8 wheels, so collected microalgae together with perforated box can be easily pushed out from presconteiner by chain piston.
- **Whole process is automated and controled by one operator from control panel**

Control panel

- Control panel is design for one operator to control all AS-S harvester functions from one place

- From control panel operator can control and see:
- Biodiesel engine parameters
- Elentric engines lifting from water
- Harvester swimming speed
- Steering wheel
- Piston chain in presconteiner
- Front heads movement up/down and left/right
- Scissors and transporter mesh rotation
- Eco-sounder parameters

- Operators place is design safely to reach any equipment needed on AS-S platform in safely conditions

Working principle

AS-S harvester working principle can be separated into 2 parts

1. Macroalgae collection (main)

Equipment used:

1. Scissors
2. Front head
3. Metal mesh
4. Dewatering cylinder
5. Spatula under transporter
6. Presconteiner
7. Chain piston

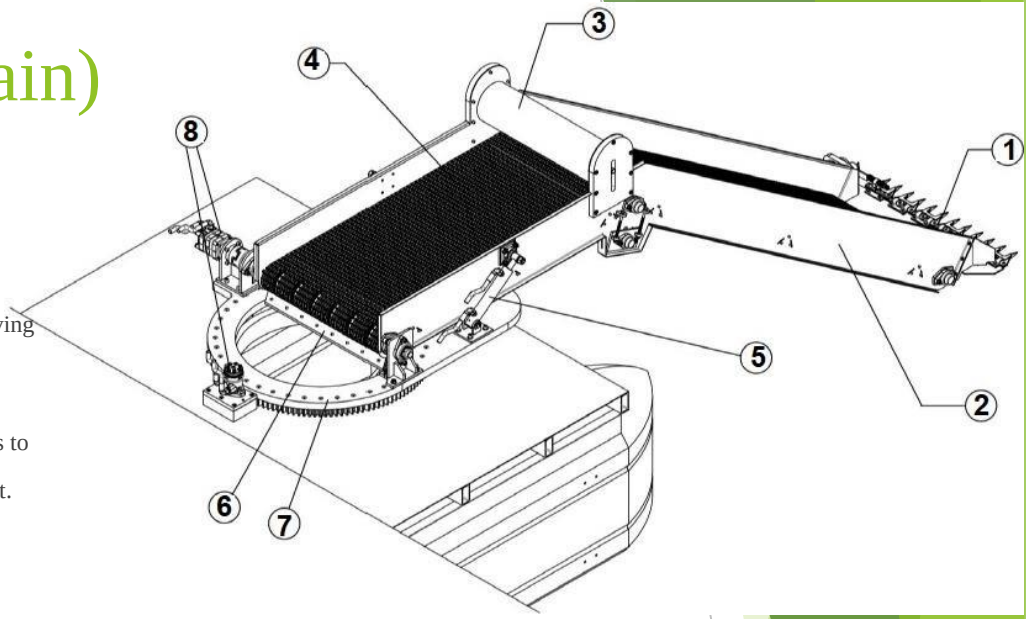
2. Microalgae collection (optional)

Equipment used:

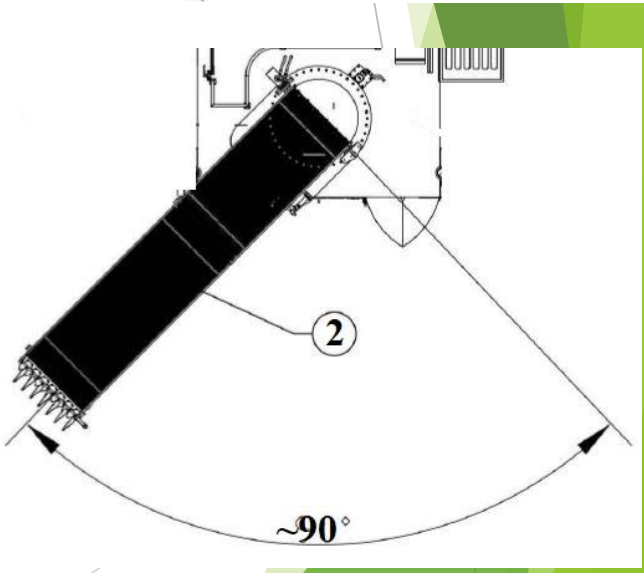
1. Front head
2. Dense mesh (53 microns)
3. Water suction equipment under filtration mesh
4. Spatula
5. Pressed air nozzles for microalgae removal from mesh
6. Perforated boxes with dense meshes
7. Chain piston

Note: Such ecology friendly equipment like electric engines, batteries, biodiesel engine, solar panels, chain piston and others like rotary wheel, control panel are working despide colected biomass type.

Working principle:
1. Macroalgae collection (main)



- Front head is lowered into water.
- Transporter (2) starts rotating, scissors (1) starts cutting.
- Macroalgae is taken from water with transporter (2) being in start position or by moving front head left/right.
- After macroalgae reaches front head, transporter (2) lifts biomass and forces biomass to pass dewatering cylinder (3) which gently press biomass and reduce its water content.
- After dewatering cylinder (3) biomass using gravity force fall into presconteiner. If biomass stuck on filtration mesh, spatula (6) which is under transporter (2) separates biomass from mesh and it falls into presconteiner.

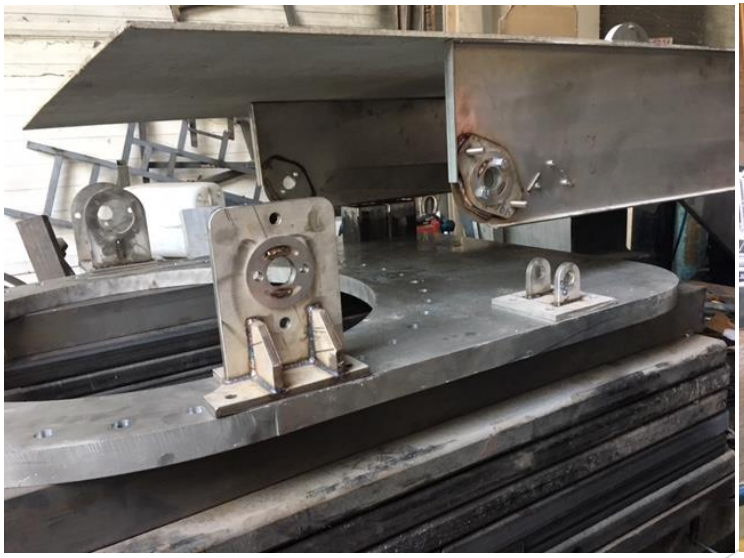


- When macroalgae is in the presconteiner, it is press number of times using chain piston to reduce its size and water content.
- When macroalgae is collected, door at the end of presconteiner must be opened and chain piston pushes out biomass from presconteiner.
- During collection process solar panels charge batteries, which are used for presconteiner and for swimming.

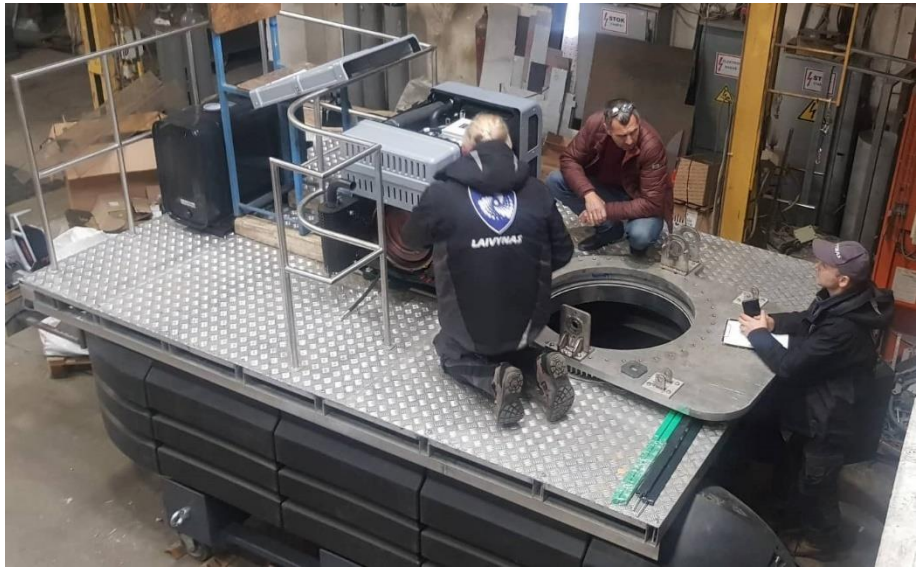
Manufacturing 07/2019



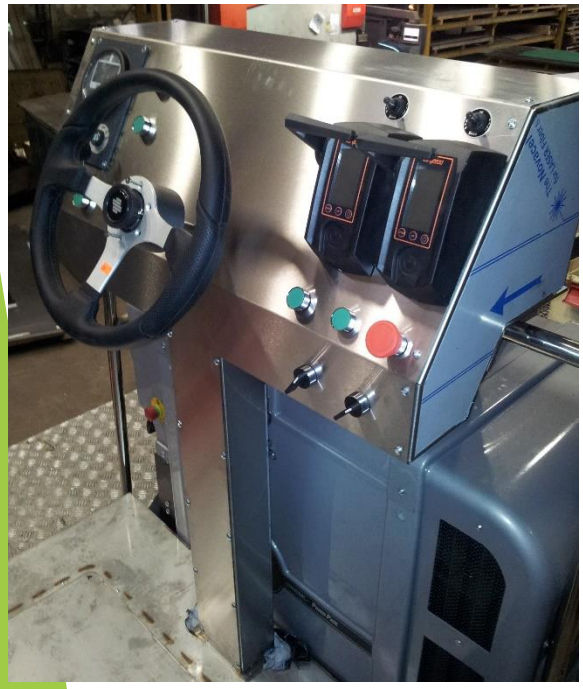


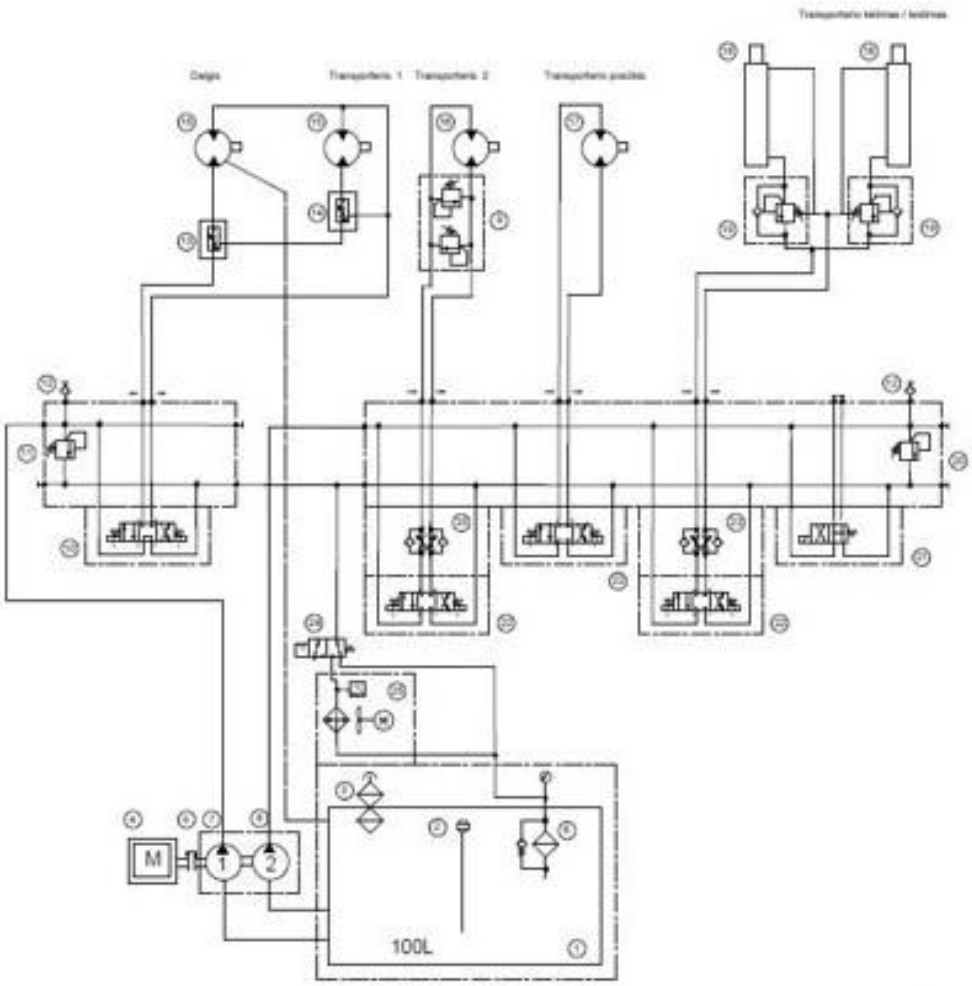

Manufacturing 10/2019



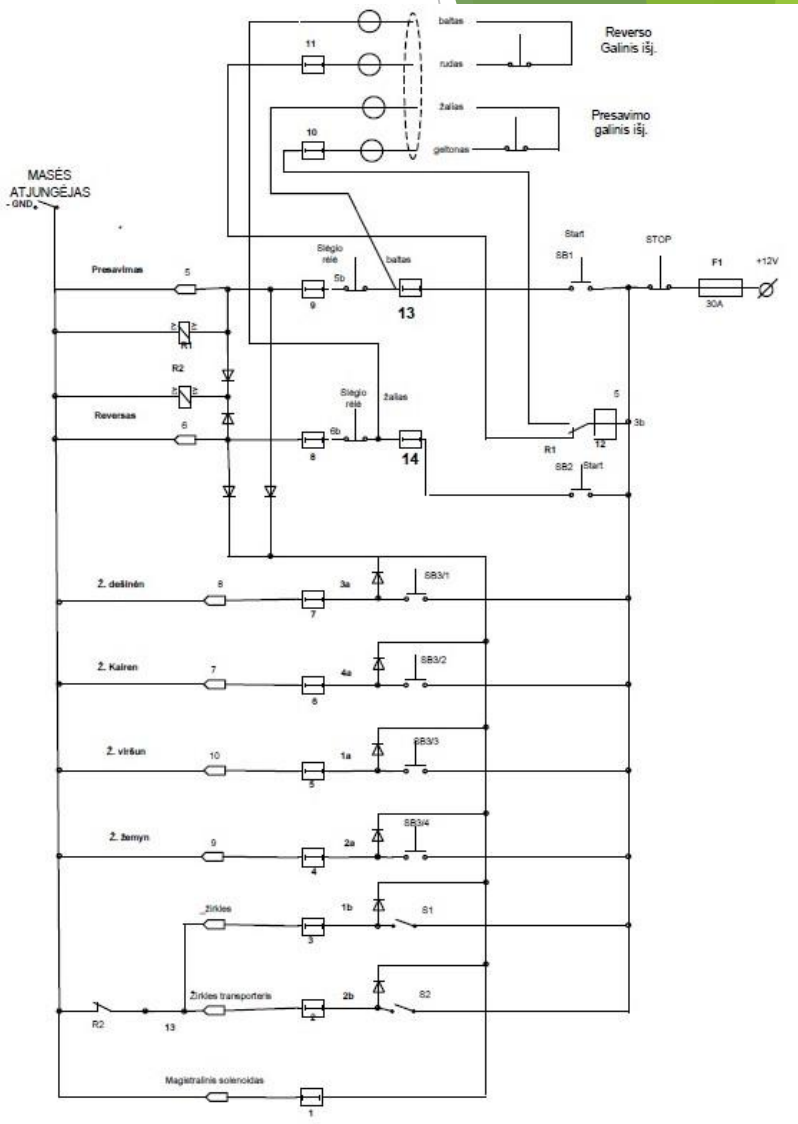
Manufacturing 12/2019



Hydraulic scheme

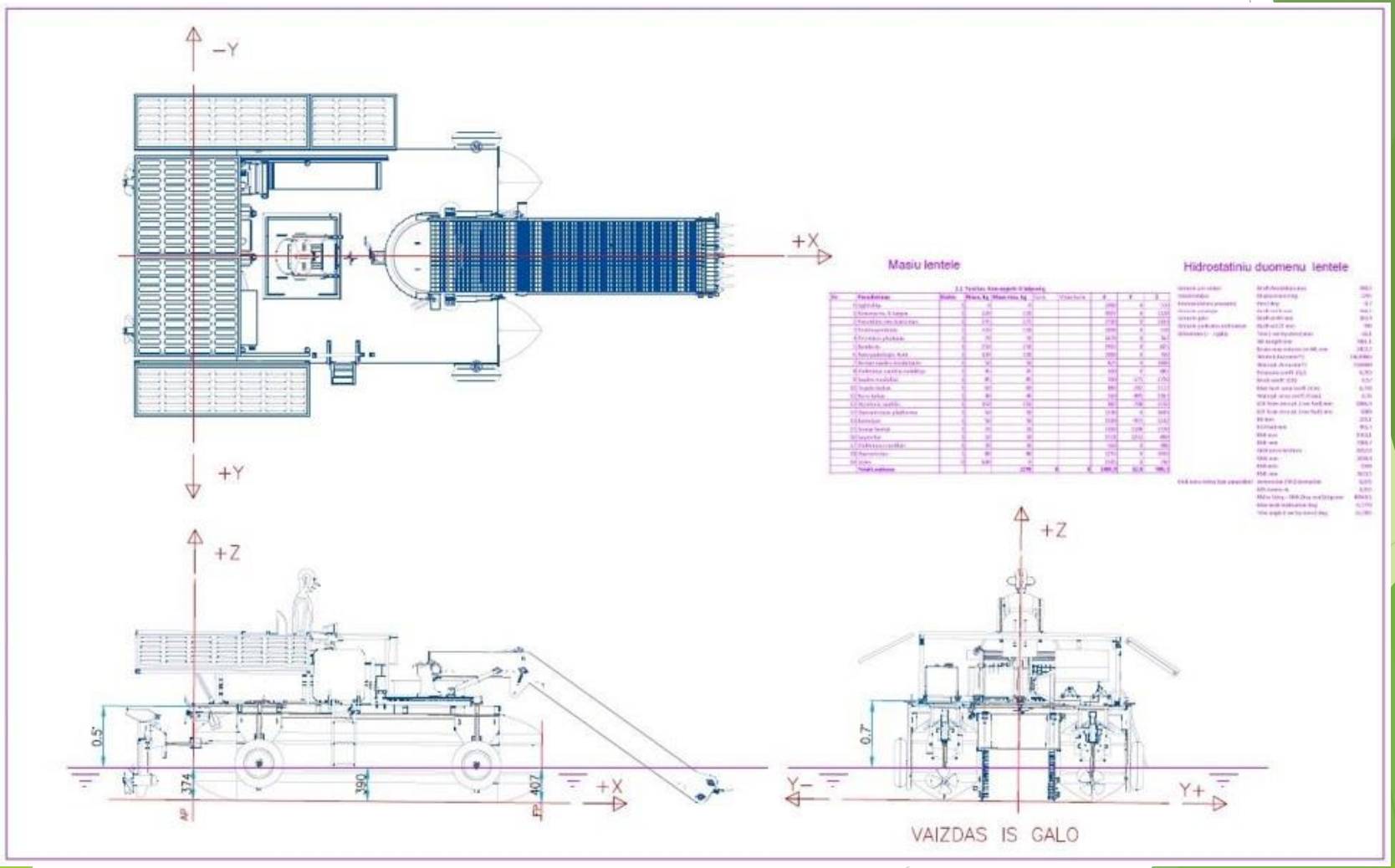


Electrical scheme



Hydrostatic stability calculations

- Up to 10 different equipment positions, AS-S positions and weights were calculated to determine needed stability and safe conditions on water



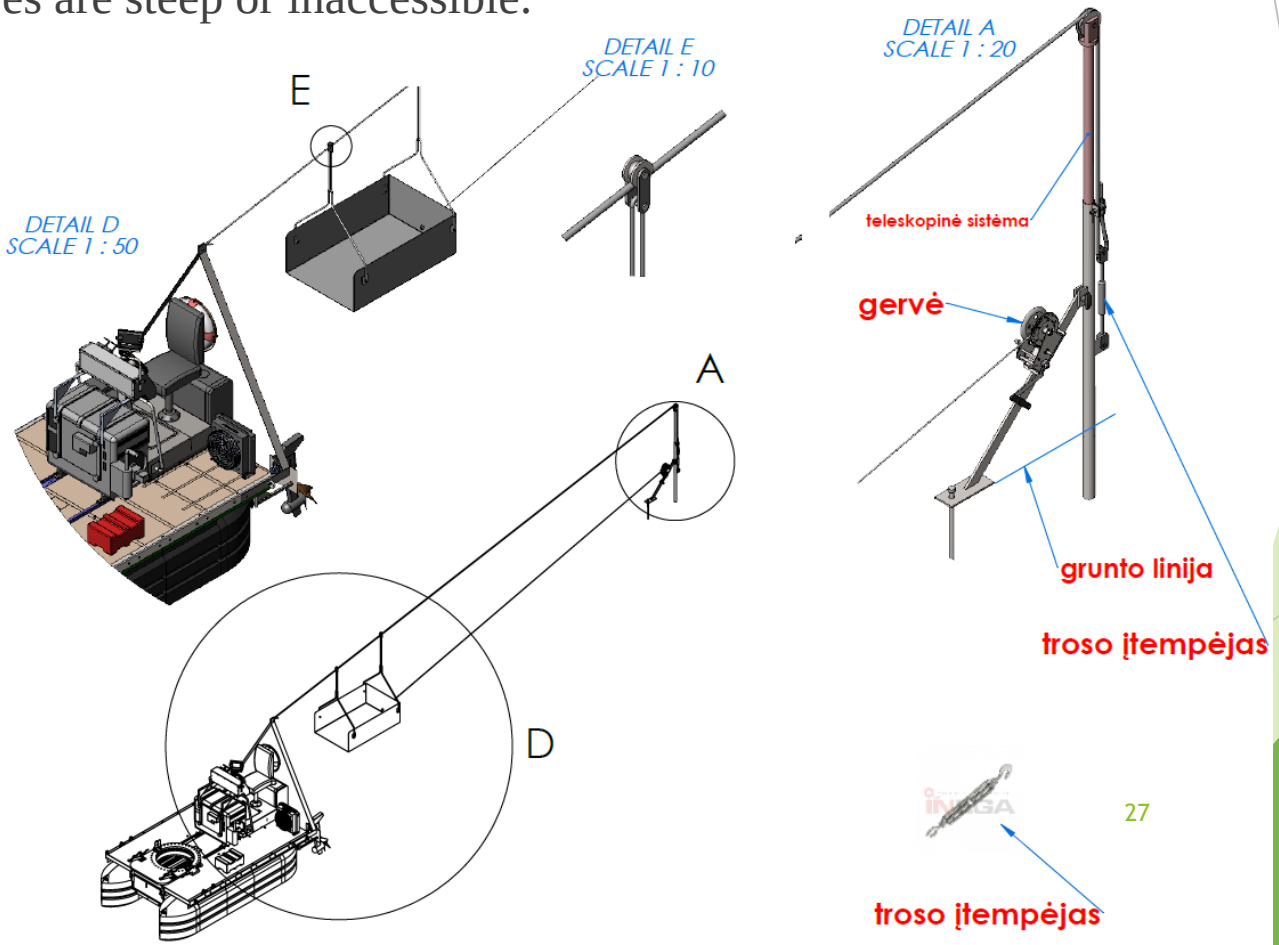
Testing and making corections

AS-S trailer

- AS-S trailer is one of its kind, because it is custom made for AS-S and is not suitable for any other harvester or ship.
- Trailer is made for pontoons and also have wheel to make AS-S discharging into the water even easier.

AS-S prototype macroalgae unloading mechanism

- Macroalgae unloading mechanism is state of art technology.
- It is created precisely for AS-S prototype to discharge collected heavy macroalgae amounts to the shore.
- This unloading mechanism solves discharging problem when riverside or lake shores are steep or inaccessible.



Permits received for AS-S

LIETUVOS TRANSPORTO SAUGOS ADMINISTRACIJA
LITHUANIAN TRANSPORT SAFETY ADMINISTRATION
VIDAUS VANDENŲ TRANSPORTO PRIEMONĖS REGISTRACIJOS LIUDIJIMAS
CERTIFICATE OF INLAND WATERCRAFT REGISTRATION

2020-06-11
Kaunas

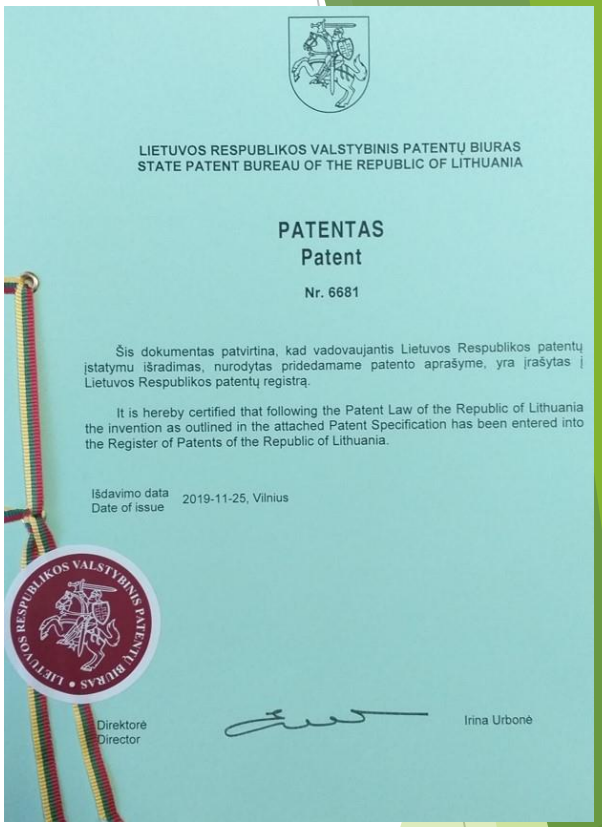
Registro Nr. **LT-PI-756**
Laivo pavadinimas – **AS-S**
Laivo tipas – **plūduriuojantis įrenginys**
Laivo paskirtis – **paviršinių vandens telkinių valymas**
Laivo modelis – **b/p**
Unikalus identifikavimo kodas – **0000366499**
Statybos metai – **2020**
Kilmės šalis – **Lietuva**
Korpuso Nr. **AS-S-2020**
Korpuso medžiaga – **aliuminis**
Korpuso spalva – **pilka**
Maksimalus ilgis – **7,69** m, plotis – **2,45** m

Maksimali grimzlė – **0,55** m
Minimalus viršvandenio borto aukštis – **0,47** m
Žmonių skaičius – **1**
Keliamoji galia – **1500** kg
Projektavimo kategorija –
Variklio tipas – **pakabinamas**
Variklio galingumas – **2,00; 2,00** kW
Variklio modelis – **Torqeedo Cruise 2,0 RL**
Variklio Nr. **19259012A1231-00-6; 19259015A1231-00-7**
Pagaminimo metai – **2019**
Savininkas:
Vardas, pavardė, asmens arba įmonės pavadinimas, kodas

UAB Baltic Environment
304169506
Adresas: **Medeinos g. 7-45, Vilnius**

Jūrų departamento
Laivybos paslaugų skyriaus
vyriausioji specialistė
Gintara Miglinienė
009900

Certificate of inland watercraft registration



LIETUVOS RESPUBLIKOS VALSTYBINIS PATENTŲ BIURAS
STATE PATENT BUREAU OF THE REPUBLIC OF LITHUANIA

PATENTAS
Patent

Nr. 6681

Šis dokumentas patvirtina, kad vadovaujantis Lietuvos Respublikos patentų įstatymu išradimas, nurodytas pridedamame patento aprašyme, yra įrašytas į Lietuvos Respublikos patentų registrą.

It is hereby certified that following the Patent Law of the Republic of Lithuania the invention as outlined in the attached Patent Specification has been entered into the Register of Patents of the Republic of Lithuania.

Išdavimo data
Date of issue 2019-11-25, Vilnius

Direktorė
Director Irina Urbonė

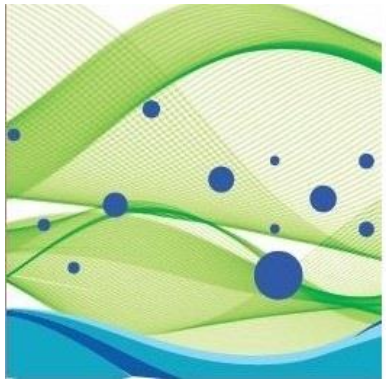
Lithuania Republic patent

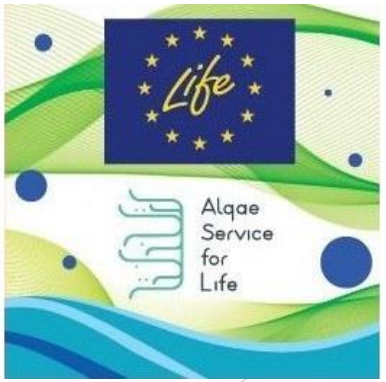
Other created documents and received permits:

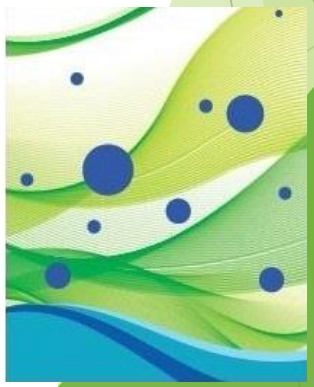
- AS-S building project
- Manufacturing AS-S registration certificate
- First technical inspection
- Annual technical inspection
- AS-S trailer registration
- AS-S trailer exploitation document
- Prepared AS-S manual instructions
- Various requests and letters
- Consent to build AS-S by authorities (Lithuanian transport safety administration, Lithuania Ministry of Environment)
- AS-S building supervision by Lithuania transport safety administration

Finishing touches...

Design







Completed product AS-S

Thank you for attention

Disclamer: The content of this presentation does not reflect the official opinion of **European Union.** Responsibility for the information therein lies entirely with the authors.