



DEPONI

Robots to reduce landfill

NOLL DEPONI JA

Year 2021/2022

**GNOSJÖANDANS
KUNSKAPSCENTRUM**

Country: Sweden

Teacher: Anders Backstig

Advisor: Stefan FalkBoman

PICTURE: Landfill coverage in Jönköping, Sweden.

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A GREEN TECH INNOVATION SEES THE LIGHT OF DAY...

The past year has truly been like a roller coaster ride for Noll Deponi ("Zero Landfill"). An incredible journey filled with lessons learned, experiences and setbacks has resulted in a company with great future prospects.

The company's commitment to the waste industry has grown as we visited more and more waste centers and landfills. Despite a pandemic, we have done everything we can to network with the waste recycling industry and get to know our customers and our competitors. One of the most beneficial customer visits was when we traveled 400 km to Vasteras Recycling Center. This visit gave us valuable insights as we shaped our business plan. Co-operation and experience are essential to a successful company!

Moreover, I personally want to say a big thank you to all the people who have doubted us, all the people who have said that we are too inexperienced. It is you who gave us the extra motivation to continue fighting. It also gives me great pleasure to say that in five months we have succeeded in inventing, financing, building and putting an industrial machine into operation. With sustainability, profitability and innovation in mind, we create added value for the planet, the general public and the recycling stations.

I and the whole company are incredibly proud of what we have achieved so far and are now looking forward to rolling out our product in the rest of the country and the world.



Emil Falk
/EMIL FALK, CEO



WE ARE NOLL DEPONI

An entire book could be written about all the experiences we have had and the skills we have developed during the year; however, we have tried to summarize these under the three headings below.

BUSINESS SKILLS

- **Idea & product development** - To develop solutions based on real needs.
- **Financing & co-operation** - We have learned the importance of visualization and a clear vision when it comes to attracting different types of partners.
- **Corporate structure** - Our GANTT schedule, common calendar & todo are central.
- **Logistics** - We have gained valuable experience in logistics. For instance, over 40 unique components were delivered and assembled within two weeks.
- **Rhetoric & presentation technology** - During the year, we conducted 35+ company presentations and learned the importance of simple and convincing rhetoric.

TECHNICAL SKILLS

- **SolidWorks 3D-program** - We have modeled two complete machines.
- **Welding & assembly** - We had no previous experience of welding and have now, in addition to welding, also learned a lot about assembly.
- **Vinyl & Painting** - We now know how to paint a machine and we have gained skills in striping and mounting stickers.
- **Machine safety** - We have learned everything necessary to ensure that no one can be injured when they use our machine.

NON-COGNITIVE SKILLS

Besides these "hard" skills, it is abilities such as self-perception, motivation, co-operation and good conduct as entrepreneurs that are the most important experiences we bring with us from the year. We have gained the confidence and courage to pick up the phone or take an interview or sales call even without much preparation.

COMPANY ADVISOR

Entrepreneur Stefan FalkBoman is our main advisor.

FROM NOTHING TO A VISION OF ZERO LANDFILL

HOW WE CAME UP WITH OUR BUSINESS IDEA

People ask us how we came up with our business idea and the answer is relatively simple. Like many others, we started our year with a blank slate and began brainstorming. We came up with about 50 business ideas that we liked, many of which were linked to sustainability and the environment. We then got a tip from our advisor to read about Sweden's environmental goals and to carry out a series of study visits to learn more and ensure that we find an actual demand and solve a problem for real.

We studied environmental targets, talked to the Swedish Environmental Protection Agency, discussed sustainability with a local retail chain and food waste with the local restaurant, we talked detergents and chemicals with the local water treatment plant and finally we made a visit that led us to our idea, vision and goals with the year...

THE STUDY VISIT THAT CHANGED EVERYTHING

One of the environmental goals we came across was that at least 70% of all construction and demolition waste in Sweden are to be recycled by 2025. Therefore, we went to our local recycling center and met Juno Liljekvist, responsible on site. We asked her about their challenges and goals ahead and she took us down to the landfill area. That is, waste that is buried when it is neither possible to reuse nor recycle.

Juno explained to us that about half the material sent to landfill is windows and doors from which nearly all components can be recycled, all except the glass. Today there is no safe, clean and efficient solution for separating the window pane from the frame. Recycling stations therefore have to bury the waste in the ground, an expensive, unsustainable practice not in line with environmental goals. From this insight, based on our studies of technology and engineering, our vision and goals grew throughout the year.

OBJECTIVE WITH THE JA-YEAR

Create a robot that solves the problem, separates windows and doors with glass to enable recycling and reduce the landfills.

OUR LONG-TERM VISION

A world with zero landfills.



The goal is to move windows and doors with glass from landfill to recycling.

EXPLORING A NEW MARKET

When we had the vision and objective ready we made Sweden our field for extensive market research. We visited no less than 12 different recycling stations in four different regions. These visits have played a major role for us in understanding the problem we must solve from an environmental, economical and technical perspective.

ENVIRONMENTAL INSIGHTS

A NATIONAL PROBLEM

We observed massive numbers of windows on landfills throughout our journey. Our contact person estimates that on average ~ 50% of the 50 000 tons of waste that get sent to landfill in Sweden consists of windows and doors. We thus have 25 000 tons of waste to save - a dizzying insight.



On a covered landfill in Gothenburg.

THE WASTE HIERARCHY

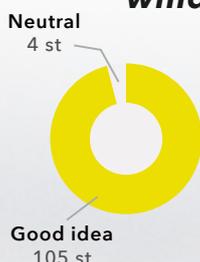
The work of recycling stations is based on an EU directive called the waste hierarchy, which governs how waste should be handled. The Global Goal, target 12.5, is to significantly reduce the amount of landfill. It is thus the responsibility of each country to move waste up the hierarchy.



SURVEY: PROPERTY OWNERS' ATTITUDES

To verify the attitude of the public, we asked:

"As a property owner, what would be your attitude to disposing of doors and windows in a separate compartment for recycling?"



1. Good idea - everything should be recycled.
2. Neutral - it doesn't matter either way.
3. Negative - the landfill option is so simple.

Our conclusion: the general public share our concern for the reuse of window glass.

FINANCIAL INSIGHTS

THE MARKET

In Sweden alone there are 583 recycling stations. Add to that a potential market of contract builders in charge of demolition sites, responsible for the landfill directive and liable to pay disposal fees.

DISPOSAL COSTS MONEY

Waste disposal is heavily taxed in keeping with environmental objectives. Each year, Swedish recycling stations pay approximately five million Euros to send windows and doors to landfill. That is the equivalent of an average of eight thousand Euros per station.

GLASS CAN BE A CIRCULAR RESOURCE

Glass can be recycled with no loss of quality or purity. 1 kilo of waste glass can be recycled into 1 kilo of new glass and can be infinitely recycled without losses. A standard size three-pane window weighs approximately 50 kilos, of which 40 kilos are pure glass, which can be sold at a profit by recycling plants, whereas disposing of less than pure fractions costs them a fee.

ntressant uppfinning!

Från Oskar Störms, Oskar - Building Glass Polska på 2022-06-01 11:11

Delad information | Mottagaradresser | Information

Hej Selma, Emil och Lucaci!

Saint-Gobain driver ett stort projekt för cirkulär användning av pånglas energikonsumtionen med 30% jämfört med att smälta primärmaterial.

Skulle ni kunna tänka er att dela lite av idéer och koncept med vår R&D möta våra höga renhetskrav med er maskin, som i så fall är superintressant!

Med vänlig hälsning / Best regards / Pozdrawiam

SAINT-GOBAIN

Oskar Störms
Architectural Projects Specification Manager SE/NO

Home > OUR TRANSVERSAL R&D CENTERS

OUR TRANSVERSAL R&D CENTERS

The R&D of 84 companies local centers dedicated businesses as 1 of eight Transva meant to serve of Saint-Gobain

The eight Transversal R&D Centers, individually and as a network, meet, maintain and acquire top-level high large projects & exploratory programs, be innovation showcases for our customer academic and external contacts, and finally protect and develop them. They rely on projects customer Business Units, leveraging their specific competences and skills.

This networked organization enables it to identify local innovation needs and provide global real on solutions and acts from all of its R&D centers throughout the world.

How to speed up the innovation processes that bring together teams from R&D, manufacturing and commercial divisions? Discover the solutions that Saint-Gobain has created for complex projects.

Many recycling experts contacting us with interest in our technology.

TECHNICAL INSIGHTS

THE AXE - A TECHNICAL COMPETITOR

At one recycling station we visited, the option of manual separation of windows was offered, with the use of an axe or a golf club. Admittedly, this solution posed a safety hazard as well as being inefficient because of the difficulty of removing the entire pane. Most recycling stations do not allow this method.



Gunnar shows the country's "best" glass fraction (left) which is very dirty.

THE ONLY WORKABLE ALTERNATIVE

VafabMiljö in Västerås is a recycling plant which provides a solution for recycling window glass. Having read about this, we drove the five hours to meet Gunnar Weiring there, an experienced consultant in waste management. We learned from this visit that their window fraction was costing them a great deal to recycle because of its impurity. Gunnar has been a valuable mentor to us, providing necessary insights into our business and technology.

REQUIREMENT SPECIFICATION

Our collected information boiled down to a five-bullet list of requirements for a technical solution to be practicable at a recycling plant.

1. The device must remove as much as possible of the pane from the frame.
2. It has to handle windows and doors of various formats and sizes.
3. The machine must work without risk of injury to the user.
4. Its use has to be simple and easily understood.
5. It must be financially viable.

INVENTING, FINANCING, CONSTRUCTING AND DEPLOYING AN INDUSTRIAL MACHINE WITHIN FIVE MONTHS

PROTOTYPING

THE FIRST IDEA - MILLING

Our first idea was to mill out the pane using an industrial robot equipped with a milling head. The problem? We had neither the head, the robot or the money. Everyone doubted us and we faced two options - to give up or to try to prove others wrong. We chose the second option. The first thing we needed was money and we managed to obtain an innovation grant from LEADER worth 23 300 euro. We created a prototype but realized that without an expensive vision system the solution wouldn't work. Three months and 17 500 euros later we had to abandon our initial idea.



ABB-robot and a milling head to solve the problem according to the first idea.

THE SECOND IDEA - PRESSING

The starting point was to find a cheaper solution, all it took to fulfill the requirements specification we made together with recycling stations. The next idea was to use a pressing method to press out the pane from the frame. We quickly built the first prototype and carried out several tests and realized the potential of having a hydraulic-based solution. The challenge was to get the solution to handle different sizes of windows and doors. We chose to keep innovating and develop the idea.



See our first hydraulic-based test on 3-pane window (click or scan QR-code).

THE FINAL IDEA

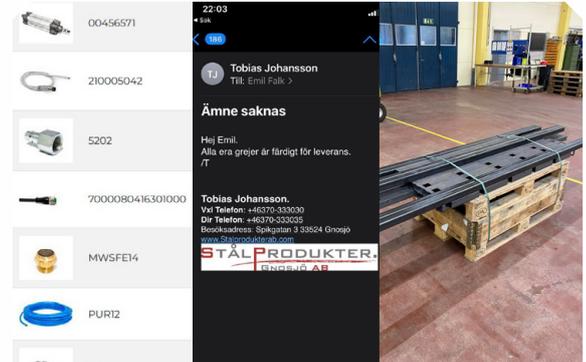
The final idea is a hydraulic-based solution that uses gas springs to press out the pane. The solution is based on the same principles as version 2, the difference is that this version is much bigger, more advanced and is able to handle all types of shape and sized windows and doors. The new machine meets all requirements in our specification.

FINANCING

Despite the innovation contribution we obtained we still found ourselves in a financing challenge. We had already spent 17 500 euro on our first idea and we only had 5 500 left in the bank. According to our calculations we would need an additional 9000 euro to realize our final idea. The conclusion - we needed partnerships.

PARTNERSHIPS

We assembled a component list in excel with all the components that the machine needed. Overall it was about 40 unique components. We managed, after many meetings and phone calls to successfully obtain, among other things, industrial components from Gohlins AB, sheet metal from GLS and laser cut tubes from Gnosjo Stalprodukter. One of the most expensive parts of the machine was gas struts which we got after many Zoom meetings with Stromsholmen AB from Tranas. They saw the potential in our solution and they even offered a constructor to help us implement the gas struts in the most optimal way.



We have learned a lot about logistics.
No component can be forgotten.

CONSTRUCTION

When all our components had been delivered, the intense but very enjoyable construction phase started up. Within two weeks, the machine had been assembled and given the name The WindowBuster™.

THE WINDOWBUSTER™

The WindowBuster™ consists of 5 main parts; the body, the crush, the safety system, the wiring and the casing.

- The **body** is the skeleton of the machine, constructed of welded steel beams.
- The **crush** is the separation device for removing the pane from the frame. It consists of gas struts mounted on an electrically powered uppe på ramverket.
- The **safety system** ensures that no one is injured. For example, the machine is equipped with a lidded magnetic locking device, an emergency stop and a confirmation button before starting.
- The **wiring** provides a current to the software, the motors and the cylinders of the machine.
- The **casing** is the shell of the machine which protects the user during operation.



Naked WindowBuster™ before mounting body and electrical cabinet. ~600kg.



THIS IS HOW THE WINDOWBUSTER™ WORKS

The device stands ready at the recycling station and the visitor operates it independently. The process is simple - a used window is fed into the shaft which is then closed. For safety there is first a blue confirm button to be pressed, and the machine is then activated by pushing a green button. Separation takes up to two minutes. The glass falls down into a container and the frame is then withdrawn and recycled either as wood or metal.



See the WindowBuster™ separate a big window (click or scan the QR-code).

DEPLOYMENT

April 1, 2022 was the big day for deploying our device. In co-operation with the municipal joint venture for waste management, SÅM Miljö, we transported the WindowBuster™ to the local recycling station. After months of late evenings, phone calls by the hundreds, numerous study visits (and even a case of concussion!) there we were, back at the site where we had started eight months earlier and first spotted the problem which needed solving for our vision to come true - a world with Nil to Landfill.



An emotional moment. Our solution is put into operation for the first time.

A film crew was on site, and so were the local newspaper Värnamo Nyheter and SÅM Miljö's communications officer. What an emotional moment it was, when, for the first time in history, a user was offered the option of recycling a window with the WindowBuster™ rather than having it buried.

So far we have succeeded in recycling five tons of window material. This feat has generated an income of 500 Euros in leasing payments. We are truly proud of ourselves and aim to continue our work towards the goal of recycling rather than burying the rest of what would have been 24 995 tons of landfill in the year 2022.

CURRENT ECONOMIC SITUATION

BALANCE REPORT

ASSETS

Fixed assets

Inventory	9 600 €
Subtotal	9 600 €

Current assets

Cash	2 046 €
Subtotal	2 046 €

Total assets	11 646 €
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EQUITIES & LIABILITIES

Equities

Venture capital	120 €
Profit for the period	11 526 €

Liabilities

Liabilities	0 €
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Total equities & liabilities	11 646 €
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EARNINGS REPORT

REVENUE

Net sales

Renting of WindowBuster prize money	500 €
Innovation Grant	23 321 €
Component partnerships	9 000 €

Total revenue	32 921 €
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COSTS

Travels (domestic)	540 €
Extern representation	200 €
Rent conveyor	1 875 €
Rent of premise	3 125 €
Marketing	875 €
Rent milling head	3 750 €
Rent industrial robot	8 750 €
Exhibition costs	2 250 €
YE-registration cost	30 €

Total costs	21 395 €
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THE YEARS RESULT 11 526 €

AUDITOR'S REPORT

I have reviewed the annual report, the accounts and the administration of the Board of Directors and the CEO for the period 21-09-01 through 22-06-15. The audit has been carried out in accordance with GAAP.



Anders Backstig › Gnosjö 15 june 2022
Teacher, Gnosjöandans Kunskapscentrum

FROM THE WINDOWBUSTER™ - AND BEYOND!

FEEDBACK AND MARKET ACTIVITIES

A week after the launch of the WindowBuster™ we had been contacted by recycling stations, recycling businesses, sustainability experts and recycling media. It was clear that the market was ready for the WindowBuster™ and right now there are no other options than to scale up after the JA year.

On April 2nd a dream came true. Karin Jonsson, editor on "avfall och miljö" contacted us and wanted to highlight our solution. "Avfall och miljö" is a newsletter for recycling stations. 90% of its readers say that the newsletter is a useful tool in their profession.



The WindowBuster in Sweden's leading newsletter for recycling stations.

THE COMPANY AFTER UPPER SECONDARY SCHOOL

BUSINESS IDEA

Noll deponi AB rents recycling systems to reduce waste that goes to the landfill in Scandinavia and in Europe.

INCUBATOR PROGRAM AND INTELLECTUAL PROPERTY

After a meeting with Science park, which had heard about our innovation, offered us to be in their acceleration program after we graduated. We have also been in contact with AWA patent through Science park in order to protect company names, product names and the technology in our upcoming version of the WindowBuster™ (which is under development).

PRICING AND BUSINESS MODEL

Our first system - The WindowBuster™ - is offered through a PaaS model (Product-as-a-Service) to a basic fee of 3000 euro every year + an extra fee per ton of waste saved from the landfills. The average recycling station will pay approximately 7500 euro every year.

CONTINUED DEVELOPMENT AND INTERNATIONALIZATION

Early in our tour we signed an agreement with SÅM miljö - the municipal joint venture for waste management for sanitation in our region. Our goal is to continue to sign contracts to roll out our product while constantly developing and innovating tomorrow's recycling systems.

FINALLY

Big thanks to all our partners and sponsors that have believed in our idea and vision. We could never have been able to realize The WindowBuster and reach our goals without you.



Europeiska jordbruksförordningen för landsbygdsutveckling: Europa investerar i landsbygdsområden



Gnosjöandans
NÄRINGSBLIV



STRÖMSHOLMEN
A business of BARNES GROUP INC



Emil Falk

Emil Falk, CEO
Gnosjö 22-06-15

Lucas Rundén

Lucas Rundén, CFO
Gnosjö 22-06-15

Selma Hästmark

Selma Hästmark, CMO
Gnosjö 22-06-15

Anders Backstig

Anders Backstig (teacher)
Gnosjö 22-06-15