____ **R**eversible ____ **R**eelles ____ **R**ecycling____

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1. COMPANY

In the early nineties three friends came together through a shared dream. They wanted to create a process in which it was possible to seperate household, commercial and hospitalar waste into their original raw materials. These raw materials needed to appear through this process, cleaned and directly usable. An almost impossible case, almost a dream.

But by using their technical knowledge and experience, persistence and common sense, they achieved in creating this unique process. This process, called Reversible Reelles Recycling or 3R, transforms household, commercial and hospitalar waste into raw materials through a closed system and was patented worldwide in 2000. In the beginning of 2008 they wanted the 3R process to be tested independently by the well-known German based engineering organisation EPC (www.epc-online.de). EPC put the 3R process to the test and they concluded that the process lived up to its high expectations. Of all waste 97% could be transformed into raw materials through the 3R recycling process, generating an estimated return on investment of about 35%.

With the 3R recycling process tested and running, the three friends started the organisation International Pure Propulsion, located in Stadskanaal (The Netherlands), with the goal of promoting the 3R recycling process and putting the patented process to commercial use.

The uniqueness of the 3R recycling process
Two main features make the 3R recycling process unique: its simplicity and its completeness. The 3R recycling system is the only recycling system in the world which can handle all types of waste in a closed system without pre-sorting. Simplified: you can throw all types of trash (household / commercial / hospitalar) in our system at the startingpoint and with little interference of personell it is transformed in raw materials of refined quality. This means any type of waste (organics / hazardous / plastics / glass / paper / metals / ...) in any form can be handled in one place and process.

With the help of our engineering partner EPC we can deliver the 3R system turn-key in any place in the world. After the pre-engineering, education of local staff and with the continuing assistance of EPC you will have the best waste management solution in the world. We call this the best waste management solution in the world because it combines three things, no other system in the world combines:

- The 3R system handles all types of waste, there will be no left-overs in this system, no landfills, no incinirating-ashes, just raw materials. This is cradle to cradle in the purest sense.
- The 3R system is climate neutral and CO2 free and therefore has a positive effect on the environment and the people living in it.
- The 3R system earns money and doesn't cost it. It generates great returns without any necessary governmental funding and is therefore economically very attractive.

2. 3R PROCESS DESCRIPTION

PREFACE

Advanced **I**ntegrated **R**ecycling is a material flow management system, which links the refuse economy with the raw material-processing industry.

The **3R** equals an All-Input-Recycling system, due to its technical ability to process any input without a pre-sorting of the raw materials**.**

3R is at present the only procedure, world-wide, which is able to produce raw materials from mixed waste, which corresponds to the quality requirement of the processing industry.

In view of more scarcely becoming resources, the **3R** System offers as of today an economical and politically well supported solution.

The integration into existing disposal systems is without a problem possible. In addition, the procedure can also be used in countries without a comparable disposal system as the one in Germany, whenever it will serve as global solution.

The processing industry can refer to the needed raw materials at competitive prices. These are supplied in a high quality through a combination of several existing engineering process systems and a high preparation ratio.

Through the connection of the existing technologies of the refuse sector with the technologies of the processing industry, the long-term interests of the market participants will be covered through the **3R** system. Licenses will be exclusively assigned to established and efficient members of the waste disposal industry.

The **3R** procedure is the technological and economic solution for the time after the German “DSD-phase” and for the new requirements of waste disposal through recycling, burning or dumping it starting in the year 2005.

A simplified description of the operational sequence follows, whereby the sequence of the process cycles could change anytime due to the flows of input.

The operational sequences, point 1 – 4, describe usual waste preparation measures, while the points 5 – 12 deviate from well-known process engineering.

DESCRIPTION OF THE SUBSTANTIAL COMPONENTS AND PROCEDURE CONSTITUENTS

I. LOGISTICS

The existing structures can be further used without additional costs. This process contains substantial saving potentials, since the collection and transport of all refuse could be done without separation.

A complex pre-separation of the waste materials is not any longer necessary. The container systems in Germany can be used in future, but they should be re-dedicated.

In example, the 220M liters (= 48.422M gallons) collector for valuable materials could receive a new usage as UV-protection container for plastics and coated papers. The garbage bins for regular household waste should be maintained for hygienic reasons. They may now however be used for glass and metal packing as well, while the usage of the old paper collectors may be continued.

In countries with other climatic conditions, the existing “one-all” container system may be maintained.

II. EQUIPMENT TECHNOLOGY

The substantial difference between the 3R System and the existing systems is that no pre-sorting before collecting the waste materials nor before its recycling treatment will be necessary. The flows of input are may delivered in high density.

The fragmentation of the materials is fully automated, resulting in fragments of high quality which may be sold to the raw material-processing industry for subsequent treatment and for marketing them to the different industrial sectors.

(1) Pre-sorting

The recycling system starts with a pre-sorting of plastics and non-plastics, as well as compounds, electrical and electronics scrap.

The magnetic metals (iron and steel), as well as wood and glass, are segregated individually and loaded into containers for its sale.

The non-magnetic material will be cleaned from all superficial organic dirt in a high pressure washing cycle with a waste water clarification technique integrating an oil recovery.

The organic material is transported to the fermentation gas power plant. All items from the garbage collection like laminated plates, old furniture or wooden products are used as input for the recycling system of pressboard panels.

(2) Analysis of the plastics

Since plastics have only a limited life span due to their processing and damages caused by UV radiation, they are submitted to a lab-control upon their reception. The laboratory analysis will provide the degree of degradation, which means the degree of the wear down of the plastic.

This pre-analysis is relevant for the subsequent treatment and to the protection of the quality.

(3) Shredder + Slitting Mills

In case of a positive lab-analysis, the materials will be cut into flakes with the help of shredders and slitting mills.

This mixture of materials, consisting of mixed plastics, plastic composites, electrical and electronic scrap as well as paper, pasteboard or cardboard (e.g. milk bags) are automatically transported to a mechanical-physical separation system.

(4) Material separation and sorting equipment

The mechanical-physical separation system uses the specific dead weight of each material. That means the individual flakes are accelerated in a rotor drum until the adhesive powers of composites such as plastic and aluminum are removed by centrifugal forces, so that the different materials will extract themselves from each other.

This system separates the most diverse metals, paper/pasteboard/cardboard and precious metals, as well as the electrical and electronic scrap, collects the result into individual containers by material and is ready to be transported for the sales.

The mixed plastic fragments are supplied to the extraction washing plant (5).

(5) Extraction-Unit (plastic washing machine)

The plastics flakes are cleaned from migrated food particles (lactic acids, flavors, etc.), processing additives (silicic acid, stabilizers, etc.), printing inks and adhering dirt on the surface and afterwards dried. The printing ink pigments are sold for re-usage to the print-ink industry.

The extracting agent is used in a closed cycle and continuously upgraded.

(6) Plastic separation and sorting equipment

The mixed plastic fractions are supplied to the next work procedure, a second mechanically - physical material separation and sorting equipment which separates the individual kinds of plastics (PET, PVC, HP, HDPE, PURE, ABS, etc.).

This separation and sorting equipment separates and assorts accordingly to the different specific weights the plastic fractions. The fully assorted plastic fractions are transported to the color separation system (8).

The plastic remainders such as PP and LDPE, which could not be assorted, are processed in the thermal scanner (7).

(7) Thermal scanner, here: PP + LDPE - separation system

The separation in the thermal scanner functions in the melt-flow index procedure, i.e. each kind of plastic has its own fusing temperature, which differs substantially from the other plastics.

The fact that plastics melt or deform at different temperatures is used by the thermal scanner. Inside the thermal scanner prevails a temperature of 80° Celsius (= 178º Fahrenheit), which corresponds to the melting point of LDPE (Low Density Polyethylene). On the stretch through the thermal scanner only the LDPE shreds change the texture of their surface. The hot-air of 80°Celsius (= 178º Fahrenheit) blown on the plastic shreds leads to a contraction of the LDPE fragments (modification of the surface texture).

At the end of the conveyor which leads through the thermal scanner, the mixed plastic fragments consisting of PP and LDPE are transported to an optical-electronic sorting system.

This system detects the plastic shreds with the changed surface texture (LDPE) and sorts these from the plastic shreds with unchanged surface texture (PP).

The fully assorted and separated plastics fragments LDPE and PP are now transported to the color separation system (8).

(8) Color separation

The individual sort-pure plastic fragments are now transported to the color separation system, an optical - electronic sorting system. This system consists of 7 successively switched sort units, which are connected by means of conveyors.

Here each sort-pure plastic shred is successively sorted and separated from each other by the colors green, yellow, red, black, white, blue and transparent.

At the end of this processing step at least 63 different groups of plastic fragments:

HDPE - separated according to the colors → green, yellow, red, black, white and transparent,
PET - separated according to the colors → green, yellow, red, black, white and transparent,
PS - separated according to the colors → green, yellow, red, black, white and transparent,
ABS - separated according to the colors → green, yellow, red, black, white and transparent,
PUR - separated according to the colors → green, yellow, red, black, white and transparent,
PVC - separated according to the colors → green, yellow, red, black, white and transparent,
PP - separated according to the colors → green, yellow, red, black, white and transparent,
LDPE - separated according to the colors → green, yellow, red, black, white and transparent,
etc. - separated according to the colors → green, yellow, red, black, white and transparent.

Each sort- and color-pure plastic group is temporarily stored in silos and/or closed feed containers until their subsequent treatment.

(9) Compounding and Extrusion

The plastics are compounded due to the customer's requests, i.e. the plastics are dyed according to DIN (German Engineer Norm) and by means of new materials added, equipped for its new targeted application before finally being extruded, which means melted and the compounds are merged.

The sort- and color-pure granulation is due to customer's orders packaged and dispatched in bags of 20kg (44 pounds), octabins – 800 kg (1,760 pounds) cardboard bags or silos for truck transportation.

With the 3R - technology it is now possible to create a flat foil plastic out of a former injected molding plastic.

(10) Gas fermentation – power plant

The next work procedure consists of a gas fermentation power plant which converts organic materials into methane gas.

With the gas several small gas turbines and generators with high energetic efficiency are operated for the generation of electricity. The developing heat of exhaust gas is used for creating process steam.

After using a first part of process steam, a second part is utilized in the extraction unit for the cleaning of the plastics. Furthermore, another part of the process steam is used in the briquette manufacturing for drying the briquettes gained from the sewage sludge and laminated fibers. The remainder of the steam can be fed into a long-distance heating network, or it may generate electricity through a steam turbine and a generator at the end of this cycle.

(11) Pressboard panel recycling system

Further a system is integrated for the recycling of pressboard panels. The recovered wood spans will be loaded into containers at the end of the process and supplied to the chip board and the pulp industry.

(12) Sewage sludge and residual chip briquette production system

The remaining sewage sludge from the gas fermentation power station and the remaining splinters from the pressboard panel recycling unit are injected in the sewage sludge and residual chip briquette production system, where they are dried and molded to heating briquettes. Those briquettes are used as coal back-up, packaged in 10 kg (22 pounds) carriers, packed and sold and/or this material may be find a further targeted application as biological fertilizer in the agriculture or farming industry.

(13) Summary – machines and machine systems

The used machines and systems of the 3R - technology are components available in the open market, which are technically applied in the various industrial sectors for years. Therefore, they are considered as matured and proofed with warranties provided by the different manufacturers for the machines and spare parts for many years.

These machines presently are over 100 times in use, will receive within the 3R – Technology a superior process control system, a new arrangement of the machinery as well as the use of other processing materials for the purpose of a new targeted application.
The user of the 3R – technology will therefore have a high degree of availability and easy access to all installation components and thus insure a high efficiency.

III. MATERIALS TO BE RECYCLED

The system is designed in such a way that it may be used in countries with an existing recycling system (like Germany, Austria, France...) and also in countries without any existing or adequate recycling system or installations.

The 3R – technology is able to process the following materials, either in an unsorted, sorted or in a more mixed and/or already deposited fragmented form (waste dumps):

- Compound materials (plastic/plastic, paper/plastic, plastic/metal, etc...)
- Garbage remainders from households,
- Organic garbage (grass cut, organic wastes from the households, liquid manure, etc.),
- Electrical and electronics scrap,
- Plastic wastes from households and/or the industries,
- Complete, not dismantle trucks and car sections,
- Bulk waste (laminated fiber plates, old furniture, any household items, etc...),
- Materials for and/or from the dump.

This means, all materials listed on the international green waste list of the Basel/Swiss agreement. In addition it should be pointed out, that by combining the system with a Pyrolysis installation, even the material flows from the yellow and red list may be processed and recycled.

IV. PATENTS AND LICENCES

Licenses will be assigned exclusively to established enterprises of the refuse industry and their partners from the raw material-processing or raw material-editing industry. Following is a list of the various licenses planned to be delivered in the USA:

- Exclusive or non-exclusive state license for marketing the **3R** system;
- Exclusive or non-exclusive state license for building and operating the **3R** system;
- Regular license for operating a **3R** plant.

The price of each license will be determined upon the number and the capacity of each plant.

Furthermore, the licenser will guarantee that no license will be issued with an expected output above the possible market volume of available refuse for his region. On the other hand, the licensee will have to agree to a regular control of the utilized capacity. This information will serve as calculation basis for the yearly royalties.

SUMMARY

The basis of the **3R** – technology is to utilize the manufacturing know-how of original and structured compounds in the material flow in order to regain from end products the basic materials. The refuse material flow becomes again a high-quality and clean raw material with a high market value. The **3R** technology solves the existing problem of the "Down Cycling", since agglomerates belong to the past.

The following advantages will result for the user:

- Application of the procedure as global solution or as plastic preparation;
- Extreme adjustment to the available material flows and the raw material markets;
- Compatibility to the available plastic fragments;
- Implementation of the own strategy independently of the specifications by the European DSD;
- Conformity for the new requirements of waste disposal through recycling, burning or dumping starting in the year 2005;
- Accessibility of its own disposal contingents;
- Return improvement within the area upgrading;
- Development of the markets outside of the European waste disposal systems;
- Investment security through a patent protection and a capacity limitation.

3R

TECHNOLOGY

Reversible Reelles Recycling