

**filter loop**  
MICRO FABBRICA

# project concept and evolution

This project examines and attempts to rethink an entire society's behaviour patterns and habits concerning cigarette butts, developing a system of intertwined loops and concentric organisations.

What if cigarette butt litter was rather valuable than destructive ?

The original Filter Loop project presented for a concept and a theory for a recycling and upcycling process in order to deal with the cigarette pollution issue with an utopic but realistic vision for society.

Along with a manifesto of different processes to deal with the cigarette filters as a new material, it features at its center a modular and mobile machine, designed to be installed in key pedestrian spaces in large cities. It enables people to gather

cigarette stubs for recycling as a good, in exchange for 3D printed products and goods created with the recycled material, cellulose acetate, directly on site.

The idea behind the intervention is twofold : to raise awareness about the litter and pollution problem in a rewarding and playful way by empowering people to change their behaviour and collect cigarette butts instead of randomly discarding them.



# facts across the world

Every minute, 2.3 million cigarette butts are discarded around the world.

Thousands of kilos per day on the ground at our feet, littering and polluting our environment.

In a returnable system where each filter would be estimated at 1 to 5cts of return value, that would make 230 000€ to 1 150 000€ to save every minute.



Most cigarette butt pollution occurs at 'Transition Points' - areas where a smoker must extinguish their cigarette before proceeding

## although

A social experiment in a city close to Shengzhou has proved very well. Local government was offering a pack of tissues for 50 butts.

They had to stop the experiment, as people were bringing too many butts. In a few weeks nearly 5 million butts were gathered by the population.

## London

**6 million butts/year**  
**60 tons of acetate a year**

cost : £3.8 million of cleaning.  
worth of returnability based on 5cts/butt :  
£3 million a year

## Sydney

**15 000 butts/day**  
**1 kilo a day**

worth of returnability based on 5cts/butt :  
€500 a day

## Paris

**35 million butts/year**  
**3500 tons of acetate a year**

worth of returnability based on 5cts/butt :  
€17.5 million

## Bengalore

**3.1 million butts/day**  
**310 tons of acetate a day**

worth of returnability based on 1cts/butt :  
€310 000 or 24 million rupees a day

**China :  $\frac{1}{3}$  of all smokers in the world (300 million)**  
**2.5 trillion butts/year**

worth of returnability based on 1cts/butts :  
2.5 million €

## the problem across the material

Acetate comes from the latin acetum, which means vinegar. It is a byproduct of cellulose, found in wood and cotton mostly. It was discovered in 1865 and since then it has been widely used in numerous applications, from air plane shells, to varnish, satin fibers, glasses frames, camera film, various types of absorbant clothes and industrial filters.



Cellulose acetate in itself the most industrially available eco-friendly plastic, as it is harvested from plants and trees while being able to degrade quicker than other plastics. From only a few months to a few years.

although

Paradoxically, in terms of statistics it makes what is the most polluted element in the world.

Because of its use in cigarette filters, and because of the natural retaining properties of the material, when thrown on the floor, it allows the cigarette stubs to unleash a batch of harmful chemicals, for as long as it is not fully degraded.

cigarette filters are  
ecologicaltime bombs

What truly happens is that we harvest cellulose based plants to transform them into plastic, and then soak them with nasty chemicals. After which we throw them on the ground and let them unleash all of their noxious content into the soils.

# acetate refining system

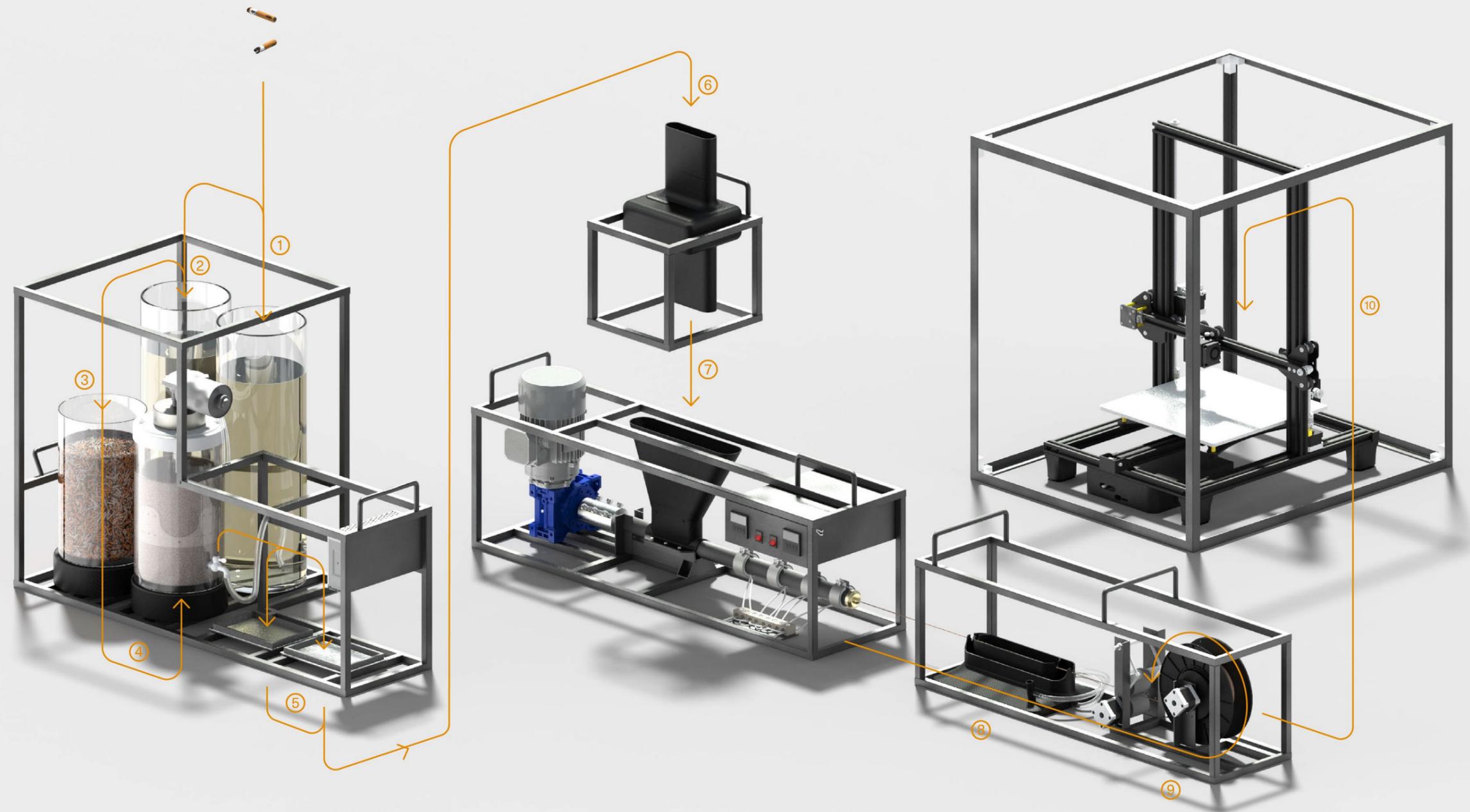
The second version of the Filter Loop system keeps most of the original features while compacting them in a portable machine.

Divided in 5 smaller modules it can be installed in any places and works on 230V main voltage.

The modules are low consumption and have a maximum processing capacity of 12000 cigarette butts per batch.

It extrudes and spools rolls of 1kg in about an hour and transforms the raw material at rate of 100 grams per hour. Due to its nature cellulose acetate needs to be printed slightly slower than regular printing materials like PLA or ABS, but stays within the average printing time range.

- ① WATER SOAK
- ② WATER + CHEMICAL SOAK
- ③ RINSE
- ④ ACETATE SOLUBILISATION + FILTER PRESS
- ⑤ ACETATE SHEETING PROCESS
- ⑥ SHREDDING PROCESS
- ⑦ EXTRUSION PROCESS
- ⑧ FILAMENT COOLING PROCESS
- ⑨ SPOOLING PROCESS
- ⑩ 3D PRINTING CELLULOSE ACETATE



# social system

Can circularity become institutional ?

What changes can we expect if we organise the way we dispose cigarette wastes differently ?

Who gets which role ?

In this model a number of paths starting from the disposal of a cigarette butt answers the questions above while giving insights on the positive repercussions of a cleaner and more comfortable city.

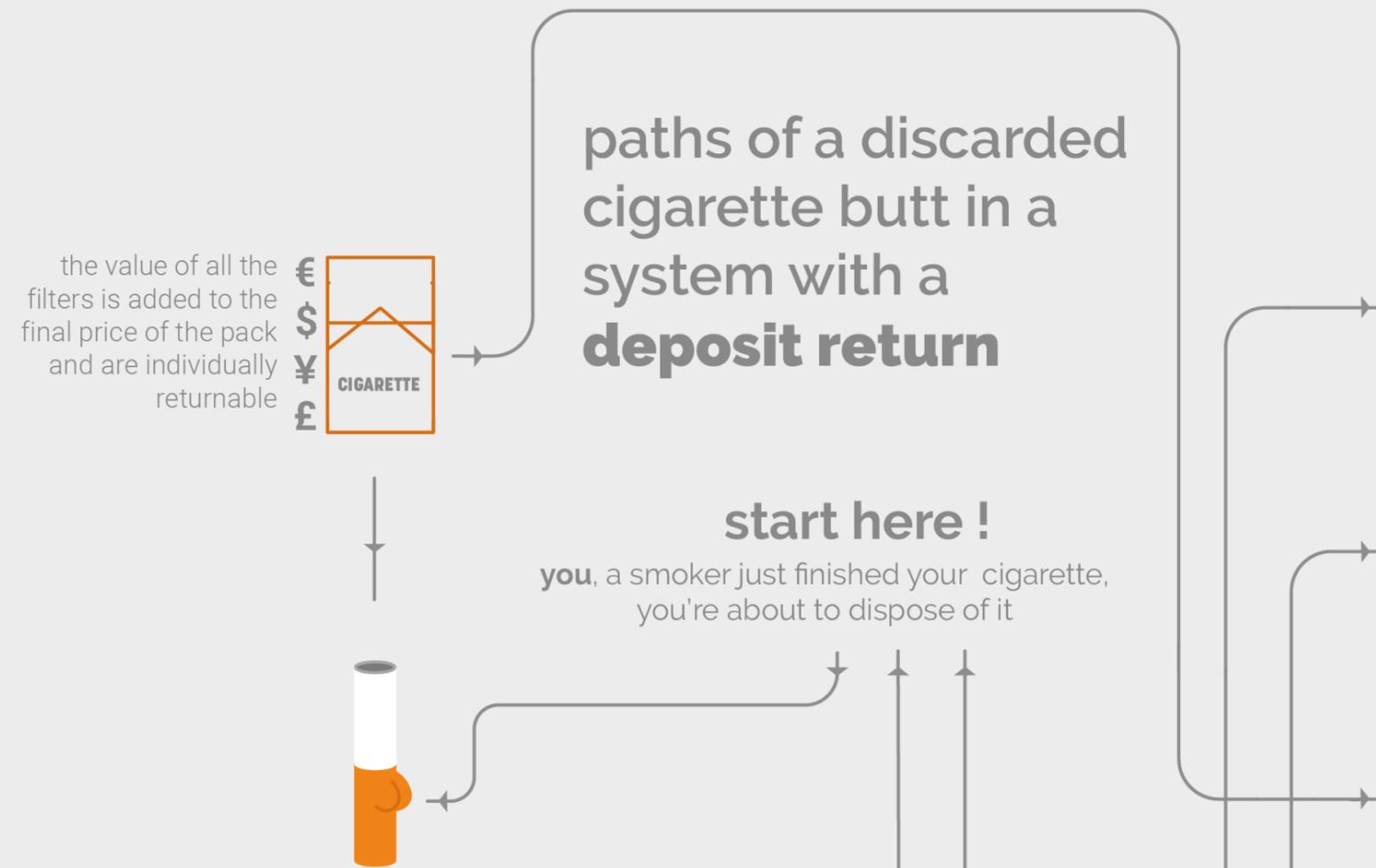
Can the large consumerist machine be stopped ?  
Yes, but at the risk of a social collapse as we have seen in 2020 within the context of the global pandemic.

What is risklessly possible is a smooth transition from our actual ways of living to a more sustainable and more organised way of living and thinking, where waste is valued and as much energy (if not more) as what we put into creation is put into discarding/transforming the waste we create.

Maybe the new issue we need to face is not how to create new and sustainable materials but first how to make what we have already created sustainable ?

*Are we going to move on to more sustainable ways while leaving all our mess on the floor ?*

*When our house is messy, do we clean it or do we move to another house ?*





tobacco and tree farms

largest cigarette manufacturers



largest filter manufacturers



paths of a discarded cigarette butt in a system with a deposit return

the value of all the filters is added to the final price of the pack and are individually returnable



start here!

you, a smoker just finished your cigarette, you're about to dispose of it



anybody who wants to make little money



The value of the filters is credited to the user.

Depending on the systems the value would vary

Exemple : for a cigarette pack costing 10 euros like in France, the return is 5cts per cigarette.



locally produced goods local designers ?



urban furniture

industrially produced goods



# recycling and refining process in theory

This recycling process uses acetone to break down the filters into a soup, which can be filtered and washed to extract the chemicals. It is basically a repetition of the last phase of the original process of the production of these filters. The cellulose acetate is then spun into a web just like for the filter making process, except here it is stretched into thicker filaments, destined to be used by most 3D printers.

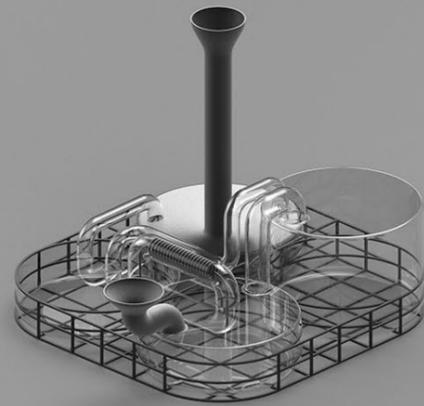
Cigarette filter pollution happens in two ways. First the filters are discarded into the environment where they eventually meet with water.

Then they get released into the environment and subsequently the filters start decomposing into micro-plastics, over a period of two years to two decades. They end up scattered all across the environment; from inside fish to inside our kitchen taps.

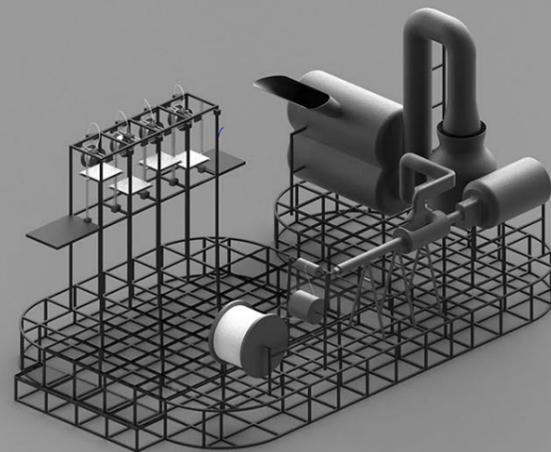
Once the polluting factors are isolated, the resulting cigarette filters are less dangerous, and offer the potential to become upcycling and recycling actors. Cigarette filters are widespread and amongst the largest polluting agents, but are essentially easy to recycle.



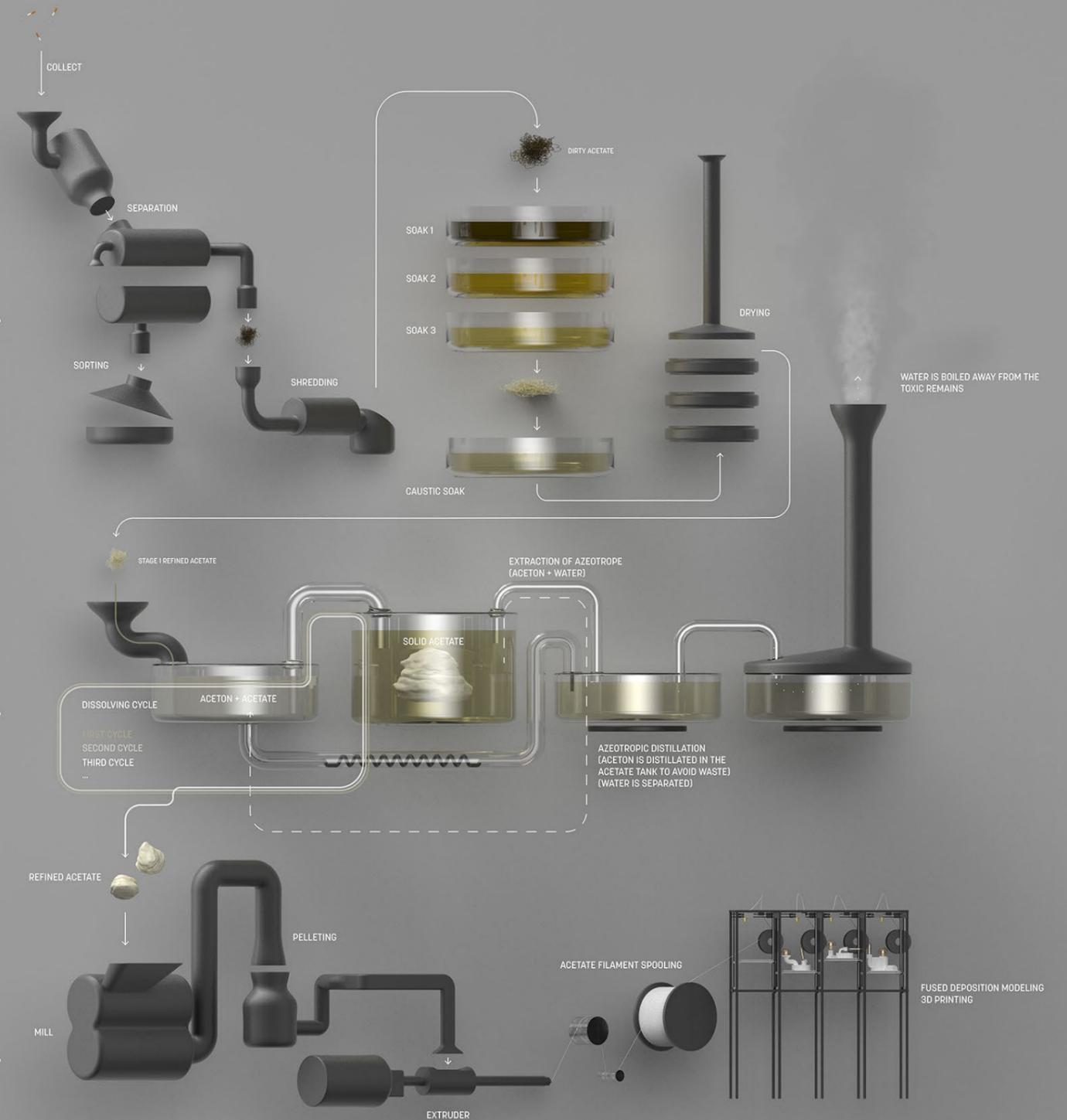
MODULE 1 : COLLECT & CLEANING



MODULE 2 : TRANSFORMING & RECYCLING



MODULE 3 : UPCYCLING AND PRINTING



# recycling and refining process the showreel



watch the [showreel](#) of the project (skip to 01:46 for the explanation of the public intervention)

# recycling and refining process in practice as a system designer

From the elaboration to the theoretical system to the creation of the actual machine, I have gone through many iterations and proofs of concept.

In 2019 started the whole process of theorizing the machine according to the system I had invented.

Most of it was based on small scale prototypes and experimentations in my garage.

When I decided to build the machine I had no other choices than to reduce the scale, and focus on the safety and the feasibility of the different elements.

It lead me to a much smaller machine, more transportable, more reproducible and overall more compact.

This new machine based on the open source plans of Precious Plastic has the added functionality of processing other plastics too in order to create 3D printing filament of any thermoplastics.



detail of the assembly displaying the shredder, the extruder, the watercooler and parts of the chemical processing module



sheet of cigarette filters, pre-processed to be shredded as pellets for the extruder  
one sheet weighs 10 grams and contains about 100 cigarettes

# recycling and refining process in practice as a craftman

(all these following pictures are part of a prequel project called **Cancer Objects** and are to be indirectly linked to the **Filter Loop** project this presentation is about)

The process has been stretched over three years, and is essentially divided into two parts.

The first part refers to an early project, 4 years ago (3 months long) during which I researched and experimented with the cellulose acetate material.

I asked myself various questions and dived into its history.

*Where does it come from ?*

*Why was it invented ?*

*What were the uses throughout time ?*

*How was it replaced ?*

*But also what can I do with it in today's context ?*

*What are the exact properties of the material, and how can I bend them to make it what I want it to be ?*

What came out of this first part was a manifesto in which I described all the experiments and outcomes that I obtained. Along with this came a deep knowledge of the industrial processes around this material in addition to 60 decorative shapes exploiting some properties of the material that were

created out of 11000 cigarette filters.

The second part of this process, unlike the first one, was goal oriented. With pollution as a leitmotiv, the field of action was narrowed down but still very insightful in terms of possibilities. As the system was theorized, it was simultaneously put into practice.

After experimenting with the transformation of the material (which constitutes the main nucleus of this project), another series of questions arose.

*Where to gather the material ?*

*How to consider the human factor ?*

*How to remain sustainable ?*

*How to clean the material with the fewest chemicals possible ?*

*How can what I have gathered during the first phase be now organised in steps and engineered ?*

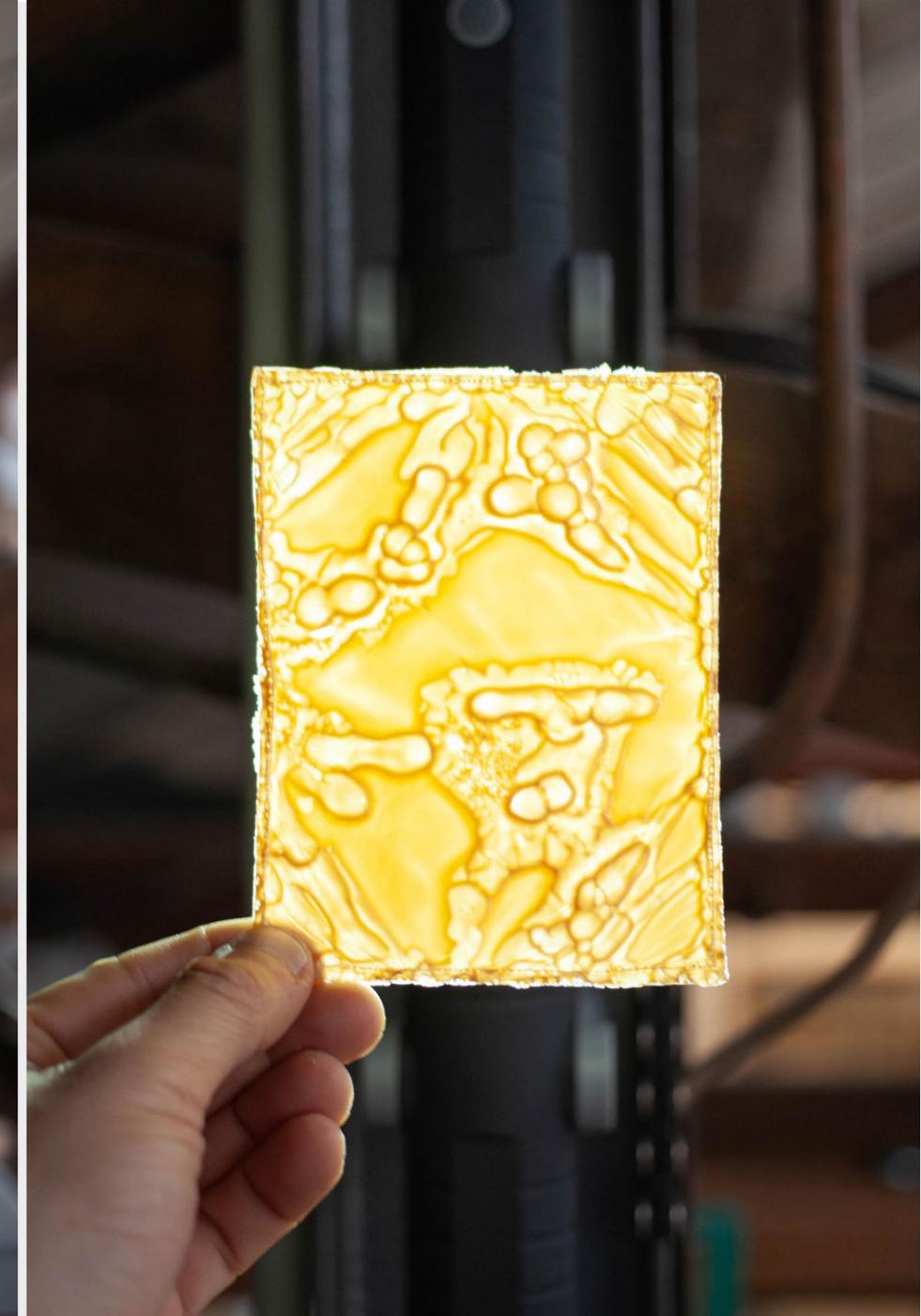
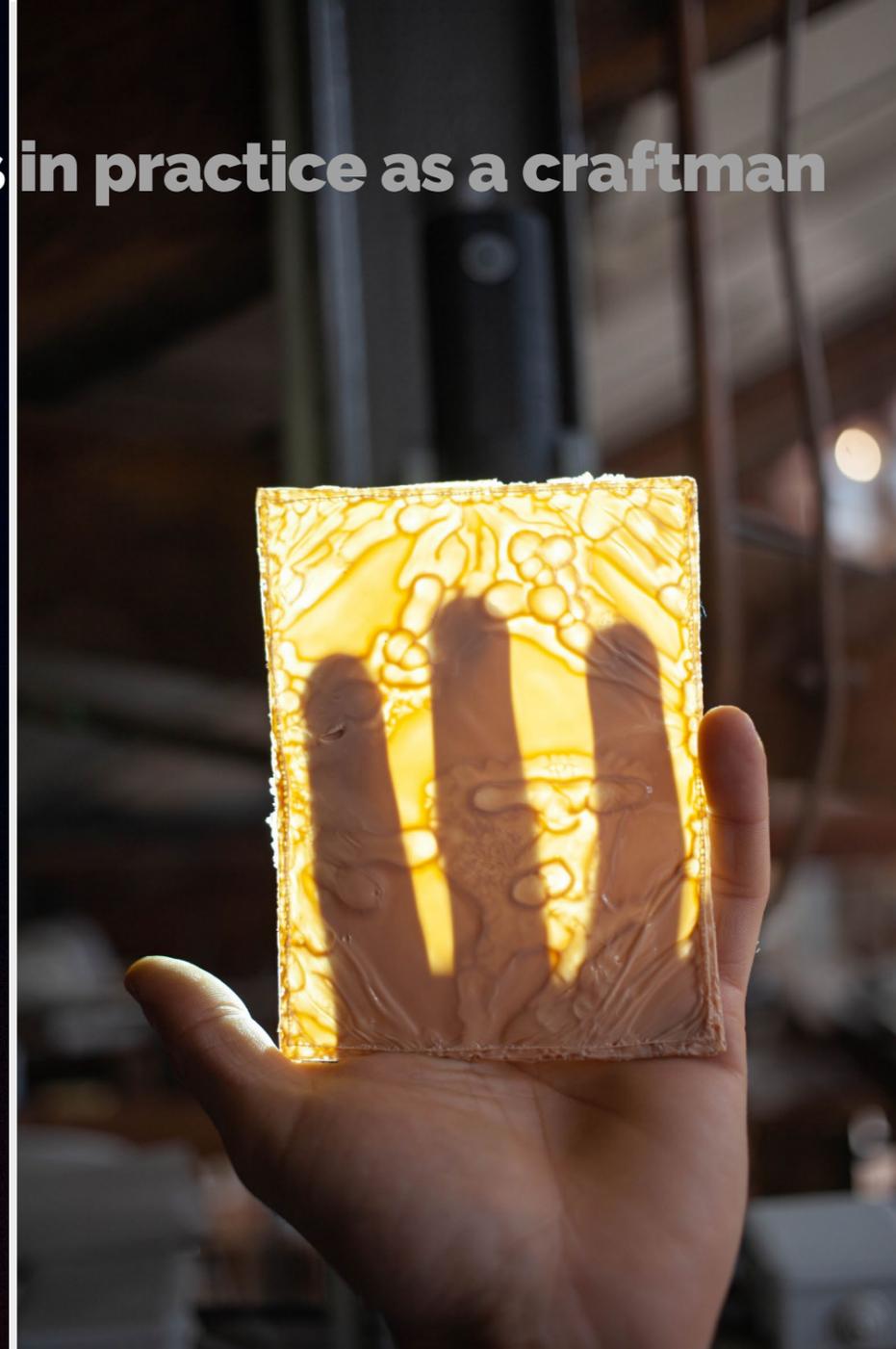
*How can it be industrialized and safe ?*

*Which exact formulas and ratios ?*

*How to create a whole system with an input, a transformation and an output ?*



# recycling and refining process in practice as a craftsman



research about stained glass making with cigarette filters collaboration with atelier.st

The research about the endless possibilities of this material is ongoing.

Cellulose acetate displays excellent light properties as well as an incredible ease to process and reprocess. The material is light, strong, casts excellent details, can be degraded to heat and solvents but on the other hand is fire resistant. It can be stretched to 10 microns thickness (0.01mm) and is hydrophilic and hypoallergenic. It can be casted, injected,

blown, sheeted, extruded, milled and so on. The possibilities are endless.

Once you know how to recycle the hundreds of billions of cigarette filters laying on the ground, this material becomes an infinite resource with an incredible value and its reprocessing for the millions of trees harvested each year to produce this material.

each lamp contains numerous thousands of dirty cigarette filters processed by hand

**recycling and refining process in practice as a craftman**



# recycling and refining process in practice as a craftman



this part of the project is currently being exhibited in YKSI @ Eindhoven, Strijp-S, NL  
De Domijnen Museum @ Sittard, NL

## about lucas zito



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Born in France in 1993 and having graduated from the Design Academy of Eindhoven in the Public Private department in 2019, Lucas Zito is now exploring his own practice and defining what are the principles he stands by.

Design can be, finding solutions to what a century of wrong decisions lead by capitalism and escorted by design itself, have created.

Nowadays, tools to research, create, prototype and engage with people are within everyone's reach, including designers. To him the importance of creating a more sustainable future cannot be stressed enough.

He is dedicated to learn and explore the new fields of design that have gained in weight this last decade. Sustainable and circular design, system design, social design and many more.

To him, we can, with the help of system thinking in design, create better models to implement ideas and solutions in society and not only in one's practice.

System design is fastidious and theoretical but it gives the opportunity to anchor real solutions to real problems and to reach to many gears of the contraption we are living in.

This is the way he tries to approach design today, alone or in a team.

The project will require about 4 meter square of space with 230V electrical facilities, as well as a screen to display the showreel and the instruction for the audience who want to participate in the educational performance of the intervention. A microphone will also be necessary for the operator to speak to the audience.

## UN sustainable development goals





**filter loop**

**Low resolution poster to be later made for A0 printing**