Autumn 2022

Sustainability & Destruction Technology

Substrate and Separation
Different banknote substrates require different destruction treatments.

The Wheel of Destruction
Different steps from sorting, separation, shredding, filtration, briquetting, handling are driving the fit for recycling approach.

Best Practice Initiatives
Learnings from global Central Bank recycling initiatives.

Green Line Concept
Energy savings through a modern intrinsic Greenline Concept.

Decentral Destruction
Smaller shredding volumes require an adapted decentral destruction process.

Control Manager
Real time monitoring of the complete destruction process.

Clean Air in Production
Viruses and dust particles are problems in industrial buildings and need to be filtered.

Hunkeler SYSTEME

BANKNOTE INDUSTRY NEWS

Content

Impressum

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Management summary

Dear Reader

Sustainability is becoming key for our world of today and many industries have already set benchmarks in their fields. The banknote industry is committed to sustainability and emphasizes this towards their suppliers. But when it comes to the end of a banknote's lifecycle, sustainability has been somewhat neglected so far.

Two thirds of all Central Banks do not have a proper destruction-recycling process of banknotes in place.

Several Reports talked about sustainability but to x-ray the destruction + recycling process has not yet been conducted. For this purpose Hunkeler Systeme and Banknote Industry News have joined forces, working several months to draw up this new guideline of a proper and optimized destruction process for different banknote substrates.

The "Wheel of Destruction" provides details of how separation of substrates is mandatory in the destruction process; a profound analysis of a one- or two step shredding process unveils hidden energy saving potentials and a proper compacting solution supports the CO_2 footprint for transportation. Smaller destruction units for a decentralized process might be the right solution when lower shredding volumes or geographical challenges are the driver. Independently if centralized or decentralized destruction takes place, dust particles need to be filtered for a clean air environment.

And specially, we feel honored that for the first time leading Central Banks have provided insights how shredded banknotes can be inserted into a proper recycling approach.

Those Central Banks are ready to talk with you about their initiatives. This report shall drive the discussion amongst Central Banks. We are here to support your destruction / recycling process for sustainability.

Yours sincerely

Erich Hodel
Hunkeler Systeme AG

Donald Scholz
Banknote Industry News GmbH

Driving the recycling process

Hunkeler Systeme AG – a leading banknote destruction company from Switzerland and the "Banknote Industry News Ltd." – the leading digital media platform in this sector – have joined forces and are proud to present the first ever published **"Sustainability & Destruction Technology Report"**.

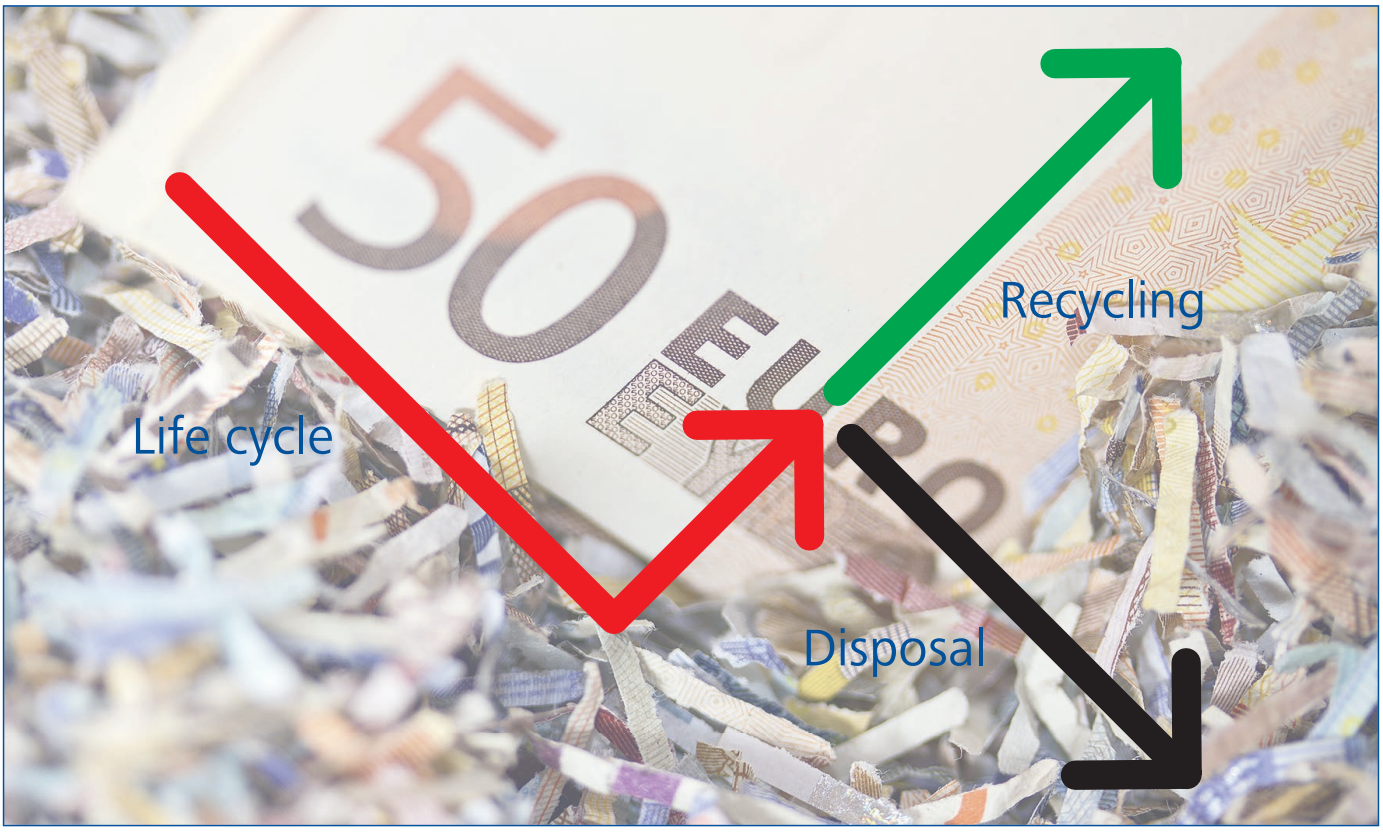
Sustainability is becoming key for our world of tomorrow – Central Banks around the world & the banknote industry are targeting an improved cash cycle. Nearly 60 per cent of all Central Banks are working on a sustainability policy and 30 per cent of them want to introduce a recycling process in the near future (see Hunkeler Systeme / BIN Recycling Survey Q4 / 2021).

It is essential to pay attention to the end of the lifecycle of a banknote. Uncontrolled processes can waste up to 100 kWh. On the next pages, please see how a proper and optimized destruction process with the right equipment is supporting sustainability and the recycling process for unfit banknotes.

An improved destruction process is key to the recycling process – with the right equipment a Central Bank can develop a better sustainability policy. Currently more than $^{1}/_{3}$ of all Central Banks do not separate their different banknote substrates (out of circulation) at the destruction process.

And only 24 per cent of all Central Banks currently have a recycling process in place. This indicates a huge potential for improvements in terms of sustainability.

Inspire yourself on the next pages, how a proper and optimized destruction process with the right equipment is supporting sustainability and the recycling process for unfit banknotes.



All our efforts should be made to process unfit-banknotes for a proper recycling process (green arrow above) avoiding classic disposal (black arrow).

Substrate and separation

Cash in circulation (volume) has been growing between 4.5 to 8 per cent on a global scale.. Cash as a means of payment is and will remain attractive. Moreover Central Banks worldwide support the importance of cash as a part of the freedom of payment choice (see recent ECB paper dd. 2nd of August, 2022).

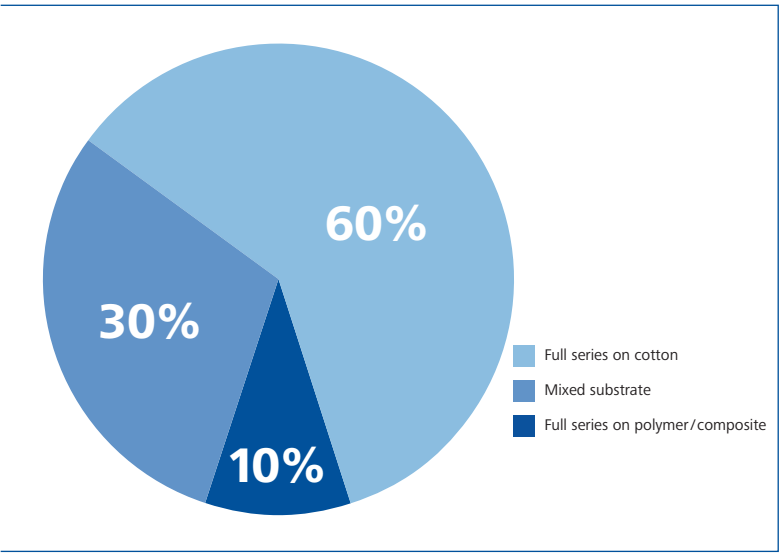
There are three known types of banknote substrates available – cotton – polymer and composite based banknotes.

When we have a view on the worldwide "Banknotes in Circulation" from a substrate perspective, we can notice that more than 30 per cent of all Central Banks have issued banknote series with two different substrates, that are currently in circulation (ascending trend) – mostly with cotton and polymer substrates.

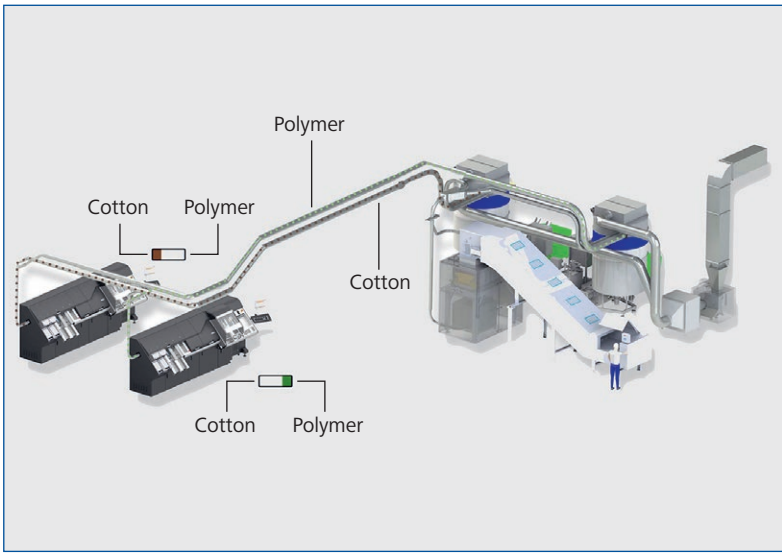
Complete cotton banknote series still have the highest share with around 60 per cent.

Of those Central Banks with a mixed substrate strategy (polymer / cotton) over 40 per cent do not separate the different substrates at the shredding process which is therefore limiting the recycling possibilities

Independently of the specific substrate, a dedicated shredding / destruction process for an improved sustainability policy at the Central Bank is necessary.



Global distribution of banknote substrates today (based on # of issuing authorities / Central Banks)



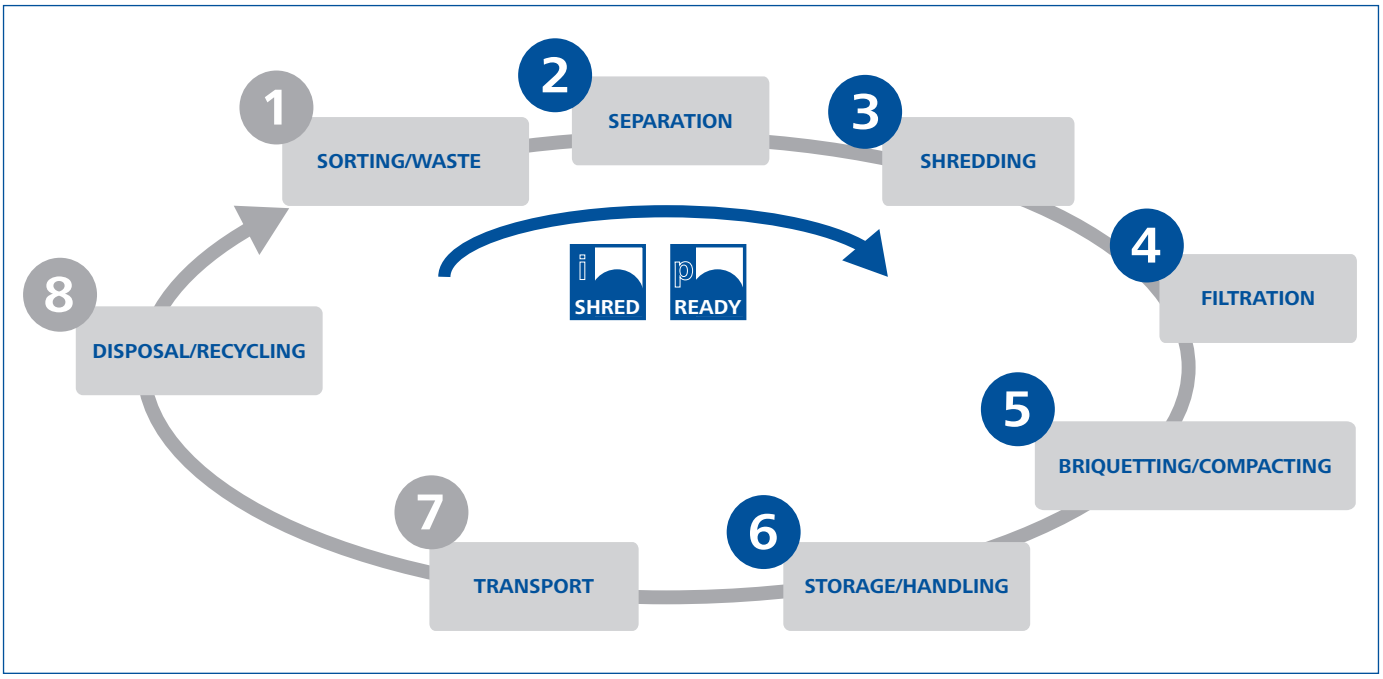
The illustration shows the separate destruction of cotton (brown) and polymer (green) in an integrated system

Key Findings

- Global Banknote Volume is increasing → This leads to increased shredding demand for unfit banknotes
- Due to the increased mixed substrates in circulation a modern destruction system needs to handle both substrates polymer and cotton
- Separation of substrates for the shredding process needs to gain importance → need to be FIT For RECYCLING → improves sustainability level for Central Banks

The Wheel of Destruction

In order to achieve a sustainable process in banknote destruction, we have created the "Wheel of Destruction". It defines the different process steps. Over the next pages, we will describe the different parts in detail and what are the key benefits for a dedicated "fit for recycling" destruction process. Notably, process steps two (2) till five (5) unveil efficiency / energy and fit for recycling potentials which should be reviewed by a Central Bank for an improved "Sustainability Policy".



The Wheel of Destruction describes the different steps in the recycling process of banknotes

1 Sorting / Waste

The pre-defined quality criteria are set by a Central Bank determine the fitness of a banknote at the point of processing.

Declared 'Fit' Banknotes will be re-circulated within the banking system, while soiled / worn-out and declared 'unfit' banknotes will be returned to the Central Bank for destruction.

2 Separation

Composite, polymer and cotton-based banknotes in circulation require a different destruction process in order to be "fit for recycling". At this point in the destruction process it can be noted that only with the separation of different banknote substrates is a downstream recycling process feasible.

Until now dedicated shredding lines have been processing either 100 per cent cotton or 100 per cent polymer banknotes. Due to the increased switch to a mixed substrate strategy by the Central Banks (see previous chapter) we need to differentiate two different types for destruction:

(I) SEQUENTIAL or
(II) PARALLEL

While for (I) the shredding process is fully dedicated to handle only one single substrate at the time, for a parallel sorting and destruction (II), different substrates can be processed simultaneously for destruction, as this system is built up on different "shredding pipelines" which are automatically switching when shredding the one or other substrate (see illustration on previous page 5).

Which substrate requires which destruction type?

▶ **Option 1:** Cotton and Composite Substrate in circulation. If cotton + composite banknotes are in circulation, there is no need for separation and sequential shredding is sufficient.

Key Findings

- Cotton and composite substrates with up to a 30 per cent polymer / plastic proportion contain the same degree of briquetting feasibility
- The briquettes of both shredded banknote substrates can be used afterwards to the same degree e.g. burning for heating (systems)
- In case briquetting is not required, a big bag or container can be adapted at the end of the destruction lines. The loose material can then be used e.g. for the production of other products such as automotive parts

▶ **Option 2:** Cotton / Composite and Polymer Substrates in circulation (Mixed substrates).

In case a Central Bank employs a mixed substrate strategy compromising at least one denomination on a polymer substrate, it is a must to adapt the destruction line to a parallel shredding process. On one line the polymer banknotes will be shredded while the other line is fully dedicated to the shredding of the cotton or composite banknotes.

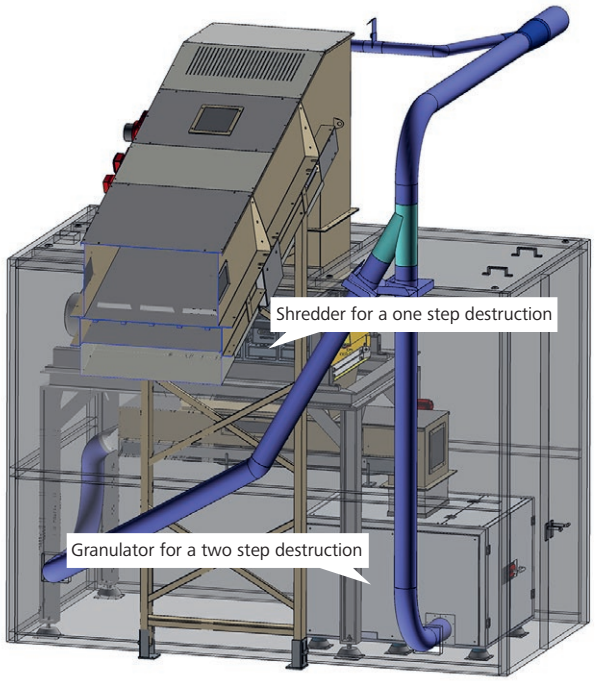
This is required by the nature of the polymer substrate, as a high degree of purity is required for a possible recycling process afterwards. With this purity approach the shredded polymer notes are fit for recycling into other high quality plastic products.

And for the cotton-based substrates (100 per cent cotton or composite solutions) standard briquetting can be put in place at the 2nd line of the parallel shredding process (see also above explanation for Option 1).

Key Findings

- For a mixed substrate strategy, it is necessary to have a parallel shredding system / process in place to enable recycling. This is because the polymer substrate needs a high level of purity (>99.5 per cent) for correct recycling
- A sequential destruction should only be considered if the banknote shreds cannot be recycled

▶ **Option 3:** 100 per cent Polymer Substrate in circulation. In this case a dedicated destruction line meets the shredding requirements. As briquetting is not possible for polymer material the destruction lines are usually equipped with a big bag or stationary press with an exchangeable container solution (in case of larger destruction volume).



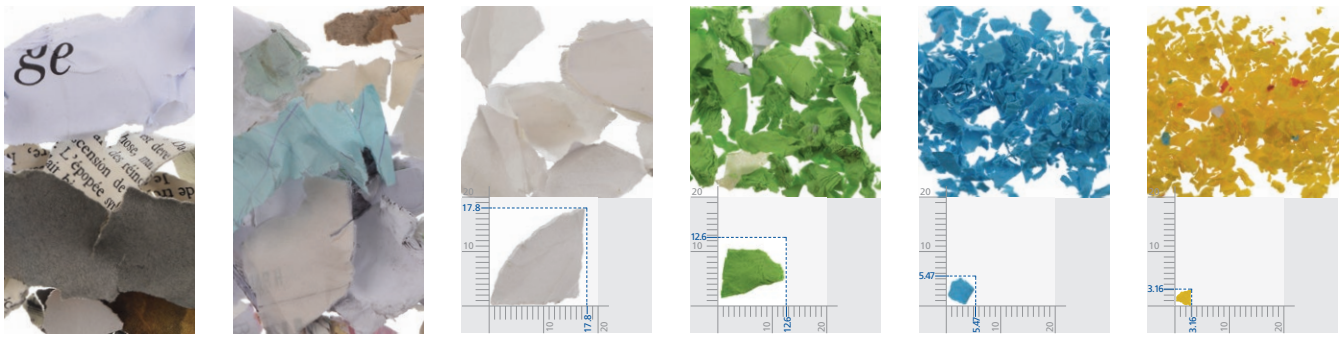
For high security destruction a shredding / granulator module can be integrated into the processing system with an automated change over between security level P3 to P5.

It is highly recommended to integrate an extraction unit with a material silo and a discharge device at the end of the destruction process. With this, the development of fine polymer dust can be decisively prevented.

For pure polymer shredding it must be pointed out that polymer tends to get stuck in various places in the system during the destruction process due to the static charge.

Therefore, the design of the destruction process to avoid material sticking should comprise of:

- antistatic belt at the conveyor belt
- scraper on conveyor belt
- non-painted inner and clamping surfaces at shafts
- potential equalization on all relevant components
- antistatic filter bags
- temperature sensor in the granulator due to the low melting properties of the polymer material



Different security levels of shredded banknotes

3 Shredding / Granulator

At the CORE step of the destruction process we need to differentiate between either online shredding integrated into the processing system or off-line shredding / granulation, which is designed for the destruction of whole bundles of unfit banknotes or unfit banknotes which can note processed through sorting machines.

We need to differentiate between (a) one stage or (b) two stage destruction systems.

For a **"one stage"** destruction system, the shredder chops up the banknotes to the required particle size. Based on the general security level for the destruction of unfit banknotes, a minimum security level of P4–P5 (for lower volumes) conforming to the DIN-66399 is required (please see above an overview of the different P-security particle size levels).

Security level 4 and lower are used e.g. for unprinted banknote sheets.

At the **"two stage"** destruction process higher security levels and destruction volumes can be achieved with a post granulator with its long-lasting shredder blades. This shredding process is required e.g. for unfit banknotes out of circulation or finished printed banknote sheets at the printing premises which do not match specifications.

It is necessary to analyse the security level of all shredded materials (unprinted sheets, printed sheets, unfit banknotes ...) as certain energy efficiencies / savings can be made.

Reduction from a two stage to a one stage destruction process can cause savings of thousands of Euros p.a. as one shredder aggregate requires up to 25 kWh less consumption compared to a granulator (two stage process).

Longevity of shredding knives

It is recommended to pay attention on the longevity of shredding knives of the supplied shredding equipment. Less maintenance and an adapted shredding process regarding a one or two step shredding process due to the required security level (see beginning of this chapter) supporting longevity and reduced replacement of the shredding knives, which results in savings of a solid four-digit Euro value.

4 Filtration

Unclean air in the operational destruction area can create shut downs of the destruction equipment or even harm the health of the machine operators.

Banknote shreds and other production waste all interfere with production when aiming at higher levels of economic efficiency. The dust-laden transport air is cleaned in the jet-filter and is either returned to the production rooms or exhausted outside the building; this is the base of saving energy with conditioned (warm / cold) air treatment.

The constant measuring of the dust concentration of the filter elements and the dedusting of the filters happens fully automatically. It saves a large amount of energy due to the constant monitoring of the dust level and is suitable for non-stop operation.

Modern systems allow additional dedusting of banknote sorters and other machines (e.g. banknote separation unit or conveyor belt).

5 Briquetting / Compacting

After shredding, the shredded particles can then be sent via an air conveyor system to a briquetter or compact bagging system. Main target at the Briquetting / Compacting step is the volume reduction by a factor of up to 12 times.

A pressing force of 0.7–1 kg/dm³ is the minimum required to keep a solid compact form.

Feasibility of briquetting depends on the substrate type and we need to differentiate between:

a) Cotton based substrates inclusive composite
b) polymer substrates

Cotton-based and composite (cotton / polyester) banknotes of up to a 30 per cent polymer / plastic proportion have excellent briquetting properties. The density of pure cotton-based banknotes is significantly higher than composite based banknote shreds.

As for polymer banknotes, briquetting is not feasible, and alternative solutions for shred transportation must be considered. Depending on volume, different solutions are appropriate, such as:

- "Big Bag" solutions for small to medium volume amount
- Stationary press / exchangeable containers for large scale destruction volumes

Integrated "Big-Bag" solution

Briquetting system

6 Storage

Prior to transport to the respective disposal system, it is necessary to store the shredded banknotes in an easy-to-handle and compact form. A component that must never be neglected is security, which needs to be maintained at all times.

Briquetting / compacting of shredded banknotes supports the storage capacity of shredded banknote material:

→100'000'000 shredded banknotes
≈100'000 kg
≈1000 m³ shredded notes (not compacted / loose)
≈100 m³ cotton briquettes

Press container system at the production premises of LANDQART (Switzerland)

This impressively illustrates how the volume of shredded banknotes can be reduced.

For shredded polymer banknotes a "Big Bag" solution is mandatory to keep the plastic dust compressed as briquetting is not possible in this case.

Key findings

The quality of briquetting is a driver for:

- better transport possibilities → reduced CO_2 footprint
- better burning properties
- easier handling for further processes
- lower disposal costs
- increased cleanliness at the workplace

7 Transport

To determine the most sustainable destruction solution for a specific situation, the transport routes must be taken into consideration when evaluating the most sustainable approach. There is no "one solution fits it all" approach as following parameters need to be put into consideration:

- volume of shredded banknotes until a full truck can be loaded
- recycling option for shredded banknotes vs distance of transportation

Sometimes it is more sustainable to avoid long transport routes for recycling and to incinerate the waste in a controlled manner next to the central bank destruction location. It is therefore recommended to pay attention to the total cost calculation/CO_2 foot print for improved sustainability.

Example calculation of shredded cotton banknotes:
→Transportation of 100 tons shredded cotton banknotes will require several times the total amount of tours if shredded banknotes are not briquetted / compacted:
→Uncompacted storage and transport leads to unnecessary environmental impact

8 Best Practice Initiatives

In the previous chapters the destruction process for an improved fit for recycling and accompanying sustainability approach was explained.

Based on a December / 2021 conducted Recycling / Destruc- tion survey by Hunkeler Systeme + Banknote Industry News amongst 45 Central Banks worldwide, it was noted that 64 per cent of all Central Banks burn (uncontrolled) or landfill the shredded banknotes. Burning to waste and landfill both carry a natural capital loss for the environment.

Now let's have a closer look at best practice approaches of Central Banks / selected suppliers worldwide, as well as how suppliers and Central Banks can work together. This information was gathered over months of research work with the respective parties / Central Banks.

Korea: Bank of Korea (Central Bank)
Shredded cotton banknotes (yearly volume around 600 tons) are transferred to companies using the material for construction (flooring material) or automotive parts (vibration dampers that reduce vibrations in cars) and for the remaining part, the Bank of Korea has appointed a 3rd party to incinerate banknotes (in a controlled manner).

Banco Central do Brasil (cotton based banknotes):
Currently, the solution for disposing large volumes of shredded cotton banknotes is the destination of the briquettes production for co-processing in cement production, which is an environmentally correct application, accepted as final destination by regulatory and supervisory bodies.

USA: The Federal Reserve Financial Services (FedCash Services)
The 'Federal Reserve Financial Services' – FedCash ServicesGroup – is a leading Central Bank institution when it comes to progressive recycling approaches. With an annual shredding volume between four to six thousand tons per annum, across 28 regional offices, there are multiple recycling initiatives in place to reduce the environmental impact of unfit cotton / linen banknotes.

In 2021
→ 98 per cent of all shredded unfit banknotes were recycled
→ 26 out of 28 FedCash offices were engaged in shred recycling contracts

The Federal Reserve Banks work with local communities / organizations to partner for the best possible recycling approach. This effort supports the reduction of its carbon footprint by reducing transportation of shredded banknotes over long distances.

This effort shows that shredded cotton-based banknotes can be
→ incinerated to be used as biofuel for power generation
→ used to reinforce cements
→ turned into spray insultation products that conserve energy, reduce noise, create better working environments, and protect construction investments
→ used in road construction or landscaping

The Federal Reserve Bank of Minneapolis, in co-operation with the local community 'Hennepin County Energy Recovery Centre' (HERC), provided an interesting energy comparison evaluation of shredded banknote material:

A ton of currency waste processed at HERC creates electricity to run a house for 21 days, plus steam to heat Target Field and downtown Minneapolis.

versus

A ton of currency waste buried in a landfill creates electricity to run a house for 3 days.

Australia:
100 per cent of all polymer spoils and trimmed material from Note Printing Australia (NPA) and 100 per cent of all unfit banknotes from the Reserve Bank of Australia are shredded on-site at Craigieburn. The shredded banknote material is collected on a weekly basis by a local recycler who processes the shredded polymer banknotes with other polypropylene material to create recycled polymer pellets.

These pellets are then sold to manufacturers of recycled plastic goods. One such manufacturer is Repeat Plastics Pty. Ltd. based in Melbourne (visit www.replas.com.au). From these polymer pellets, products like bollards, picnic benches, exercise equipment, construction material, display infrastructure and a range of other useful items are manufactured thus avoiding the use of wood to make these products. At this stage, polymer banknotes enter the circular economy as the lifetime of these recycled products is between 120 to 140 years. This longevity is made possible due to current recycling technology that allows for these recycled plastic items to be melted and re-made three times.

This recycling process has been in place for more than 20 years, connecting polymer banknotes with a circular economy of sustainable and useful products that proactively contribute to conserving the environment.

Amongst 45 Central Banks worldwide, it can be noted that 64 per cent of all Central Banks burn (uncontrolled) or landfill the shredded banknotes. (Source: "Front Page" Africa / Liberia)

Costa Rica: Banco Central de Costa Rica (BCCR)
Banco Central de Costa Rica hires an authorized company that collects and manages the recoverable waste, including the residue from unfit banknotes. This procedure follows Costa Rican Law for "Integral Waste Management". The company delivers the material to a collection center that processes and transforms it into plastic wood products such as fences for national parks, accessibility walkways on trails and beaches for people with limited mobility, benches, and playgrounds. Moreover it includes construction materials that are more affordable for social housing.

This it a great showcase of a Central Bank delivering an environmental and social benefit.

Pakistan: State Bank of Pakistan
The banknote shreds are processed together with the online shredded bank notes into briquettes (units can compress up to 400 kilograms per hour) which are sold to pivate contractors to be disposed-off.

The burning of shredded banknotes is not carried out, as it is seen as not environmentally friendly (an exercise was carried out in collaboration with Pakistan Council of Scientific and Industrial Research (PC-SIR) wherein the feasibility of burning briquettes of shredded banknotes was explored).

Although these briquettes burn with higher energy (BTU) compared to other materials (wood, coal etc.) of the same mass, due to high sulfur content in the notes (primarily due to high security inks), it is not advisable to do so due to adverse environmental impact.

Key Findings

This indicates that any Central Bank, no matter which substrate is in circulation, should work on a recycling concept for its shredded banknotes to help keep our environment alive.

Example of a suppliers "recycling" working approach with a Central Bank

(in this case insights were provided by CCL Secure)

A) General Discussion Framework with a Central Bank to establish a sustainability and recycling policy. This addresses areas such as:

1. legal / policy requirements for waste
2. templates for a policy and contracts with recyclers
3. ensuring the shredded polymer is not contaminated

CCL Secure is then identifying the optimal recycling system within the country. It is driven by:

1. size of country and established Polypropylene (PP) recycling in the country. If CCL Secure need to find a local recycler, it is using CCL Industries' global existing contract network.

or

2. local CCL recycling facilities. (CCL Secure takes back its waste) or
3. volume of waste (Banknote printer and / or Central Bank).

Afterwards CCL Secure conducts a test at each recycler with the following requirements:

1. Mix of banknote shreds with other polypropylene (PP) products to establish its optimal mixture grade. As the banknote volume is relatively low compared to other PP material, the recycler can mix different percentages to obtain a certain grade for their customers
2. Logistics / Technical questions
3. Final use. The Central Bank wants to know the type of material the recycled product is used for
4. Commercial agreement

Energy saving with the Greenline Concept

Energy saving for a sustainable destruction
A modern sustainable destruction process needs to be driven by an intrinsic "Greenline" shredding concept which saves energy and supports cost reduction. It is based on four separate considerations:

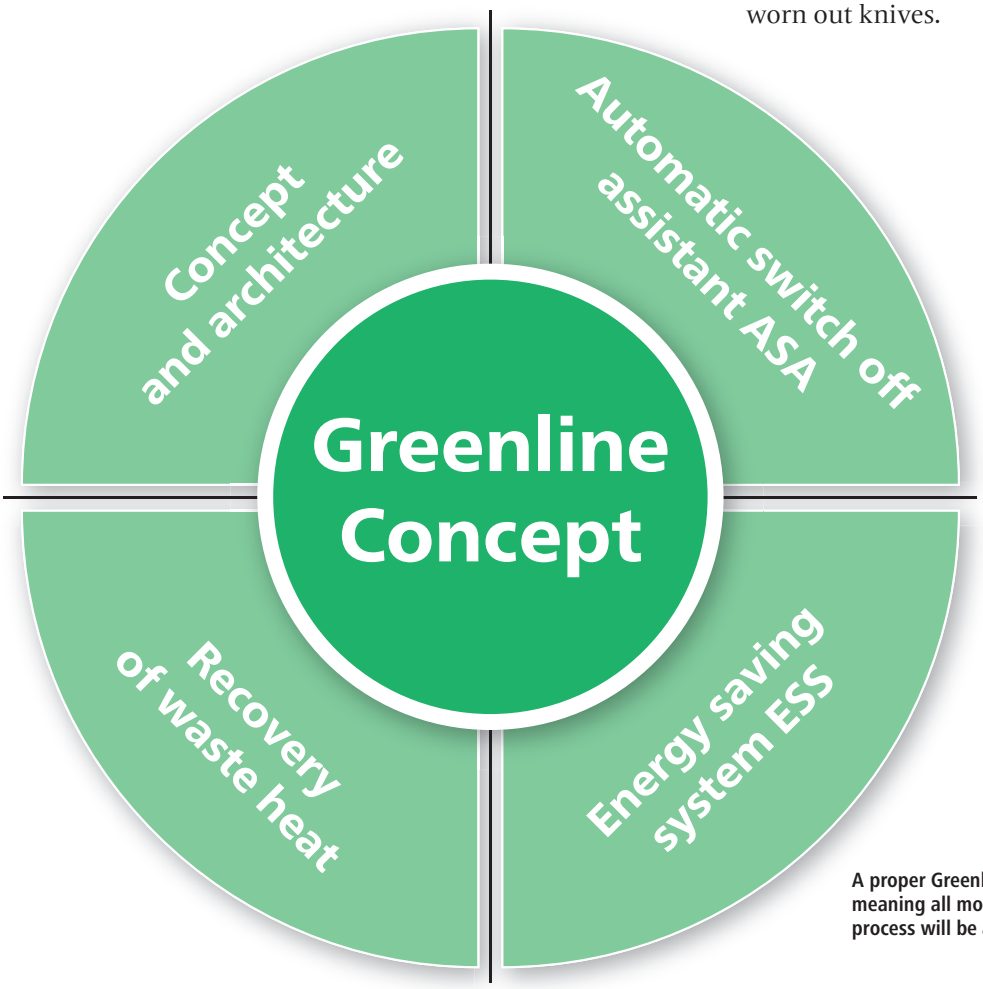
→ *Automatic switch-off assistant (ASA)*
Basically, a suction system consumes energy at a steady level, whether it is transporting material or not. The ASA has the effect that a suction system is only in operation when suction is required.

→ *Energy saving system (ESS)*
The energy saving system regulates the energy consumption of suction technology according to need. The fan will only transport air according to the requirements of production. Compared to operation without the ESS, the consumption of electrical energy is lowered by as much as 40 per cent.

→ *Concept and architecture of a suction system*
The duct diameter of a suction system is always adjusted for the required air volume flow. Thus, for the required suction performance, a comparatively low air volume is necessary. The relation between energy consumed and suction obtained is optimized.

→ *Recovery of waste heat from a suction system*
A suction system brings with it a valuable resource: thermal energy. The warmed air allows to heat the production rooms at relatively low cost. In the cooler months of the year, this supports to cut down the heating costs.

→ *Energy management system*
An "Energy management system" shows where and how much energy is being used in the production system. The energy flow can be precisely managed, resources efficiently used and operating costs accordingly lowered. Time monitoring of how much time X kg of unfit banknotes needs to be destroyed in the shredder assists in the detection of worn out knives.



A proper Greenline Concept is steering energy where needed – meaning all modules that are not used during the destruction process will be automatically switched into a standby mode

Decentral banknote destruction

Countries or Central Banks with smaller shredding volume do not need large destruction units when capacity or operating utilization is not being used.

In such cases a Central Bank can destroy low shredding volumes with a decentral unit as a HDDS 30. The unfit banknote bundles are loaded manually into the operating shaft and the destruction process can be started. (e.g. for a P5 security level the shredding unit can shred up to 100 kg per hour).

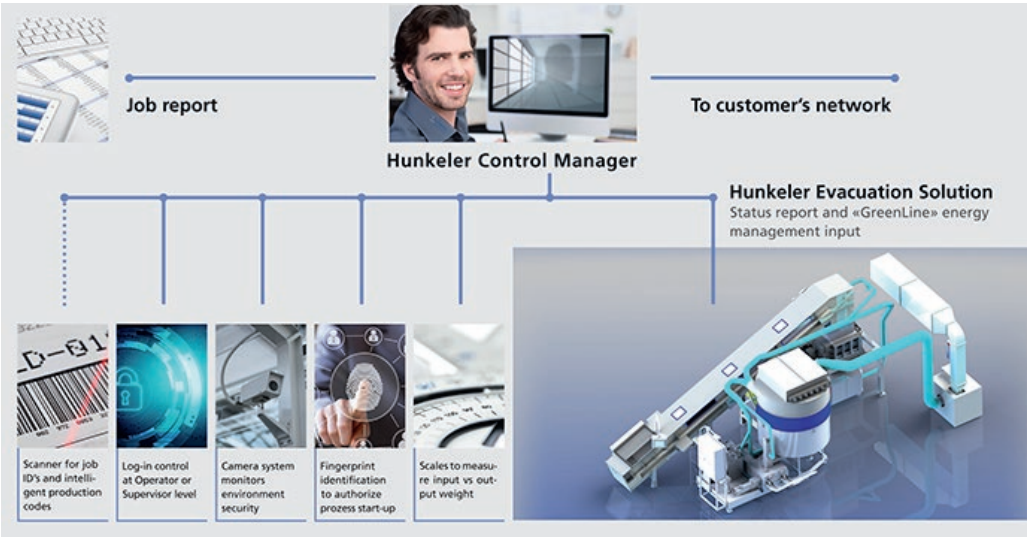
Basically, this small unit behaves like a large two-stage shredding system, independently if polymer, cotton or composite banknote (bundles) need to be destroyed. The HDDS 30 compact solution can even be connected to a separate briquetting press and to a compact suction system such as the HKU 4500. With this approach to smaller shredding units, a Central Bank with low shredding volumes can be prepared for recycling adaptation.

Key Findings

- Small destruction units have the same security level as larger units
- Working with the same Control Manager
- Central Bank reduce transport risks by shredding at decentral locations, therefore also reduced transport costs

The HDDS 30: A compact shredding system for the decentral destruction of banknotes in smaller amounts.

Quality management and process control



The "Control and Workflow Manager" continuously monitors the entire disposal process during production time

The 'Control and Workflow Manager' (CM) continuously monitors the entire disposal process during production time.

All the relevant information is stored and displayed in a central control station. The interface allows a transparent view of the actual production as well as of the history data.

The workflow software shows the supervisor in real time the status of the destruction line and a summary of the production data within a day or a week.

The visualization tool is an extension of the HCM PVS17 software and can be adapted to the customer host via XML, CSV interfaces.

The file export from the CM-Software is uploaded into the core banking system of a Central Bank. Current real time reports are retrieved immediately. Statement by the State Bank of Pakistan: The System meets the high requirements of SBP BSC and performs exactly to the needs of the Bank.

Key Findings

- User management system with customized workflow process
- Central user administration with individual password assignment up to 3-way authentication
- Important user data such as the username, date and time, destruction duration and destroyed product are registered in the job report tool
- Export to any customer system via a csv file possible
- 100 per cent process control to improve energy consumption

The Control Manager from Hunkeler Systeme has met the requirements of State Bank of Pakistan (Central Bank) Division BCS to a high degree.

Compact Aircleaner HKA

Viruses and dust particles caused by movement, production processes and air circulation are well-known and unavoidable problems in industrial buildings.

The Compact Aircleaner from Hunkeler Systeme is a multi-filter system with the most modern air cleaning technology. It ensures improved air quality and optimal air hygiene in closed rooms. The built-in fan with the most modern EC-technology has an effectivity of up to 90 per cent and needs no maintenance. Thanks to electronic monitoring and easy operation, the filters can be changed quickly and easily.

Dust, pollen, viruses and bacteria – indoor air quality is endangered by many influences. With the start of the corona pandemic, these factors gained even more importance. They represent an important bastion against the spread of the virus, from offices to large industrial buildings.

In addition to the virus filter EPA E11, HEPA filter H13 with a 99.95 per cent protection or activated carbon filter F7 can also be used for odorous air.

Keeps the air clean and ensures a healthy working environment: The Compact Aircleaner HKA from Hunkeler Systeme.

Virus protection
- Protects the environment from viruses and bacteria up to 99.5 per cent
- Significantly reduces the risk of infections
- Filter aerosols in winter and summer
- HEPA filter H13 available for HSA 3000

Running costs
- Low heating costs thanks to good air circulation of the various air levels
- Reduction of the cleaning intervals for machines, systems and buildings
- Low power consumption with 230 V

Product advantages
- Plug & Play with a 230 V
- Low-cost replacement filter
- Filter monitoring with visual display
- Mobile system on wheels, allows flexibility to position the unit

Productivity
- Employee absences reduced
- Maintenance intervals for the system and machines are improved
- Dust reduction of up to 50 per cent, protects air conditioning systems