SophSys BV - Dutch Waste2Energy specialists

Turning waste from a cost to a revenue model.

SophSys BV introduction.
SophSys is a Dutch company, specializing in developing, constructing and operating waste2energy and waste2hydrogen facilities, based on EU accepted processes and technologies.

Solution providers.
SophSys is a solution provider, supporting the client from the very start (planning and identification of options and possibilities) to the finish line (delivery of a turn-key facility).
Knowing that many clients have a specific desire or need and that clients not always have the required specialists within their own team, SophSys is able to bring together all the required technologies and specialists that are needed to develop a project on behalf of the client.
By taking the role of solution provider, the client is assured that his project is managed by people that know the industry, know the technologies and know the risks and ensures that the client is supported and guided throughout the entire process.
SophSys is a one-stop-shop for the development of waste recovery, waste2energy and waste2hydrogen projects.

Independent from manufacturers.
Depending on the situation and the requirements of the client, SophSys deploys the best available technology and best available technology supplier to the project. SophSys is not limited to a single manufacturer but always works with several suppliers and specialists to ensure the client gets the best options and solutions.

The art of the possible.
Working together with the client and based on the client's desires and wishes, SophSys provides an overview of the possible solutions, technologies and options. As SophSys has a wider range of solutions available, the art of the possible will provide the client with an overview of what options and solutions can be available and are profitable for the client.

Proven technologies.
SophSys only works with technology providers that offer proven and tested technologies.

New and cutting edge.
Part of the tasks for the SophSys team is to always be looking for new developments in the industry. When identifying a potential new technology, the SophSys specialists will visit the manufacturer and investigate the technology and the manufacturer to ensure the client gets proven and reliable technologies for the project.

The SophSys team.

The SophSys team is a group of specialists, each in their own field of expertise, working together to enable a successful and sustainable development of the project.
The aim of the team is to provide a full and integrated solution for the client, ensuring that the client is advised and supported from the start to the finish, ending with the delivery of a turn-key facility and even the option to provide management support during the operational deployment of the facility.

Within the SophSys team are the following specialists/expertise:

- Permits and approvals (EU level)
- Legal
- Finance (EU/state and commercial banking)
- Project management team
- Mechanical recycling
- Chemical Recycling
- Energy storage
- Grid development
- Gas and Hydrogen conversion
- Gas turbine
- Hydrogen (production, transport and fuel station)
- Solar
- Wind turbine
- Engineering team
- Infrastructure
- Construction (buildings and facilities)
- Fire safety
- Laboratory and chemical analysis
- Heat recovery
- Heat engineering
- District heating

Depending on the situation and the requirements of the client, the specialists are selected and deployed to the project to ensure a successful development.

SophSys has experience in obtaining EU funds and support and has political advisors in various countries to support the project.

What is Chemical Recycling.

Chemical Recycling is the general name for a technology that enables the recycling of various waste products into energy, hydrogen, oil and/or re-usable materials with minimum emissions.
Chemical Recycling is a Level-C Recycling technology and is considered to be the Best Available Technology (BAT) in the industry for processing waste materials that can not be recovered or re-used.
Mechanical Recycling and Chemical Recycling together form the final steps within the EU waste system for processing waste that is EU accepted.
Mechanical Recycling is EU Level-C1 to C2. Chemical Recycling is EU Level-C3.

Incineration is a Level-E technology and is NOT an EU accepted solution and is not eligible for EU funding or support/

SophSys only offers proven technologies that either can show a full functioning commercial deployment or have a functioning, long term operational research facility.
Upon proceeding with SophSys as your technology/project partner, site and technology visits can be arranged.

Integrated solution provider.

SophSys has a team of experts and specialists to enable a fully integrated project development. SophSys is a chemical recycling specialist, but to develop a full and successful project, additional actions and steps are needed on waste sorting and recovery (mechanical recycling), gas-to-energy conversion, gas to hydrogen conversion, grid connection, design and calculations, permits and construction.
SophSys can provide above stated services to its clients and in some cases even assist in obtaining EU funding for projects.
To know more about the SophSys team and the capabilities of the team, please contact SophSys at 0031-6-288-47-131 or via mail at Martijn@sophsys.nl .

Off-Grid power stations.

As the world moves towards a greener and cleaner environment and countries adopt the Climate Change reduction goals, local and national power grids get overloaded and congested. As a direct result of implementing solar and wind turbine farms, the local and national grid system experiences peak searches and industries and municipalities are often unable to obtain a new grid connection or extend their grid connection to facilitate growth.
By working together with its partners, SophSys is one of the few companies that is able to offer small and larger power plants on a full off-grid setting, avoiding/bypassing the local and national grid.

Chemical Recycling offers a stable and reliable energy baseload supply, by combining the Chemical Recycling (Pyrolysis) with battery storage and subsequent backup power systems, a reliable and sustainable (green) off-grid power supply can be achieved.

Off-grid power stations are a reliable solution for small and larger industries such as manufacturing sites, communities and data centers.

Overview of additional available technologies.

Pre-sorting and recovery (Mechanical Recycling EU Level-C1 and C2).
Waste often contains valuable and recoverable materials. The EU waste system requires the implementation of recovery for valuable and reusable materials. SophSys has a long-term partnership with several waste-sorting technology providers. Retrieving valuable materials from your waste could enhance your project ROI and increase the revenues from the process. Non-recoverable material is send to the pyrolysis unit whilst recovered valuable materials can be sold to third parties to be reused in various processes.

Gas to electricity.
Alongside the chemical recycling units, SophSys is able to provide high-end gas generator units for converting pyrolysis gasses (syn-gas, similar to LPG) into electricity.
The generator unit capacity is between 0.4 to 1MWh per unit and are all containerized and sound-proof installed.

Hydrogen production from electricity.
SophSys has a strong partnership with the Dutch Hystream company.
Hystream is one of the leading developers of hydrogen production facilities and hydrogen fuel stations. Hydrogen is produced from electricity via electrolyser units. The produced hydrogen is then compressed to 350/700 bar to enable deployment as a (stored) fuel for trucks, cars and industrial usage.

Alternative processing is the extraction of hydrogen from syn-gas.
Through this alternative technology, hydrogen is extracted from the syn-gas and compressed for further processing or utilized as a fuel for generators, cars, trucks and ships. The remaining gas is processed into alternative by-products that are sold to the industry.

Waste analysis.

Knowing the real composition of your household and industrial waste is essential for understanding the required process and potential outcome models on product and finance.
SophSys offers waste analysis to businesses and governments, both on and off-site using the latest in available technology and research and works with European laboratories for validation and quality control.

Heat Recovery.
Chemical Recycling (Pyrolysis) units produce and excess amount of heat that can be recovered and deployed for drying waste and/or for district heating solutions. Depending on the situation and requirements, SophSys is able to provide expertise for heat recovery and district heating solutions.

Battery storage.
As the world works towards the climate change reduction goals, solar and wind production is increasing around the world. As solar and wind are inconsistent in it its availability and cause peak searches onto the local and national grid, the local and national power grid suffers from congestion and overloading. Local battery storage enables the buyer to temporary store energy that has either been bought during low traffic/low cost hours or energy produced from solar and wind that has been produced by their own installations.
SophSys provides graphene energy storage solutions (super capacitors).

SophSys works together with some of the leading battery manufacturers and offers battery systems for private houses and industrial deployment, ranging from 27 KW to 100+MW.
Capacity of energy storage can be scaled by combining multiple units.

Horizontal wind turbine.
SophSys has a partnership with the developer of a new type of wind turbine that uses horizontal blades. The efficiency of the horizontal wind turbine is much higher compared to conventional wind turbines. The horizontal wind turbines come in sizes from 1 Mw to 12 Mw and are able to operate at windspeeds between 1.5 m/s to 56 m/s.
Horizonal wind turbines have a lower environmental impact, lower noise levels and have a longer life expectancy. The horizontal wind turbine is currently deployed within a US Army development and has a proven track record on efficiency, life expectancy and durability.

Oil or gas operated turbines.
In addition to the gas operated combustion engines, SophSys is able to provide turbine units for the conversion of pyrolysis gas and pyrolysis oil into electricity. The oil and gas turbines are combined with integrated ORC units for maximum efficiency and energy production.

Steam turbine.
Upon request, SophSys is able to provide steam turbine units to a project. SophSys has relationships with several steam turbine manufacturers that are able to provide steam turbine units in various sizes and models.

Various other services, technologies and systems are available but not listed in this overview. For specific requests, please contact the SophSys office for more details and information.

SophSys provides technologies to recycle the following waste products:

Landfill waste

Depending on the mixture and on-site situation of the landfill, SophSys can process the landfill waste as follows:
Step 1 - separating and removing of organic materials (compost materials)
Step 2 - drying of remaining waste composition
Step 3 - sorting of waste to recover valuable materials (Mechanical Recycling EU Level-C1 and C2)
Step 4 – chemical recycling of remaining waste (RDF) into gas (Chemical Recycling EU Level-C3)
Step 5 - converting gas into energy (electricity) and/or hydrogen.

Household waste

Depending on the mixture of the waste, SophSys can process the household waste as follows:
Step 1 - separating and removing of organic materials (compost materials)
Step 2 - drying of remaining waste composition
Step 3 - sorting of waste to recover valuable materials (Mechanical Recycling EU Level-C1 and C2)
Step 4 - pyrolyze remaining waste (RDF) into gas (Chemical Recycling EU Level-C3)
Step 5 - converting gas into energy (electricity) and/or hydrogen.

RDF/SRF

RDF/SRF can be processed as follows:
Step 1 - separating and removing of organic materials (compost materials) (optional, if required)
Step 2 - drying of remaining waste composition (optional, if required
Step 3 - pyrolyze remaining waste into gas (Chemical Recycling EU Level-C3)
Step 4 - converting gas into energy (electricity) and/or hydrogen.

Industrial waste (other then SRF)

Depending on the mixture of the waste, SophSys can process the industrial waste as follows:
Step 1 - separating and removing of organic materials (compost materials)
Step 2 - drying of remaining waste composition
Step 3 - sorting of waste to recover valuable materials (Mechanical Recycling EU Level-C1 and C2)
Step 4 - pyrolyze remaining waste into gas (Chemical Recycling EU Level-C3)
Step 5 - converting gas into energy (electricity) and/or hydrogen.

End-Of-Life Plastics

Depending on the mixture of the plastics, SophSys can process the plastic waste as follows:
Step 1 – chemical recycling of plastic waste into gas
Step 2 - converting gas into energy (electricity) and/or hydrogen
Or:
Step 1 – chemical recycling of waste into oil
Step 2 - purification of oil (extraction of unwanted components to enhance quality of oil)

Medical waste

Depending on the mixture of the waste, SophSys can process the medical/chemical waste as follows:
Step 1 - controlled and isolated drying of materials
Step 2 - controlled and isolated chemical recycling of waste into gas
(Chemical Recycling EU Level-C3).
Step 3 - converting gas into energy (electricity) and/or hydrogen
Please note that for medical and chemical waste processing, strict rules and regulations on health and safety apply. Additional gas-cleaning technology is required to ensure a safe and controlled processing of produced gasses. For more detailed information, please contact our specialists.

Car and Truck Tires

Depending on the type of tires, SophSys can process the tires as follows:
Step 1 - specialized shredding technology
Step 2 - extraction of valuable materials such as Kevlar and metals
Step 3 – chemical recycling of remaining waste into gas (Chemical Recycling EU Level-C3).
Step 4 - converting gas into energy (electricity) and/or hydrogen
Or:
Step 3 – chemical recycling of remaining materials into oil and char (Carbon)

Wind Turbine Blades

SophSys can process the wind turbine blades as follows:
Step 1 - On-site shredding technology with minimum environmental impact
Step 2 – chemical recycling of shredded blades into clean reusable fibers and gas
(Chemical Recycling EU Level-C3).
Step 3 - Converting gas into energy (electricity) and/or hydrogen

Note: Fibers obtained from pyrolysis can be used to produce new plastics and products such as car-parts.

Sewage (wastewater) Sludge

SophSys can process the sewage sludge as follows:
Step 1 - drying of sludge material (using heat from chemical recycling unit)
Step 2 – chemical recycling of dried material into powder for disposal

Notes:
-In certain circumstances, the dried pyrolyzed powder can be used as a filler. This depends on the composition and polluting elements within the sludge.
-Due to the very low caloric value of sewage sludge, it is advised to combine this process with a household-waste installation to obtain gas for operating the sewage sludge installation.
Please ask our specialists for detailed advise on this product and setting.

DKR310 and DKR350

SophSys can process DKR310 and DKR350 into a high quality oil that can be used for production of new plastics and/or the production of bio-fuels.
This system is always supplied with an additional Mechanical recycling installation to purify the DKR310 and DKR350 to an acceptable level to avoid unwanted Chlorine levels within the oil.
This system comes with an off-take agreement for the produced oils.
REACH and ISCC+ certified oils and system.

Step 1 – purification of DKR310 and DKR350
Step 2 – on-site shredding and palletizing of materials
Step 3 – chemical recycling of materials into oil (Chemical Recycling EU Level-C3).

Organic residues

(ranging from wood, grass to agricultural residues).

Carbonization (part of C3 chemical recycling) of organic materials such as wood cuttings, agricultural residue, and grasses can be deployed to produce bio-char and Bio-Coal. Bio-Char can be used as fertilizer whilst the Bio-Coal has a caloric value of (indicated) 26Mj/kg or higher, compatible with regular black coal.

Step 1 - drying of materials
Step 2 - Shredding of materials
Step 3 – palettization of raw unprocessed materials (if required)

Step 4 – Carbonization
Step 5 – powdering of materials
Step 6 – production of Bio-Coal or Bio-Char mixing and briquetting

More waste processing options are available. Please ask our specialists for the best solution for your waste material.

Available systems and settings.

Several chemical recycling-equipment manufacturers have developed their own technology for a specific type of waste.
Depending on the waste type, the best technology is selected and deployed for best result.
The systems offered by SophSys are all 24/7 operated systems.
All offered systems are field-tested, proven technologies.

Capacity (indicated "Up-to" based on waste composition)

Landfill waste:	model 1: 8.000 ton per year	model 2: 24.000 ton per year
Household waste:	model 1: 8.000 ton per year	model 2: 24.000 ton per year
Industrial waste:	model 1: 8.000 ton per year	model 2: 24.000 ton per year
End of life plastics:	model 1: 8.000 ton per year	model 2: 24.000 ton per year
Medical and chemical:	model 1: 8.000 ton per year	
Car and truck tires:	model 1: 8.000 ton per year	
Wind turbine blades:	model 1: 4.000 ton per year	
Sewage sludge:	model 1: 4.000 ton per year	
DKR310/DKR350 (oil):	model 1: 1.600 ton per year	model 2: 16.500 ton per year
Organic residue:	various models available.	

Above models can be interconnected to allow for larger waste volume processing.

Chemical Recycling explained (general process).

Chemical Recycling is a process of chemically decomposing materials at elevated temperatures in the absence (or very low) of oxygen. The process occurs at temperatures above 200°C and up to about 1.000°C in slight under-pressure condition. It simultaneously involves the change of physical phase and chemical composition and is an irreversible process. It makes it possible to obtain a carbonaceous solid, oil and a gas, and, depending on the temperature, the proportion of the three resulting compounds is different.

The processes shown below represents one operational unit.
Before processing waste materials, certain types of waste require a drying process to reduce the moisture content of the waste (affects the yield of the system if too wet). The heat required for drying waste can be obtained from the pyrolysis process.

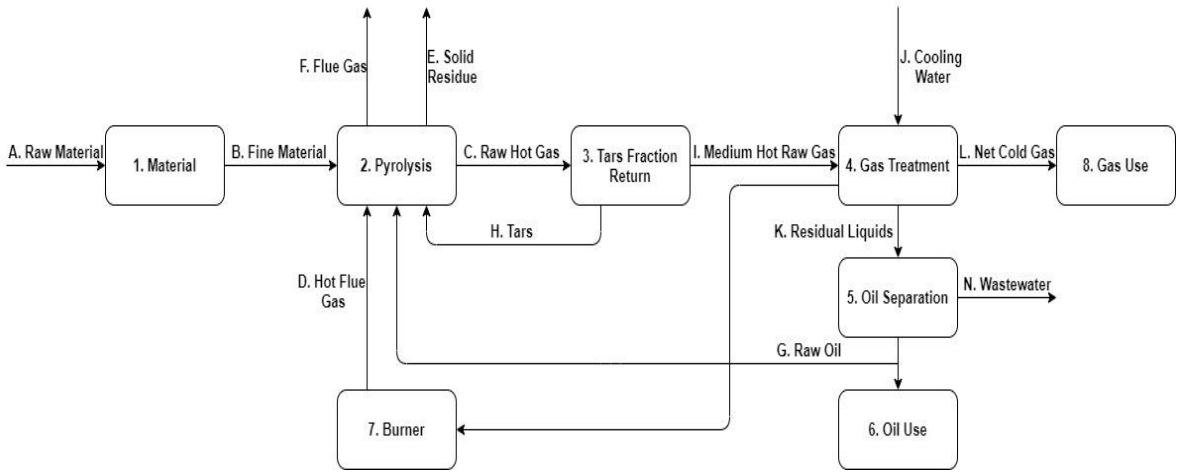
Waste is shredded into a specific size and stored into a special design holding container (fireproof system). From this holding container, the waste is sent into the reactor unit (chemical recycling unit).

Inside the reactor, the waste materials are converted into ashes and gas.
If the chemical recycling process is cut short, it is possible to retrieve oils and gas from this process. The shortened process is also deployed to recover fibers from wind turbine blades.
(Please note that producing oil requires extensive knowledge to avoid production of chemical waste.)

An internal loop is used to process tar fractions into 100% gas.

20% of produced gasses is used for external heating of the reactor unit (parasitic load). Remaining 80% gas is available for converting into energy (electricity)
Alongside the gasses, ashes are produced. These ashes can contain valuable materials such as metals and minerals.

The basic process flow diagram shown below describes the technology as performed by PGE and SR2.0 (Dutch design) and various other system developers.



Chemical Recycling is a Type-C chemical waste recycling process under EU law. The technology is identified under EU law and within the 'Ladder van Lansink' as part of the stricter Dutch/EU legislation on waste disposal and emission reduction. As such, Chemical Recycling is a better and more sustainable solution in comparison to gasification, incineration and landfill.

Chemical Recycling (Type-C) is seen as 'best available technique' (B.A.T.) for disposal of remaining (reject or end-of-life) waste streams after separation and re-use of waste (class A to B). The Chemical Recycling installations presented in this brochure are recognized, approved and supported by Dutch and British government as green technology and in-line with EU waste legislation and EU directive.

Emissions.

Chemical Recycling is a technology that operates *without* (or with very limited) the presence of *oxygen* in the system, the basic principle of chemical recycling. As such, the formation of toxic gasses - such as dioxins and furans - is avoided. The chemical recycling installation operates at temperatures between 200 and 1.000 degrees Centigrade and can therefore accept all components inside the waste that can occur in household, SRF, RDF and landfill waste. The indicated types of waste and their composition, versus the used technology and absence of oxygen make it impossible to produce toxic gasses. The closed system includes a high-end tested and proven gas-washing installation to purify the produced gas for conversion through the LPG-operated generator set.

The installation encounters two positions for emission:
1 on the exhaust of the pyrolysis heating system, and 1 on the exhaust of the gas-operated generator sets for converting the LPG to electricity.

Exhaust pyrolysis heating system.

The emission on the heating system of the chemical recyling installation is classed under EU law and emissions are within EU legislation for indicated technology and method of recycling. As such, the technology complies with EU emission regulations and the emission is significantly lower than other methods of final disposal of waste.

Emission data calculated to standard 11% oxygen level

Emission	Chemical Recycling emissions	Maximum allowed level
NOx as NO_2	68,5 mg/Nm3	180 mg/Nm_3
SO_2	14,7 mg/Nm3	40 mg/Nm_3
C_xH_y and C*	< 0,2%**	10 mg/Nm_3
CO	< 1,25 mg/Nm_3**	30 mg/Nm_3
HCl	< 1,0 mg/Nm_3**	8 mg/Nm_3

Exhaust emission gas-operated generator set

The LPG-operated gas generators are certified as a Tier 5 installation under EU law for emissions on LPG-operated engines. As such, the generators are within EU legislation for emissions and comply with national and local legislation. Several KVT generator installations are already operating on this pyrolysis LPG gas worldwide, i.e. in The Netherlands, African countries and United Kingdom. The KVT generator sets are equipped with top of the range DeNox units for final cleaning of exhaust gases as required by Dutch/EU law.

Want to know more about Chemical Recycling technologies and what that could do for your situation, please contact our us via Martijn@sophsys.nl or call 0031-6-288-47-131.

SophSys client boarding procedures.

This document outlines the way SophSys interacts with it's clients and what steps are taken to reach a successful project start.

-Please note that SophSys will reveal their contacts and expertise. As such, SophSys will require the client to sign a mutual NDA/Non-Circumvent between SophSys and the client, based on Dutch law.

-Before the first call, SophSys will send a basic questionnaire to the client.
This questionnaire is designed to reveal basic but necessary information to SophSys in relation to the situation at hand.

1. SophSys is contacted by client.

The client contacts SophSys to obtain information on potential solutions.

The initial talks include (but are not limited to):

- The nature/background of the client,
- discussing what the client wants and/or needs,
- what waste and environmental legislation is applicable at clients location/country of origin,
- what previous steps the client has undertaken before reaching out to SophSys,
- what funding methods the client foresees for the project,
- political situations in clients area/country,
- who they currently work with in regards to waste management and other partnerships that can influence the work/project,
- if the clients has a waste management protocol for their site/area,
- what type(s) of waste the client has (in tons),
- what the client thinks or knows the waste consists of (morphological and chemical analysis is requested)
- how the waste is collected and by whom,
- location of a landfill site (if any)
- size and conditions of the landfill site(s) (if any),
- potential left capacity of the landfill (if any),
- what the cost of waste collecting and processing is at this moment in time,
- if they execute any sorting and recovery,
- explanation by SophSys on available technologies, based on provided information by/from the client,
- explanation by SophSys on procedures and steps SophSys intends to take with the client.

2. Questions by SophSys

based on the above discussions, SophSys will provide a list of questions and will request documents SophSys will need to be able to provide an offer or give indications on the viability of the intended project.
To enable an insight into possible solutions and results, the client will be requested to provide a morphological and chemical waste analysis and to explain how the initial waste sample on which the analysis are performed are obtained to ensure the data provided by the client is accurate.

-If a client does not have a morphological and chemical waste analysis, SophSys is unable to perform any calculations or estimations on solutions and/or potential revenues.

-An example of a morphological and chemical analysis is added to this boarding process overview as a reference point. (attachment 1: Morphological and chemical analysis example Opcina Davor)

If a client does not have a valid morphological and chemical waste analysis, SophSys is unable to provide any valid proposals on technologies and/or potential revenues. If the client wishes to obtain

valid proposals for technologies and revenues for the intended project, the client will have to perform a valid waste analysis and provide SophSys with all requested data.

2.A Offer for performing validated waste analysis.
SophSys can provide an offer for obtaining this information for the client, based on the situation and settings at the client and includes the development of a sampling protocol, the actual taking of the waste samples needed for an analysis, performing the waste analysis and providing the client with a valid report.
The obtained information will be owned by the client and the client can utilize the data from that work independently from SophSys, meaning the client is not bound to working with SophSys after this point and can use the obtained information to attract other solution providers if they wish to do so.

3. Proposed technologies and estimated results.

If the client is able to provide a valid waste analysis, SophSys will make an initial preliminary and basic calculation on potential volumes/quantities of recoverable items from the waste (if needed) and provide an initial idea on the proposed technology for processing waste that cannot be recovered.
Based on the provided data from the analysis, SophSys will also provide a basic and estimated result for the chemical recycling technology that SophSys has proposed as a solution, including estimated calculations on caloric value of the remaining waste, potential residues (if any) and estimated data on produced electricity/hydrogen or oils.
This is an **estimated calculation** of CapEx and OpEx cost and **estimated revenue calculations**. These calculations are NOT an offer but simply a basic cost indication for the client to obtain a first understanding of the cost a for a project and revenues of a project. Actual CapEx, OpEx and revenue calculations will only appear during a feasibility study or a development study.

SophSys will bring this information together in a basic project proposal and presents it towards the client, showing what systems and technologies SophSys foresees to deploy and potential revenues from the proposed technologies for the client.

4. Presenting the project proposal.

Based on the provided morphological and chemical analysis, SophSys has produced a basic and preliminary project proposal.
The project proposal can be presented to the client via digital presentation via ZOOM or, if the client requires a physical presentation at the clients location, SophSys will visit the client to present their intended solutions and indicated results.
Please note that a visit by SophSys to a clients location is subject to an invoice by SophSys to the client and will be based on travel expenses, food and drinks during the travel and hotel costs. SophSys will not calculate any hours in this initial phase of the project.

5. First go/no-go decision.

Upon presenting the proposed solutions and revenues, the client will be requested to make a decision if the project is feasible for the client, based on cost and revenues/results.

6. Show-and tell visits to technology providers.

Upon reaching a positive outcome of the decision, the client can request a show-and-tell visit to the technology suppliers that SophSys has selected for the project.
If the locations for the technologies are in the Netherlands, the clients only pays for it's own travel cost and expenses, including food/drinks and hotel and SophSys will not invoice hours from their end.

If a visit includes locations outside the Netherlands, the client is expected to cover any and all costs associated with the travel by SophSys to a location outside the Netherlands. again, SophSys will not charge any hourly rate for performing/executing these visit(s).
The client is expected to cover it's own cost for traveling.

7. Second go/no-go decision.

After executing the visits to potential technology suppliers, the client knows what to expect, knows the estimated indicated cost for the technologies and knows the estimated indicated revenues for the
project. SophSys has presented it's vision on the solutions for the client and the client has a basic understanding of the project and all is clear to all parties within the project.
The client will now be requested to make a decision on the next steps for the project and the collaboration with SophSys.
If the client decides that they don't want to proceed with the project, the participation of SophSys ends here.

8. Feasibility study.

Upon reaching a positive outcome of the previous request for decision, the client is entering the next phase of the project, a feasibility study. This is a paid study, executed by SophSys, and is intended to show the viability of the project in relation to the situation and settings at the client's location.
The obtained information within this study is usable for obtaining funding for the project.
The feasibility study will reveal actual cost and revenues for the project, backed by actual offers from technology suppliers.

In an alternative model, the client can opt for a basic pre-feasibility study.
This is a much smaller and more basic study and is often used to obtain funding for the full feasibility study.

9. Conclusion and next steps.

After the feasibility study, the client has a full understanding of the selected technologies, the viability od the selected technologies, the cost of the selected technologies and the revenues from the selected technologies and knows what steps and actions are required for executing the next phase of the project, the development study.

Contact details:

If you require additional clarification or explanation related to our boarding procedures, please contact SophSys at 0031-6-288-47-131 or via mail at Martijn@sophsys.nl

Attachment 1: example of morphological and chemical analysis Opcina Davor.

	Total collected waste	no of people	kg resident
Davor	544.65	3015	180
Nova Gradiska	2652.60	14229	186

	Davor %	Nova Gradiska %
Paper cardboard	10.1	7.3
Paper cardboard packaging	2.0	4.0
Metal packaging waste	1.0	1.4
Metal dispensers	0.1	0.2
Metal others	1.4	0.4
Wood untreated	2.5	0.2
Wood treated	2.0	0.3
Wood packaging	0.0	0.0
Glas plain (window)	0.0	0.0
Glas packaging	2.4	1.3
Clothes and shoes	4.8	7.8
Fabrics (textile)	1.6	3.8
Textile packaging	0.1	0.4
Plastic	1.4	0.8
Plastic packaging	15	13.6
Rubber	0.3	0.7
Skin and bones	1.2	0.1
Kitchen waste	32.2	37.1
Garden waste	2.5	9.4
Eatable oils and fats	0.0	0.0
Diapers	11.1	1.2
Multi layer packaging	5.3	4.3
Mixed packaging	0.4	0.9
Medicine	0.0	0.0
Batteries and accumulators (storage)	0.0	0.0
Electric waste (radio's etc)	0.1	0.3
Earth dust sand	2.7	4.6
Total 100%	100	100

Fraction

	Davor combined	Nova Gradiska combined
paper and cardboard	12.0	11.3
metal	2.5	1.9
wood	4.4	0.4
glass	2.4	1.3
textile cloths	6.5	12.0
plastics	16.4	14.4
rubber	0.3	0.7

organic waste	35.9	46.6
rest/other	19.5	11.3
total	100	100

Idem for 2020

	Davor %	Nova Gradiska %
Paper cardboard	9.8	14.6
Paper cardboard packaging	2.6	1.3
Metal packaging waste	1.2	2.2
Metal dispensers	0.1	0.0
Metal others	1.1	0.3
Wood untreated	0.0	0.0
Wood treated	0.3	0.3
Wood packaging	0.0	0.0
Glas plain (window)	0.0	0.3
Glas packaging	3.0	2.3
Clothes and shoes	9.6	1.6
Fabrics (textile)	4.3	5.0
Textile packaging	1.1	0.0
Plastic	1.2	0.7
Plastic packaging	11.8	20.7
Rubber	0.3	0.5
Skin and bones	2.1	0.4
Kitchen waste	35.3	29.8
Garden waste	7.4	0.0
Eatable oils and fats	0.0	0.0
Diapers	2.9	14.5
Multi layer packaging	3.5	2.8
Mixed packaging	0.7	1.4
Medicine	0.0	0.0
Batteries and accumulators (storage)	0.2	0.0
Electric waste (radio's etc)	0.3	0.0
Earth dust sand	1.4	1.2
Total 100%	100	100

Fraction

	Davor combined	Nova Gradiska combined
paper and cardboard	12	16.0
metal	2.4	2.5
wood	0.3	0.3
glass	3.0	2.6
textile cloths	14.9	6.6
plastics	13.0	21.4
rubber	0.3	0.5
organic waste	44.7	30.2
rest/other	8.9	20.0
total	100	100

Prilog 3 physical chemical analysis waste autumn 2019
Davor and Nova Gradisk
Autumn 2019

Product	Davor	Nova Gradisk	measuring	method
Upper caloric value	16.853	16.212	kj/kg st	hrn en 15400:2011
Upper cal value in delivered form (moisture etc)	8.989	7.912	kj/kg st	hrn en 15400:2011
Lower caloric value	15.382	15.322	kj/kg	hrn en 15400:2011
Lower caloric value in delivered form (moisture)	7.448	6.286	kj/kg	hrn en 15400:2011
% of moisture	45.67	51.2	%	hrs cen/ts 154141:2010
% of solid matter	54.33	48.8	%	hrs cen/ts 154141:2010
Loss on ignition (burning)	86.48	82.88	%st	hrn en 15169:2008
Ash	13.52	17.12	%st	hrn en 15403:2011
% biomass	43.0	41.9	%st	hrn en 15403:2011
% Non biomass	43.5	41.0	%st	hrn en 15440:2011
% of biomass as part of total carbon (bio carbon)	60.0	59.5	%st	hrn en 15440:2011
% of NON biomass as part of total Carbon	40.0	40.5	%st	hrn en 15440:2011
Anorganic parameters:				
Chlorides dry matter (Cl)	8.395	7.512	mg/kg st	hrn en 15408:2011
Chlorides delivered sample (Cl)	4.561	3.666	mg/kg	hrn en15408:2011
Sulphur dry matter (S)	2.316	2.635	mg/kg	hrn en 15408:2011
Sulphur delivered sample (S)	1.258	1.286	mg/kg	hrn en 15408:2011
Antimony dry matter (sb)	5.70	5.02	mg/.kg	hrn en 15411:2011
Antimony delivered sample (Sb)	3.10	2.45	mg/kg	hrn en 15411:2011
Arsenic dry matter (As)	0.156	0.158	mg/kg	hrn en 15411:2011
Arsenic delivered sample (As)	0.085	0.077	mg/kg	hrn en 15411:2011
Cadmium dry matter (Cd)	0.014	0.002	mg/kg	hrn en 15411:2011
Cadmium delivered sample (Cd)	0.008	0.001	mg/kg	hrn en 15411:2011
Cobalt dry matter (Co)	<0.100	<0.100	mg/kg	hrn en 15411:2011
Cobalt delivered sample (Co)	<0.100	<0.100	mg/kh	hrn en 15411:2011
Chromium dry matter (Cr)	2.91	2.87	mg/kg	hrn en 15411:2011
Chromium delivered sample (Cr)	1.58	1.40	mg/kg	hrn en 15411:2011
Lead dry matter (Pb)	1.42	1.29	mg/kg	hrn en 15411:2011
Lead delivered sample (Pb)	0.774	0.631	mg/kg	hrn en 15411:2011
Nickel dry matter (Ni)	<0.025	<0.025	mgkg	hrn en 15411:2011
Nickel delivered sample (Ni)	<0.025	<0.025	mg/kg	hrn en 15411:2011
Mercury dry matter (Hg)	<0.001	<0.001	mgkg	hrn en 15411:2011
Mercury delivered sample (Hg)	<0.001	<0.001	mg/kg	hrn en 15411:2011
Organic Parameters…..				
Carbon dry matter (C)	50.3	48.5	%st	hrn en 15407:2011
Carbon delivered sample (c)	27.3	23.7	%st	hrn en 15407:2011
Total Carbon dry matter	41.0	40.8	%st	hrn en 13137:2005
Total carbon delivered sample	22.3	19.9	%st	hrn en 13137:2005
Total organic carbon dry matter	23.4	28.5	%st	hrn en 13137:2005

Total organic carbon delivered sample	12.7	13.9	%st	hrn en 13137:2005

3 physical chemical analysis waste Winter 2020

Product	Davor	Nova Gradisk	measuring	method
Upper caloric value	16.308	17.481	kj/kg st	hrn en 15400:2011
Upper cal value in delivered form (moisture etc)	8.271	9.282	kj/kg st	hrn en 15400:2011
Lower caloric value	15.721	16.328	kj/kg	hrn en 15400:2011
Lower caloric value in delivered form (moisture)	7.428	8.743	kj/kg	hrn en 15400:2011
% of moisture	49.28	46.91	%	hrs cen/ts 154141:2010
% of solid matter `	50.72	53.09	%	hrs cen/ts 154141:2010
Loss on ignition (burning)	86.66	88.01	%st	hrn en 15169:2008
Ash	16.34	11.99	%st	hrn en 15403:2011
% biomass	40.9	40.7	%st	hrn en 15403:2011
% Non biomass	42.7	47.3	%st	hrn en 15440:2011
% of biomass as part of total carbon (bio carbon)	61.0	60.7	%st	hrn en 15440:2011
% of NON biomass as part of total Carbon	39.0	39.3	%st	hrn en 15440:2011
Anorganic parameters:				
Chlorides dry matter (Cl)	9.054	6.782	mg/kg st	hrn en 15408:2011
Chlorides delivered sample (Cl)	4.593	3.601	mg/kg	hrn en15408:2011
Sulphur dry matter (S)	2.515	2.380	mg/kg	hrn en 15408:2011
Sulphur delivered sample (S)	1.276	1.263	mg/kg	hrn en 15408:2011
Antimony dry matter (sb)	4.57	7.39	mg/.kg	hrn en 15411:2011
Antimony delivered sample (Sb)	2.32	3.93	mg/kg	hrn en 15411:2011
Arsenic dry matter (As)	0.167	0.164	mg/kg	hrn en 15411:2011
Arsenic delivered sample (As)	0.084	0.087	mg/kg	hrn en 15411:2011
Cadmium dry matter (Cd)	0.004	0.015	mg/kg	hrn en 15411:2011
Cadmium delivered sample (Cd)	0.002	0.008	mg/kg	hrn en 15411:2011
Cobalt dry matter (Co)	<0.100	<0.100	mg/kg	hrn en 15411:2011
Cobalt delivered sample (Co)	<0.100	<0.100	mg/kh	hrn en 15411:2011
Chromium dry matter (Cr)	2.31	2.64	mg/kg	hrn en 15411:2011
Chromium delivered sample (Cr)	1.17	1.40	mg/kg	hrn en 15411:2011
Lead dry matter (Pb)	1.41	1.86	mg/kg	hrn en 15411:2011
Lead delivered sample (Pb)	0.713	0.985	mg/kg	hrn en 15411:2011
Nickel dry matter (Ni)	<0.025	<0.025	mgkg	hrn en 15411:2011
Nickel delivered sample (Ni)	<0.025	<0.025	mg/kg	hrn en 15411:2011
Mercury dry matter (Hg)	<0.001	<0.001	mgkg	hrn en 15411:2011
Mercury delivered sample (Hg)	<0.001	<0.001	mg/kg	hrn en 15411:2011
Organic Parameters…..				
Carbon dry matter (C)	48.4	52.8	%st	hrn en 15407:2011
Carbon delivered sample (c)	24.6	28.0	%st	hrn en 15407:2011
Total Carbon dry matter	41.3	43.5	%st	hrn en 13137:2005
Total carbon delivered sample	21.0	23.1	%st	hrn en 13137:2005

Total organic carbon dry matter	28.4	23.4	%st	hrn en 13137:2005
Total organic carbon delivered sample	14.4	12.4	%st	hrn en 13137:2005

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