



Green from the ground up



Makro stores are large retail cash and carry outlets that are big on value, but low on frills. Massmart's Masswarehouse division runs 13 Makro stores in South Africa and each new store is more efficient than the last. The chain's newest store is Makro Vaal near Vanderbijlpark. It has been specifically designed to use less water and electricity in its operations and to incorporate space for indigenous plants. Because Makro Vaal is in a residential area, the development team is also making sure the new store blends in naturally with the surrounding area.

Prepping the ground

Site developers are working to minimise any negative impact they might have on the environment.

They started with a search and rescue mission for indigenous plants and found 259 *Hypoxis hemerocallidea* and 20 *Hypoxis rigidula* African potato tubers. These were relocated to a wild nursery and as of July this year, three-quarters had reached the deciduous stage. "These will be planted in the Makro Vaal garden, without the use of fertilisers," says the store's landscaper, Bertha Wium.

Once all fragile flora was removed, developers graded and levelled the ground and reused any excess soil wherever it was needed. This reduced the amount of new soil brought to the site.

To avoid inconveniencing people living nearby, graders work with ground-wetting trucks to keep dust levels down. The water for these trucks is pumped from the local dam and the graders are harnessed with satellite tracking devices for near-perfect, efficient levelling.

Greening the site

The parking area includes plenty of space for trees. According to Makro chief financial officer, Doug Jones, Makro doubled its typical Makro store's landscaping budget for the new Vaal site. They also gave up valuable parking space to accommodate indigenous plants.

"Every fourth parking bay will have a tree," says Jones. Trees offer shade for shoppers in summer and help prevent heat build-up commonly found in paved areas.

A loffelstein retaining wall in the parking area has been installed to incorporate more growing plants. Makro will also be planting a flora zone just outside the site to smooth the transition into the natural veld beyond.

Choosing the right materials

Wherever possible, locally produced materials are being used to build the store. This means materials will have travelled a shorter distance to reach the site, thereby reducing their carbon footprint.

As for manpower, local labour is being used for jobs such as bricklaying, carpentry, carport construction and curb-building. Sandro Rossi, part of the team at the Makro Vaal site, says, "The builder working on our curbs has done such a good job he's already been asked to work on other building projects."

There are some elements of the Makro Vaal store that could not be locally sourced. One example is the natural light skylights the store is installing. Makro store development manager, Alan Walker, explains: "We are including over 265 Sun-Optics units from the United States on Makro Vaal's roof. These units capture and diffuse sunlight and direct it in-store, but they do so without heat build-up. This cuts electricity costs (with a saving of 48 000 kW/h per month) plus there's data to support the positive impact natural light can have on retail sales.

We believe we'll be boosting sales of the goods on display beneath these units while at the same time we'll be saving money on electricity."

Natural light is being utilised behind the scenes, too, and administrative offices in the building are lined with aluminium framed windows. Florescent light fittings dim when the natural light from outside increases in the office.

In addition, offices, toilets, meeting rooms and other areas off the trading floor have audio and motion detectors to switch lights off when not needed.



Reducing electricity consumption

Makro Vaal uses compact fluorescent light (CFL) bulbs, which draw less current than traditional bulbs. What's more, CFLs don't get hot, so the store's lighting won't put pressure on the air-conditioning system.

The store uses a lighting controller that was especially developed to switch off lighting in sequence and switch on the store lights in sequence just before trading. This reduces the electricity consumption and start-up current.

In addition to all of this, some areas in the back of the store use sensor lights that switch on only when movement is detected.

This helps avoid having to light areas of the store which are not always needed.

Electricity meters will record the consumption and demand at the main incoming power as well as the refrigeration supply and air conditioning supply. This data will be monitored so that opportunities can be found to further reduce or eliminate excessive consumption.

Refrigeration

Jones says Makro spent R12-million more than usual on refrigeration for the store. "The chain purchased the most efficient refrigeration solutions possible. This also includes adopting the latest state of the art energy saving features for our fridges, automated night blinds, high speed doors and better insulation to reduce temperature loss," says Jones.

At the heart of the refrigeration efficiency is the plant outside the store. Makro Vaal will use CO₂ and ammonia in its refrigeration plant instead of ozone-depleting refrigerant gases. Refrigeration specialists Dave Spence and Mike Holt are working on Makro Vaal's refrigeration plant. Holt says, "Makro has chosen CO₂ and ammonia even though the total installation is 21% more expensive when compared to a traditional installation. The refrigeration gasses used are 100% natural and have a zero ozone-depleting (ODP) and global warming potential (GWP) rating. All the refrigeration room polyurethane insulation panels also have a zero ODP and GWP.

"What's more," says Holt, "gasses like R134A have a coefficient of performance (COP) of 2.16. Makro Vaal's CO₂ and ammonia refrigerants have a COP of 2.48. This means we'll get more energy out of these gasses."

There are a multitude of other aspects of the refrigeration at Makro Vaal that were chosen to save electricity. These include insulation under the fridge and freezer rooms, 100mm thick insulation on the freezers, modifications to the cold receiving area, stainless steel piping to reduce gas leaks by 90% and more. (Please see Part 2 for more details on Makro Vaal's unique refrigeration.)

Reducing water usage

The store's restrooms use two features that help reduce water consumption. The first is a push button system for taps, so water



cannot be left running; and the second is a cistern dual flushing system that reduces water usage by 30%.

Hot water for the store's washrooms and the canteen kitchen is produced without the use of electricity. Heat from the refrigeration plant is reclaimed and used to heat water, saving the store another 15 kW of electricity. Water meters have been installed at the point of supply to the building and the garden irrigation system. The consumption will be monitored for leaks and over-usage.

Cooling the store

Makro Vaal is using a thermal storage system to produce chilled water for the store air-conditioning. Air-conditioning specialist, Gianluigi Abbiati, says Makro Vaal has chosen an efficient technique.

"The principle is to reduce the electrical requirement for the air-conditioning of the store by under-sizing the chillers and adding a thermal storage system to assist during peak demand," says Abbiati. "The chillers will run at night in low ambient temperature conditions, increasing the efficiency and using the power in a less

congested, critical and expensive period. Energy is stored, then released during daytime to assist the units in keeping the store at the right temperature."

The store's trading floor will be heated via hot water that is warmed by heat reclaimed from the refrigeration system. This will have an electricity saving of 385 kW. (Look out for more details on Makro Vaal's air-conditioning systems, coming in Part 2.) With a firm focus on building the Vaal store in an environmentally responsible way, Makro is pleased with the results so far.

They're not, of course, stopping here. "Just wait until you see the next Makro store," says Walker. ■

How green is Makro Vaal?

- Every 4th parking bay will have a tree planted.
- 259 *Hypoxis hemerocallidea* and 20 *Hypoxis rigidula* African potato tubers were rescued from the site before construction began. These are being replanted around the store.
- The introduction of natural lighting on the trading floor will reduce electricity consumption by around 48 000 kW/h per month in the 16 500m² store.
- Dimmers in the offices reduce electricity consumption by R7.00 per day per light fitting.
- The store's restrooms use cisterns with a dual flushing system that reduces water usage by 30%.
- Water is heated by reclaimed heat from the refrigeration plant, saving the store 15 kW of electricity.
- Makro Vaal's chillers and freezers use 100% natural gases that have a zero rating for ozone depleting potential (ODP) and global warming potential (GWP).
- The store's trading floor is warmed up by heat reclaim system that will save 385 kW.
- All the refrigeration room polyurethane insulation panels also have a zero ODP and GWP rating.