

For the food & beverage industry

# PACKAGING Reporter

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## FOOD GRADE RECYCLED PET

An African first  
made in SA

## METAL PACKS

The focus is  
on design

## HOT FILL NEW PET

New PET  
technology

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**Extrupet: SA's newest PET resin producer is up and running**

# Africa's first food grade recycled PET

The first production in SA of "food grade" recycled PET resin (rPET) has been met with strong immediate demand from the foodbev industry, according to Chandru Wadhvani, COO of Gauteng-based Extrupet.

Extrupet has set up the first and only facility in Africa to produce food grade rPET resin from industrial and post-consumer waste. The plant was commissioned in October last year. Tests on the "food grade" status of the products were completed in October, and in December commercial sales began.

The plant currently has a capacity to produce 500t/month of this rPET resin. Already 350t/month of that capacity has been allocated, much more than anticipated at this stage, says Wadhvani.

500t/month (6,000t/year) is still small compared to the 150,000t of PET which it is estimated will be consumed in SA in 2010. The balance of the 150,000t will be virgin PET material. Following the closure of SANS Fibres by AECL, there is only one SA manufacturer of virgin PET resin - Hosaf - and about 30% of local demand for virgin material is being imported.

Wadhvani says the primary reason for the strong demand for this specialised rPET resin is its environmental accreditation as well as the competitive price on one of the grades produced - it is sold at a "nominal discount" to virgin PET resin.

SA companies are expected in the same direction as overseas companies - where rPET has been used in foodbev applications for over five years now - towards a "marketing" motivation for using rPET, in which they will make claims that their packaging includes recycled material.

Wadhvani says several brands already mark this on their packaging as a "badge of honour".

Extrupet will be producing three grades of rPET resin. Its higher grades will be primarily directed at food and beverage multinationals which have more rigid specifications for their bottles, jars and punnets, while also meeting their specific marketing advantage requirements. These higher grades of rPET resin will be sold at lower discounts - and in some cases at a premium - to virgin PET resin. Of course much depends on what happens to the oil price, the reference feedstock for virgin PET.

## PET's popularity

PET's popularity as a material continues to grow throughout the world. PET bottles weigh very little but take up considerable space in landfills, if they are not properly compressed. Hence there is ongoing and increasing pressure from both government and consumers for used PET bottles to be recycled.

However, PET advocates point out that PET produces less greenhouse gases compared to competing packaging types; consumes less energy in its lifecycle; and is a material that can be used again and again.

In SA, in 2001, a PET recycling committee - an entirely voluntary body - was formed by end-users, converters, bottlers and resin producers. It was largely led by the Coca-Cola system.

**COVER:** SA's newest PET resin producer, Extrupet, is up and running - and it is green!



*Extrupet's Chandru Wadhvani in front of PET bales.*

At that time SA was consuming about 50,000t of PET; but less than 1,000t was recycled with the balance - 49,000t - going to landfills.

The PET recycling committee's first target was to collect 5,000t of post-consumer PET bottles, a five-fold increase from what was the prevailing situation. But while recycling rates grew, so did demand and the gap between offtake and recovery continued to increase.

In 2004 PETCO, a dedicated non-profit PET recycling organisation was formed by the PET industry. PETCO's mandate is to raise the percentage of collection and recycling of post-consumer PET relative to the consumption in SA. PETCO currently has the participation of over 80% of the industry by volume.

The fact that landfills have been filling up much more rapidly in recent years than anticipated was one of the reasons that SA's Waste Management Act was formulated and passed into law in April 2009. Regulations have to be promulgated in terms of the Act within two years - that is, by March 2011.

Two main aspects of the Act which directly impact on the PET industry are:

- Extended producer responsibility, which places the onus on industry to devise specific sector plans on waste recovery, failing which it runs the risk of financial levies and penalties.
- The re-use of old packaging to manufacture new packaging. For instance, the PET industry will have to demonstrate the ability to take an old discarded bottle and recycle it back into a new PET container.

Given the above, the Extrupet development is therefore of great significance to the PET industry.

## The technology

rPET itself is not new in SA . It was pioneered and

introduced by Kaymac, and has long been produced for the manufacture of fibres used in pillows, duvets, etc. Extrupet and Hosaf are the only producers of this fibre in Africa.

However, the local rPET fibre industry is threatened by cut-price imports from the Far East, where recycling economies of scale are far greater than in SA.

In the developed world, plants producing food grade rPET have been in place since the early 2000s.

Extrupet's new facility for producing food grade rPET has been long in development because, Wadhvani says, it was an absolute priority for Extrupet to create confidence in the food safety standards of the new rPET resin among manufacturers and consumers.

In Africa, empty PET containers can be used for many applications, and collection from waste streams and landfills is "challenging to say the least". Extrupet thus decided to go for "overkill" in ensuring its products' food safety credentials as well as overall quality.

SA law does not have any standards of approval for food grade rPET beyond a general provision that food packaging may not contain any contaminants that are harmful to the product or the consumer of the product. However, SA health authorities have said that if SA recycled PET packaging meets the extremely stringent US Food and Drug Administration standards, it will be considered as acceptable in SA.

Extrupet discovered that the Austrian company Erema manufactures the majority of installed food grade rPET plant capacity internationally. Its food grade rPET technology, using its proprietary "super-clean" process, is called Vacurema<sup>®</sup>. The heart of the process is a vacuum reactor where flakes are kept in a vacuum for a specified time at a specified temperature. The logic is that PET, like most plastics, is permeable, so contaminants could possibly migrate into it during its life cycle. The super-clean process reverses this, ensuring the removal of any volatiles that may be present to a food grade standard.

However if any one of the three parameters - vacuum, heat or time - is not adhered to (for instance, due to a power failure), then the system automatically diverts that production to a separate station to be bagged (in a different-colour bag) for non-food grade purposes.

The Vacurema system provides real-time records so that the process parameters to produce a particular bag of rPET resin are traceable.

Food grade rPET produced with the Vacurema technology has undergone exhaustive third-party testing, particularly by Germany's famous Fraunhofer Institute, mostly to gain approval from the US's FDA. Other technologies besides that of Erema have also gained these approvals.

This testing has been of two types: *challenge testing* and *migration testing*.

- **Challenge testing:** a sizeable sample of rPET flakes is contaminated with five pre-selected chemicals, and then run on the super-clean technology of the applicant to ascertain the success of their removal. The results are analysed for traces of these chemicals, in parts per billion.

- **Migration testing:** rPET bottles, punnets and trays, etc, made from the flakes from the challenge test are filled with a viscous substance such as ethanol and left for a lengthy period. The ethanol is then analysed for traces of any chemicals, in case the blowing/extrusion process brings them out in some way which might not have been detected in the challenge test.

In 2000 Erema's super-clean technology achieved FDA

approval for food grade rPET - first only for rPET bottles which had originally contained foodbev products; then for any rPET bottles; then for thermoformed products; and finally for rPET bottles which are used for hotfill applications.

### The Extrupet plant

At the Extrupet plant, much more than just the Vacurema technology is being used in the cleaning process.

Recyclate PET material is received in bale form. The bales are meant to be purely PET bottles but are in fact not so - other types of bottles (HDPE, polypropylene, etc) are also often present.

The plant currently recycles in excess of 1.5 million bottles per day, mainly for the production of fibre, but now also for the new food grade rPET resin.

Initially the bottles are washed so that they are clean for better sorting by Extrupet's automatic sorters. In automatic sorting, a light is shone onto a conveyor transporting the bottles; the reflection off the passing bottles determines whether the material is acceptable or not. Rejected bottles are automatically blown onto another conveyor.

If, for instance, a bottle is HDPE or has a PVC label, it is blown off.

Extrupet has several automatic sorters, in succession, and each is 95% accurate - resulting in over 99% aggregate accuracy, says Wadhvani.

Nonetheless, as an added failsafe, Extrupet has a manual sorting line thereafter, on which several sorters perform a final check on the purity of the bottle stream.

The sorted bottles are then ground into flakes, which are then specially washed. The main target of this washing is glue removal, which is a contaminant. Shrink-labelled products generally have no glue and are preferred for recycling; stuck labels may have glue in one strip, but some products are "unfortunately full of glue", says Wadhvani.

The washed flakes are then bagged for testing before moving into the food grade rPET plant. This unit is segregated from the rest of Extrupet's recycling plant and incorporates several safety aspects such as a continuous positive air-flow system to maintain high hygiene standards as well as stringent access control systems.

But that is still not the end. Extrupet has installed a Buhler Sortex machine (most commonly used for sorting rice and grain, based on the colour of the grain). This sorting of each individual flake is done faster than the human eye can see. Unsatisfactory flakes are blown away with an air nozzle, thereby further purifying the input stream of raw material.

Finally, the flakes enter the Vacurema process. They emerge as crystallised chips which are automatically bagged in new jumbo bags with liners (as is the standard for virgin resin).

Extrupet's final check is generally not found in comparable European recycling companies, says Wadhvani: it has a state-of-the-art in-house laboratory, including, among other equipment, a gas chromatograph for ongoing testing of the flakes and chips produced.

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European recycling companies normally send away occasional samples for checking to outside labs, whereas Extrupet has the capability to test each bag it produces prior to delivery to the customer.

Wadhvani says the plant is run to a BRC (British Retail Consortium) standard and Extrupet hopes to be BRC-certified by mid-2010. The plant was ISO 9001:2008-certified in October 2009.

Extrupet further sends samples from its production line to the famous British food testing institute, Pira

International, for third-party checking.

Pira has, since last year, been testing Extrupet's polymer to US FDA and EFSA (European Food Standards Agency) standards. It has found the resin to be well within the standards demanded by these agencies. Wadhvani says PIRA has issued certificates to this effect, which Extrupet makes available to its customers.

Extrupet's customers normally use blends of its rPET polymer with virgin polymer. Currently Extrupet is supplying blends of 30% rPET and 70% virgin, and 50%-50%. It is able to custom-blend other ratios where required. Bottles have also been pro-

duced from 100% of its material. Some Extrupet customers are also doing their own blending.

"Stress tests, clarity tests, and IV tests (to name a few) of all bottles have all come in within customer requirements, even for carbonated soft drink applications," says Wadhvani.

By February 2010 Extrupet had over 14 food grade rPET customers in the bottle-blowing market as well as the sheet thermoforming market, he says. As demand grows for the food grade rPET resin, and Extrupet's current capacity is fully allocated, more units of the modular plant will be installed, he adds. - *Teigue Payne*

## CORPORATE

## POSITIVE DEVELOPMENT FOR PET RECYCLING

In 2004 PETCO, the trading name of the PET Recycling Co, was formed to represent the SA plastic industry's first joint effort to self-regulate post-consumer PET recycling. Recycling is a commodity business, and as such it is prone to significant cycles.

PETCO is financed by a voluntary recycling levy paid by converters and/or bottlers on PET resin purchased either from Hosaf or imported. PETCO also receives grants from brand owners and resin producers (see the list of PETCO shareholder members, last paragraph).

These funds support recyclers such as Extrupet who are paid for every ton of PET that they recycle. This enables Extrupet and other recyclers such as Hosaf Recycling and Kaytech Engineered Fabrics, as well as newcomer Sen li Da Chemical Fibre Co, to sustain recycling tonnages through

adverse economic cycles (the oil price; R:\$ variations; international fibre price; etc) and to enable increased tonnages and greater collection coverage.

Now, some five years since PETCO was formed, it has the participation of 80% of the industry and 99% of the beverage sector. The organisation has gone from 9,840t to 29,000t of post-consumer PET bottles recycled; from 16% to 32% of beverage PET recycled; from 87,000t to 130,000t of PET resin produced; and from small to large amounts of recycling levies collected.

Cheri Scholtz, CEO of PETCO, says the production of food grade recycled PET (rPET) is a positive and exciting development for the country, and it is now possible to "close the loop" by recycling bottles and containers back into bottles and containers. "With the tonnage that PETCO and its recyclers are starting to recover, such a move is now feasible and will greatly increase the demand for rPET."

Scholtz further emphasizes that an effective tool to build recycling industries

is for industry and government to jointly agree to establish minimum post-consumer recycled content requirements for products such as PET plastic. "In the US, brand owners such as Coke and Pepsi have actually made a voluntary commitment to use 10% rPET content in their PET bottles, and we hope that this will happen here," she says.

- PETCO members: Azores/Crickley Dairies, Bizee Corp, Bottle It, Bowler Metcalf, Boxmore Plastics, Brenkyle Preforms, Cinqpet, Coca-Cola Fortune, Coca-Cola Cannery, Coca-Cola SA, Coca-Cola Shanduka Beverages, Consol Plastics, Crystal Pack, Designa Plastics, GA Plastics, Hilfort Plastics, Hosaf, Inter Afrika, Mondi Plastics Wadeville, Peninsula Beverage Co, Nampak Liquid and Petpak, New Age Plastics, PETech, Pigments and Masterbatch, Polyoak, Purple Line Plastics, SABMiller (ABI soft drinks division), Tsitsikamma Crystal Spring Water, and Winplas.

PETCO: Tel 0860-147-738 or 021-788-9954; website: [www.petco.co.za](http://www.petco.co.za)

# THE ROAD TO SUCCESS

**Plastics Industry Indaba**  
Chaired by PFSA, SANS and Nampak

**PET Forum Formed**  
CCSA takes leadership role

**SA Polyester Recyclers (SAPRI) Incorporated**  
now Extrupet with backers CCSA, SANS, Nampak and Boxmore

**Phase 1**  
June 2001 – May 2003:  
5000 tons recycled (10%).  
Initiative endorsed by DEAT and officially launched by Minister Valli Moosa

**Phase 2**  
August 2003 – July 2004:  
10 000 tons recycled (14%).  
Hosaf starts as recycler

**PETCO Established**  
and recycling levy introduced April 2005

NOVEMBER

1999

FEBRUARY

2000

OCTOBER

2000

JUNE

2001

AUGUST

2003

DECEMBER

2004

