



Shruder Mk II



June 2018



ABOUT US

Plastic Collective (PC) is a social-for-profit enterprise which provides machinery, tools and educational training programs for remote communities and islands to transform plastic waste into profitable new products, creating jobs, resources and community development.

Based at the *National Marine Science Centre, Coffs Harbour*, Plastic Collective works in the Australasia-Pacific region where communities struggle with plastic waste issues, primarily due to transportation costs and lack of infrastructures. To overcome this problem, PC brings the solution to the problem, with mobile waste plastic recycling machines and unique training programs.

KEY PERSONEL

Our Lead Team members include Louise Hardman (Founder-CEO) and Mark Wolf (CTO). Both Louise and Mark have extensive experience in their relevant fields. Louise in the Chemistry of Plastics and the development of training programs. Mark in the design and delivery of integrated systems and solutions.

Backed by an expert team of world class mechanical and electrical engineers, industrial designers and renewable energy specialists, PC has been able to engineer the fit for purpose Shruder MkII.

Australian designed, Australian engineered, world leading technology.



Louise and Mark stand proudly with the Shruder MkII. The machine configuration includes Shruder MkII plus Spooler (the green machine on the left). This machine is in use at Airlie Beach Far North QLD, Australia operated by ECO-Barge. The machine was funded by Coca Cola South Pacific.



SHRUDER MACHINERY

The Shruder MkII is a mobile, dual purpose, industrial shredder and extruder, designed to recycle single-used thermoplastic items. Purposely engineered to be easily transportable with lockable wheels, the machine fits into a standard 6x4 trailer or small truck, allowing people to take the solution to the problem area.



Shruder Mk II

The Shruder runs off single-phase main power (220VAC/240VAC) or a small 2kW generator. A solar power options is also available. The Shruder includes a proven 1.1kW 3-phase motor which is connected to a Variable Speed Drive and single phase to 3-phase converter. Designed with remote locations in mind the Shruder uses industry standard "off the shelf" components to ensure simplicity of maintenance, long life, reliability and durability. The



system is plug and play with all electrical connectors being uniquely keyed for fail safe connectivity. The Shruder is engineered with both performance and safety in mind.

Capable of shredding 5-8 kg of plastic/hour (approx.1.4 tonne/ month) and extruding up to 120 m / hr (or 20km /month). The Shruder can process raw shredded plastic material, used in building, household recycled items and even houses, as well as extrusion cord or filament, potentially 3D printer filament plus other cords.



Shruder control system include a: Variable Speed Drive (VSD), Programable Logic Controller (PLC), Wi-Fi connectivity, Safety Switches, Heater Control Units and panel meters.

Filament is taken from the extruder and pressed into silicon moulds by the Team at Eco-Barge. The filament can also be drawn onto a spool by the optional spooler with the resulting cord able to be used for handicrafts, 3D printing. Injection moulders can also be attached.

Shruder MkII Specifications

Motor	3-Phase 1.1kW	Power Converter	Single Phase to 3 Phase
Shredder	14 nitro coated hardened steel blades, 13 nitro coted hardened steel knives	Extruder	25mm extruder screw, purpose built seamless barrel, 4 heater coils and 2 thermistors
Shruder Safety	Electrical, mechanical and PLC management for maximum protection	Extruder Safety	Thermal lockouts and an electric clutch ensure the operator is protected from any potential harm
Materials	316 SS frame, Aluminium panelling, SS fixtures and fittings for maximum corrosion resistance	User Interface	Shruder App enables monitoring and control from any Wi-Fi compatible device,

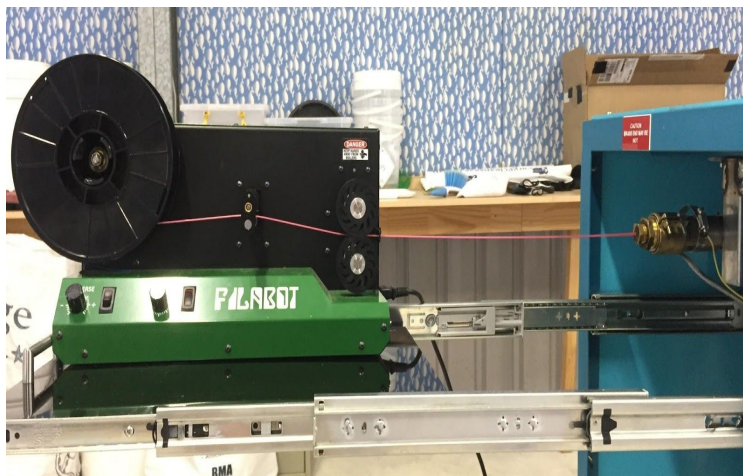


Power Supply	240VAC 10A	Shredder Output	Up to 5Kg per hour
Weight	150kG	Mobility	4 x locking castor wheels

For more details of the Shruder components see to pages 9 and 10.

FILABOT SPOOLER (Optional)

A specialised filament spooler enables users to be able to make continuous cord or filament hands-free. The automated winding machine simply attaches to the Shruder and draws the plastic cord onto a reel as a speed that enables an even and consistent product. This is ideally used for creating high-quality 3D printer filament and can also be applied in other useful products.



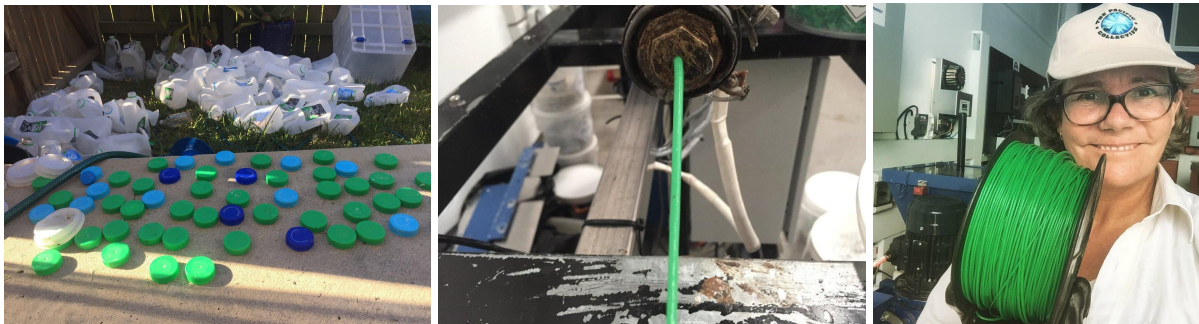
RECYCLED OUTPUT

Currently the Shruder has three forms of recycled output; shred, filament (cord) and small moulded items. 'Shred' or shredded plastic flakes of thermoplastics PET, HDPE, PVC, LDPE,



PP, PS and PLA can be used in the extrusion component or sold to various advanced recycling businesses 'Creators', including landscape products, furniture manufacturers, building products, skateboards, sunglasses, and many other items.

Other outputs include extrusion from select plastics, which is continuous cord that can be used or sold for various applications such as 3D printers, woven items, furniture and concrete reinforcement, plus others. Various items can also be made from simple mould techniques, allowing a range of small moulded products, such as key rings, jewellery and other specialised components.

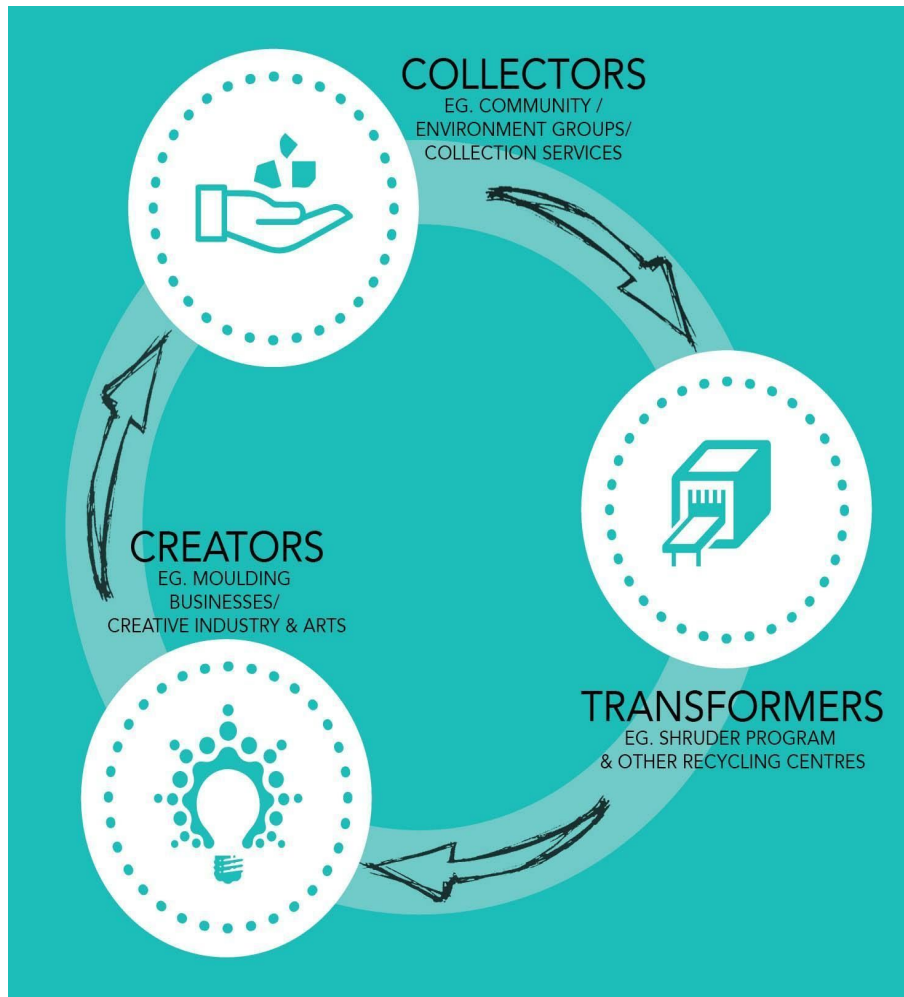


CLOSED LOOP ECONOMY

The Closed Loop Economy model is defined as a regenerative system in which resource input and waste, emission, and energy leakage are minimised by slowing, closing, and narrowing energy and material loops, as opposed to a Linear Economy of 'take, make and dispose'.

The development of Closed Loop model is vital for the success of the Shruder program. The 3 aspects are outlined below, with the Shruder program linking the Collectors to the Creators, thus creating an economic model that harnesses plastic waste back into valuable resources for the community product sales and export.

Plastic Collective's Closed Loop Economy Model



TRAINING

Designed by Louise Hardman, Zoologist/ Science Teacher the 4-day training program is an essential component of the Shruder program, which ensures safe and appropriate use of plastic materials machinery and tools, learning how to create a micro-business from the products and well as many other aspects including moulds design and product development. To ensure a complete package is delivered, the training is based on three principles: EMPOWER with knowledge, INNOVATE with ideas and CREATE with tools and machinery, as outlined below;



EMPOWER (Day1)

EMPOWER training shifts perceptions from 'plastic as waste pollution' to 'plastic as a valuable resource'. Through explicit training in our current global pollution situation, materials science (chemistry of plastics) and closed loop solutions for a healthier and cleaner world. Training in Steps 1 collection, and Step 2 Sorting of resources is covered in detail through hands-on workshops. Specialised resources include posters and manuals on material science, plus tools and equipment.

INNOVATE (Day 2)

Armed with material science knowledge of plastics, participants explore new ideas and designs (Step 3) which focuses on the community needs and practical applications. Potential local markets for products are explored, networks created and also introduces an online recycling-market platform app 'Blockcycle'. Essential micro-business skills are explored, plus local and export sale networks, with the aim to create a circular and economically viable model.

CREATE (Day 3 & 4)

The final stage of training introduces the Shruder machinery and tools necessary to transform waste plastics into resource products that have been designed in previous stages. In depth engineering training covers the Shruder machinery components, health and safety, as well as maintenance. Once installed and operational, the participants will develop skills in machinery operations using a range of plastic materials (discarded and clean), which creates the products designed in the previous stage.

Training Outcomes

- Whole community resource recovery planning and waste management
- Collection of material - clean and discarded
- Sorting of different plastic types
- Chemistry of plastics, properties and safety issues
- Designing & innovating new products for Closed Loop market
- Setting up a working area
- Machine operations - shredding / extruding
- Machinery maintenance and servicing



- Sales of plastic items
- Ongoing support and networking - Collective links

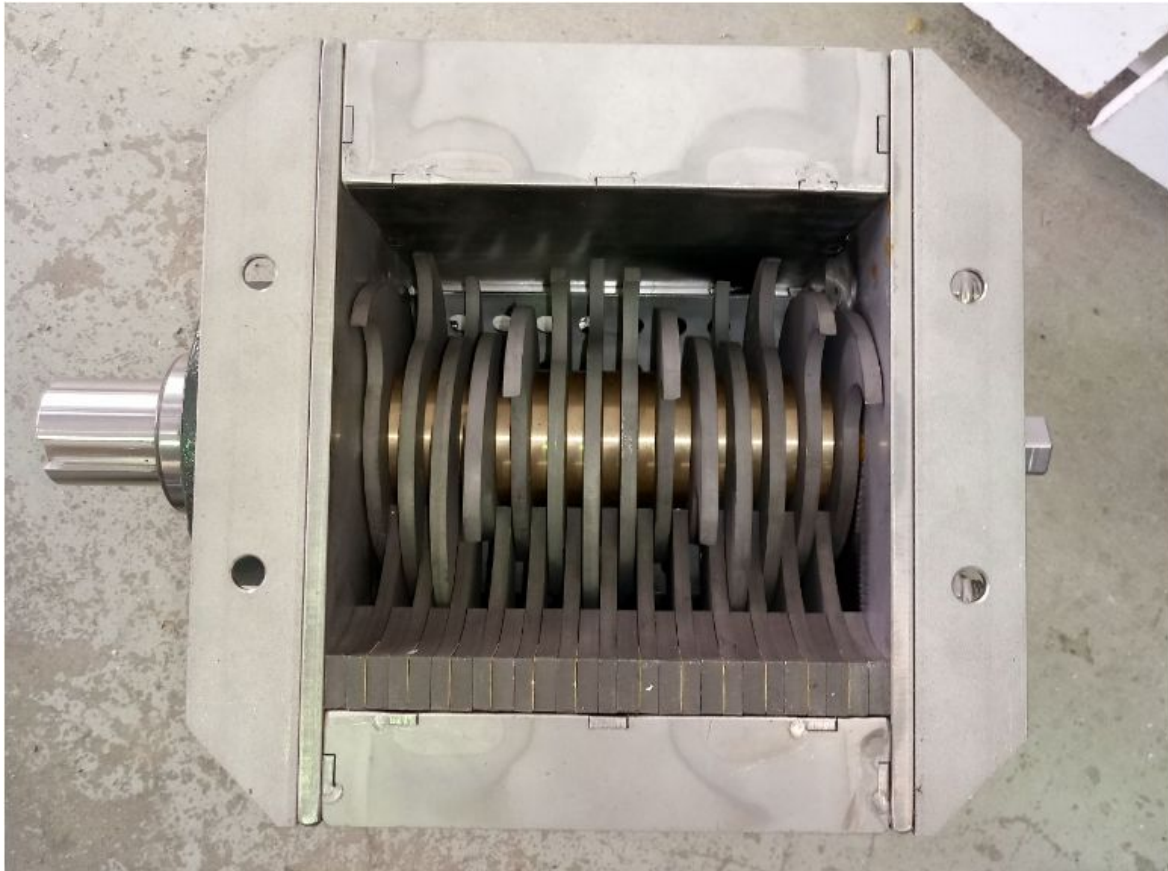
Ongoing support and product development is optional, but strongly encouraged due to the collaborative nature of the program with other Shruder programs around the Asia-Pacific region and Plastic Collective advanced training options. Other programs including Plastic Neutral training & community programs are also available upon request.





Additional Technical Information

SHREDDER BOX



The Shredder box is a precision engineered plastic cutting device. Designed by Military Spec supplying Mechanical Engineers the Shredder box is designed for long life, superior shredding and low maintenance. The shredder box can be simply unbolted and swapped out when it comes time for blades to be sharpened. Service intervals will depend on the plastic shredded and the cleanliness of the waste plastic.

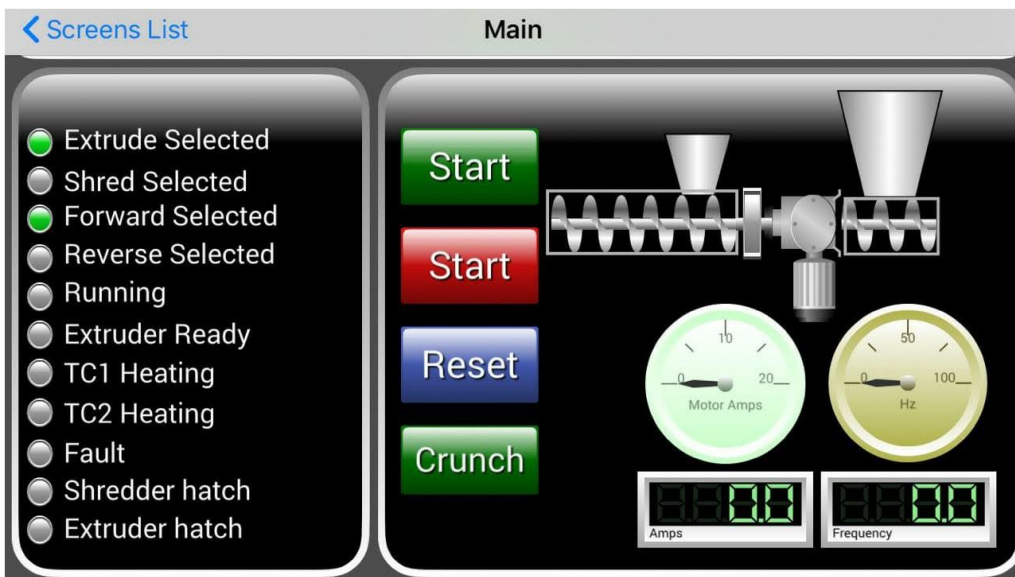
ELECTRICS AND APP



The electrical system has been engineered with safety and performance as the primary objectives.

A PLC manages the operations and includes current load sensing of the Variable Speed Drive enabling plastic to be shredded efficiently by auto reversing the VSD at the appropriate time in the shredding process.

Wi-Fi connectivity enables the machine to be operated from a user-friendly App.





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