



DRYCORE™

Specialised agricultural drying solutions

RELIABILITY IS **GROWTH**



ABOUT DRYCORE™

Based on three decades of industry experience, Specialist Mechanical Engineers and IMECH Consulting Engineers developed enclosed cool-drying systems on request specifically for drying macadamias in 2017, which evolved into Drycore today. Besides environmental conditions, which play a significant role in the time to dry nuts, macadamia farmers face the bottleneck of drying their Macadamias from 25% to 8% moisture content before they may be delivered to the processing plants. Solving this problem led to the idea of putting drying containers with drying modules on the farm to accelerate the drying process and use cool drying to eliminate quality issues, enabling the farmer to achieve a higher yield per kilogram.

The significant advantage of our enclosed, cool drying systems was validated when keen interest was shown to use the same concept for limiting food wastage and preserving the product's nutritional value, considering the shortage of food and famine worldwide. We base our technology on the results of scientific tests done on the preservation of proteins in mushrooms when dried in cool temperatures versus hot temperatures. Our engineering team's experience in heating, ventilation and air-conditioning contributed to the development of various custom solutions specific to the characteristics of the product.



COOL DRYING TECHNOLOGY

Cool drying is the future.

We are proud to announce the **DRYCORE™** range of innovative cool drying systems, adapted and customised to provide a turnkey agricultural drying solution for any climate, weather or product.



PRODUCTS



Nuts & Seeds Legumes Dried Fruits Vegetables Herbs & Spices Coffee Tobacco Biltong Seafood Droëwors



SIMPLE

The **DRYCORE™** range provides a turnkey solution to cool dry any and all produce within customised shipping containers. Each unit is custom-built and suited to your needs, providing benefits such as a higher quality product, production streamlining and effective use of space.



SMART

The **DRYCORE™** units have built-in smart technology allowing for remote access and monitoring of the drying system, as well as tamper-proof technology and alarms. Real time monitoring and control are becoming industry standard and provide true real time control.



THE ADVANTAGES OF COOL DRYING

The drying process is a cool air-controlled process which preserves the product by inhibiting the growth of micro-organisms, be it moulds & spores or bacterial growth.

The drying/curing temperature can be adjusted between 15°C and 30°C, or be fixed if product specific, to ensure an optimal cooling rate and minimum energy consumption.



EFFICIENT

The **DRYCORE™** range provides cool drying in any climate or weather due to the controlled enclosed cooling spaces, cutting down on cooling time and providing a higher quality product, all at the same time.

- ✓ 100% Controlled drying process.
- ✓ Improve product quality.
- ✓ Reduces time of drying process.
- ✓ Decreased risk of mould & other contamination.
- ✓ Protects the product against all external environmental elements.
- ✓ Financial gain on product price.

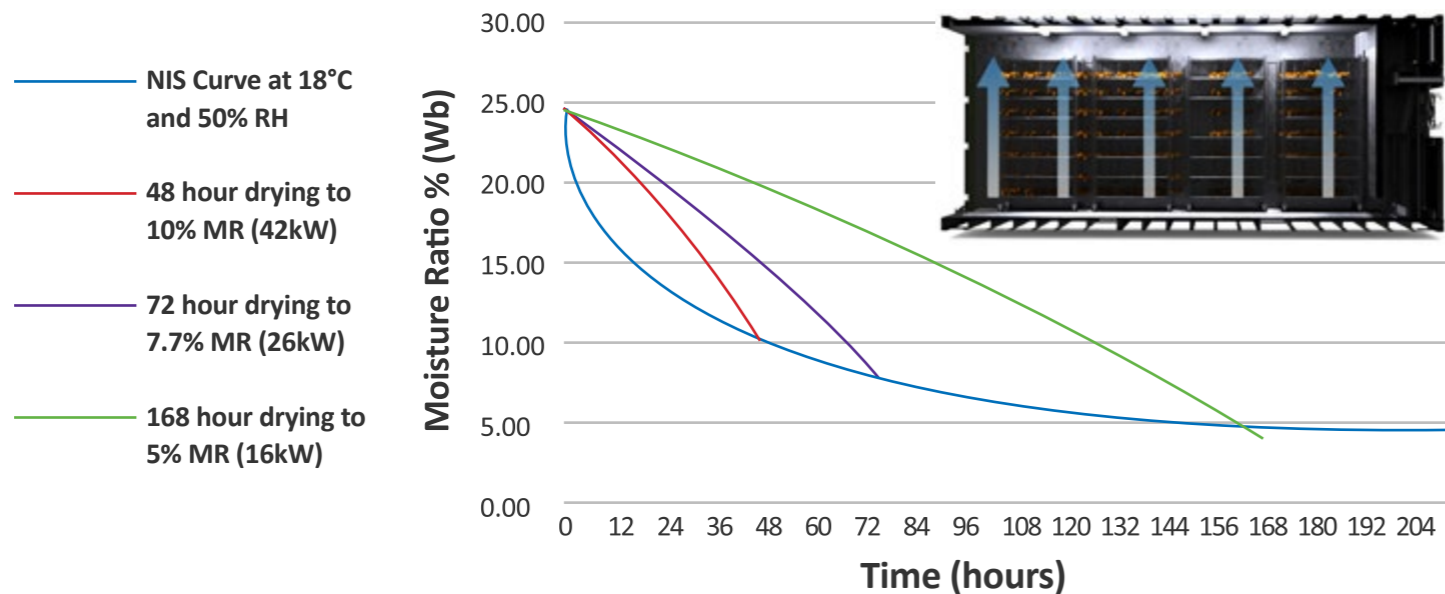


DRYCORE™

PRINCIPAL OF DRYING

The system operates as a control volume in which the temperature and the humidity are accurately controlled. The extraction of moisture depends on the characteristics of the specific product. These characteristics determine the drying time and the product's minimum moisture percentage.

Cool Drying of Nut in Shell Macadamias



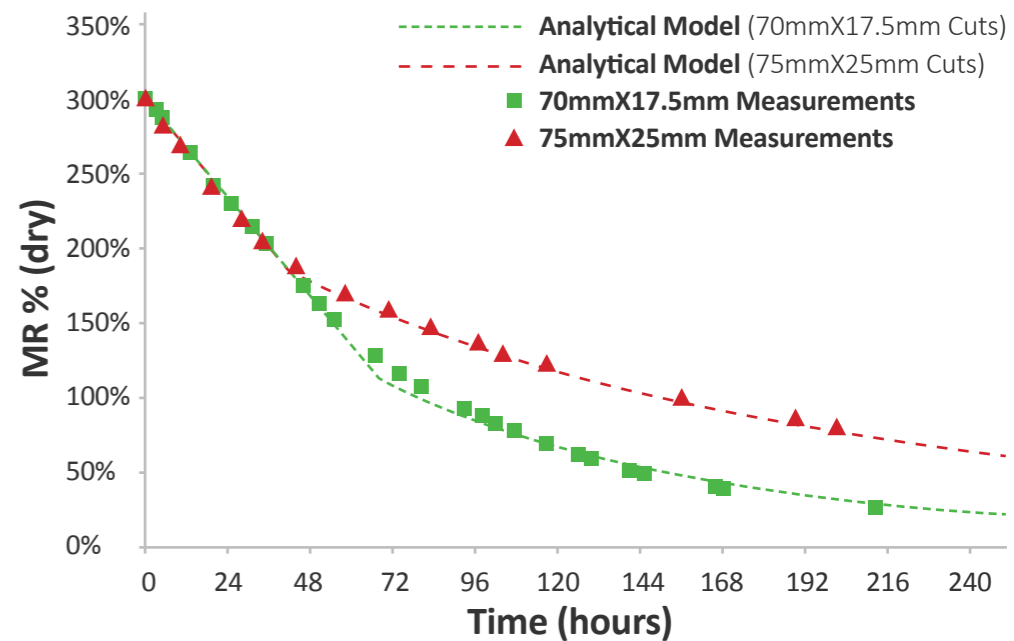

TYPICAL COOL DRYING MODELS

Each product has its own drying characteristics and moisture diffusivity. Product geometry and quantity play an important role and it is essential to first calculate a drying model before deciding how much drying capacity is required. Specific energy consumption (SEC) is measured in kWh/kg of moisture removed and is an important parameter to consider especially in terms of operational cost of the drying process. The graphs also show the accuracy of the models compared to the measurements which Drycore has developed to calculate the required system capacity and characteristics.

As an example: **Meat**

- ▶ Moisture Diffusivity
- ▶ Geometry
- ▶ Product Quantity
- ▶ Airflow Quantity
- ▶ Temperature
- ▶ Humidity
- ▶ Consistency
- ▶ Shrinkage

Calculated Models compared with Measured Results (i.e Meat)





DRYCORE™

CUSTOM CONTAINER SOLUTIONS



DRYCORE™ DS5

GRAINS, NUTS AND OTHER GRANULAR
PRODUCE OPTIMISED VERSION



Granular Produce Nuts & seeds Legumes



DRYCORE™ DFV

DRIED FRUITS OPTIMISED VERSION



Fruits Vegetables Tobacco



DRYCORE™ D1M

MEAT OPTIMISED VERSION



*Biltong Seafood *Droëwors

* Traditional South African delicacies



COOL AIR-DRYING MODULES

CAPACITY OPTIONS:

Option 1:



❄️ 16kW ⚡ 8.0kW 🌡️ 18°C (Fixed)

Option 2:



❄️ 26kW ⚡ 13kW 🌡️ 16°C-24°C (Adjustable)

Option 3:



❄️ 42kW ⚡ 21kW 🌡️ 18°C (Fixed)



DRYCORE™ DS5

GRAINS, NUTS & LEGUMES

GRANULARS AND COOL DRYING

Dust

Grains and other similar commodities are dried by purging air from the environment through a silo filled with grain or any similar product. Traditionally, most of these systems utilise large fans to introduce outside air through the bottom grid of the silo into the stacked product and thereby provide the necessary drying. Due to the high-velocity air intake through these fans, dust is also entrained into the product causing a distinct decrease in quality.

Moisture

The conventional silo drying method is also open to the environment, and therefore severely affected by inclement weather. Silo drying in humid environments can also cause spoilage of the product. This method is an uncontrolled process with temperature and humidity fluctuations which may cause inconsistent drying and negatively impact the final product.

Heat

To eliminate the effects of fluctuating weather and accelerate drying, heat is usually introduced into the process. With heating, there is the risk of stress fractures in grain products. High-temperature drying is also known to cause enzymatic browning, which causes unpleasant odours and flavours in for example nuts. Heat can contribute to discolouring and cell damage in certain products which should be avoided at all cost, especially for the export market. Another adverse effect of high-temperature drying is the compromising of the nutritional content. Fast, high-temperature drying of macadamia nuts may cause early separation of the nut from the shell, which may result in bruising or even breaking of the nuts during handling and processing. For this reason, it is recommended in the industry that nuts such as macadamias rather be cured at below 30 degrees Celsius, than dried at 40 degrees Celsius plus.



DRYCORE™
CONTAINER SOLUTIONS

DS5 GRAINS, NUTS, LEGUMES

Top Hatch Fill Area for Each of the 5 Separate Compartments Within the Unit

The DS5 unit has 5 separate compartments ideally suited for grains, nuts and other granular produce, each compartment has a capacity of 5m³ with a top fill hatch and a side door for dispensing cool dried goods. The DS5 also provides conveyor and automation possibilities to streamline production.



Granular Produce Nuts & seeds Legumes



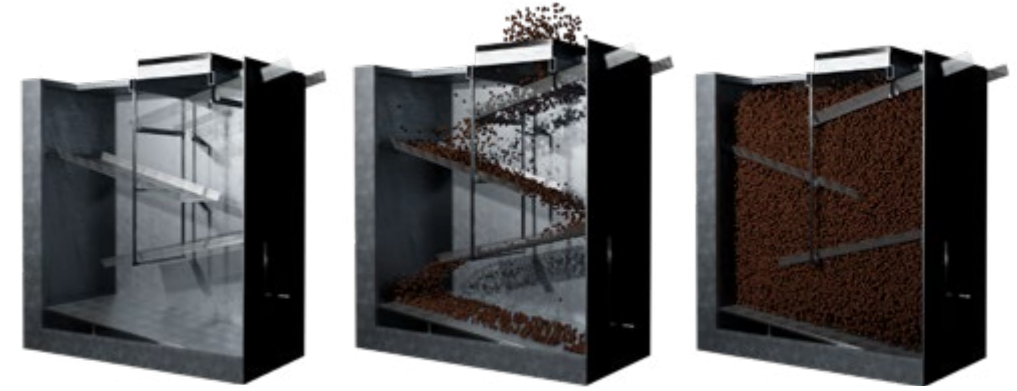
Conveyor System Friendly Layout for Automation or Production Streamlining

5m³ Compartment to House Produce During Drying Cycle

GRAINS, NUTS & LEGUMES OPTIMISED BIN

• **6M CONTAINER FROM ONE TO FIVE COMPARTMENTS**

• **12M CONTAINER FROM ONE TO TEN COMPARTMENTS**



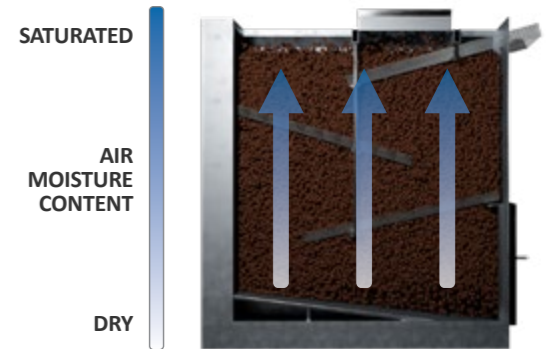
EMPTY COMPARTMENT

FILLING UP

READY FOR DRYING

1-5 INTERNAL COMPARTMENTS

The 5 separate compartments in the DS5 unit allow for various drying cycles and different products to be dried at the same time, in the same system. Each compartment can be filled independently and therefore have multiple cycles running simultaneously. Tandem cycles can help to streamline production, for example having each compartment run on its own 7-day cycle where compartment 1 is emptied on Mondays, compartment 2 on Tuesdays, etc.





DRYCORE™
DFV1
FRUIT, VEGETABLES & TOBACCO

SOFT PRODUCE AND COOL DRYING

Waste Not

According to a report by the WWF, in South Africa, 10 million tonnes of food go to waste every year. This equates to one-third of the 31 million tonnes produced annually. Fruits, vegetables, and cereals account for 70% of the wastage and loss throughout the food supply chain. The Council for Scientific and Industrial Research (CSIR) has valued this annual loss at R61.5 billion.

Preservation is the answer

Limited shelf life and time to market are major contributing factors to food wastage. Food preservation is generally growing in popularity and limits food wastage by eliminating the fresh state shelf life. Dried fruits and vegetables prove to be a solution for wastage. In addition, if the produce can be dried at the source, it will alleviate pressure on the logistics management and even reduce waste. There is an irreversible growing demand for high nutritional content snacks, especially by people living the fast and high demand city lifestyle. Snacks form part of their daily diet whilst in general, the younger generations do not want to spend hours on conventional high nutrient foods preparation.

Cooler is Healthier

Produce dried at cooler temperatures proves to be healthier due to the inhibition of micro-organisms. Traditional drying methodology utilising higher temperatures are known to stimulate micro-organism activity that may cause unhealthy food.

Controlled Environment is Key

Presently vast amounts of fruits and vegetables are dried by placing the products out in the open in direct sunlight. Even though ultraviolet (UV) radiation in natural sunlight eliminates bacteria, the open method does not protect the produce from other secondary contamination threats. Drying near towns or cities can cause chemical contamination due to industrial activity. Contamination from pests such as rodents and insects or even pollen and dust makes this method less ideal. Unplanned, inclement weather will also negatively affect the drying process in this open method and could even cause excessive spoilage.

DRYCORE™ offers a perfect, closed-cycle, low-temperature drying environment with minimal energy usage. De-humidification through refrigeration technology provides a low energy consuming, drying solution. **DRYCORE™** uses less than half of the power, compared to conventional drying methods where hot air through heater elements are used.



DFV1 FRUIT, VEGETABLES & TOBACCO

The DFV1 unit has a singular cooling compartment of 25m³ suitable for racks, trolleys, trays etc. which can slide or be pushed into the container. This unit is optimised for dried fruits, bundles or larger, more sensitive produce such as mangos, apples, apricots and tobacco. Existing racks, trays or similar can be used to integrate into existing processing lines.



CUSTOMISED INTERIOR FOR OPTIMAL HANDLING



EMPTY COMPARTMENT



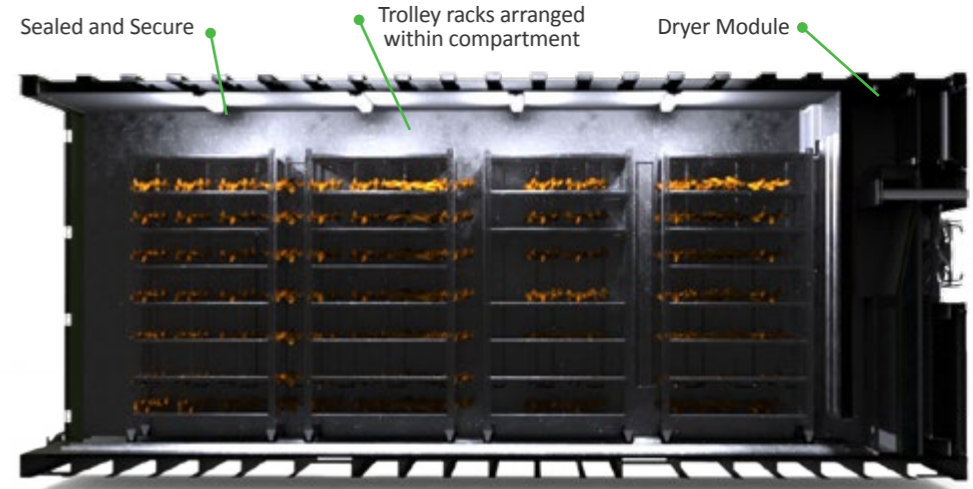
EMPTY RACKS IN POSITION



READY FOR DRYING

25M³ INTERNAL CAPACITY

The DFV1 has an internal capacity of 25 cubic meters allowing for up to 12 trolley shelves to be placed within the unit. Each trolley can be packed with any suitable product and has wheels to facilitate moving, replacing or cleaning outside the unit. The DFV1 is well suited for soft produce such as fruits, leaves or products with high moisture content.





MEATS AND COOL DRYING

Safety

The University of Wisconsin – Madison, Center for Meat Process Validation has conducted several studies; (*Ingham et al. 2006, Burnham et al., 2008*) concerning the fermentation and drying of certain meat products. The studies conclusively proved the food safety of low temperature (22°C) prepared biltong* (dried meat) products. In the *Burnham* study, harmful acid-adapted pathogens (e.g. *S. aureus* and *L. monocytogenes*), initially introduced as inocula, were reduced extensively after drying at lower temperatures. This proved that micro-organism activity is inhibited at low drying temperatures compared to meat dried at higher temperatures. Disinfection using UV-C light further reduces micro-organism activity and can be added as an option to any of our **DRYCORE™** units.

**Biltong is a South African dried meat delicacy*

Flavour

Further to the above, it was found that flavour is also enhanced when meat is dried at lower temperatures instead of meat dried at higher temperatures, where the natural flavour is lost due to heat destruction. This destruction is attributed to the increased oxidation of the fatty acids inside the meat samples, resulting in a negative taste experience.

Consistency

A study at the University of Stellenbosch South Africa (*Jones et al. 2017*) recommended that biltong drying be standardised so that consistency can be obtained. Consistency in produce will create a satisfactory level of customer experience as well as an increase in expectation and brand loyalty. The **DRYCORE™** units ensure proper process control, which facilitates consistency by eliminating insects, dust, secondary chemicals, and pests like rodents.

Customisation

Depending on the preferred moisture ratio and the size of the meat cuts, drying at low temperatures generally takes between 3-7 days. Droëwors* (dry sausage) takes approximately 2 - 3 days, and chilly bites (small or thin meat cuts) will dry in approximately two days.

DRYCORE™ systems for this application, operate between 17°C and 22°C at 45% Relative Humidity. Smaller dryers (typical fridge size) are also available, which can dry approximately 40 kg of wet meat. Units can also be custom built to customer requirements.

**Droëwors is a South African dried sausage delicacy*



DRYCORE™
CONTAINER SOLUTIONS

D1M MEAT, SEAFOOD, BILTONG & DROËWORS

Similar to the DFV1, the D1M is a meat optimised version with built-in slide rails for mounting hanging racks, eliminating the need for entry and using the maximum internal space to dry biltong* (dry meat), droëwors* (dry sausage), bokkoms* (dry fish) etc. Alternatively the D1M can be used to cool and store carcasses with convenient access from the door.



CUSTOMISED INTERIOR FOR OPTIMAL HANDLING



EMPTY COMPARTMENT



EMPTY RACKS IN POSITION

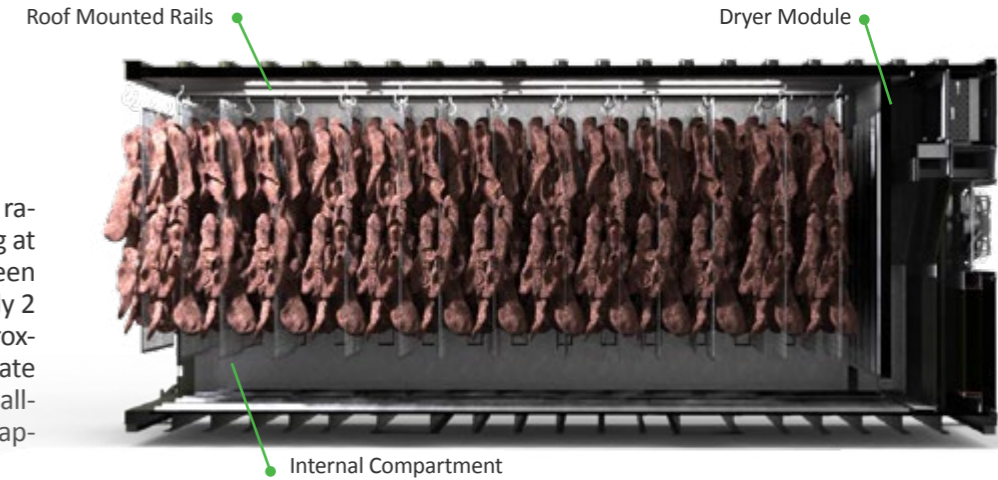


READY FOR DRYING

SINGLE COMPARTMENT

ADDITIONAL COMPARTMENTS CAN BE ADDED

Depending on the preferred moisture ratio and the size of the meat cuts, drying at low temperatures generally take between 3-7 days. Droëwors takes approximately 2 to 3 days. Chilly bites will dry in approximately 2 days. Our meat dryers operate between 17°C to 22°C and 45% RH. Smaller dryers are available which can dry approximately 40 kg of wet meat.



DRYCORE™ PD

ITEMS

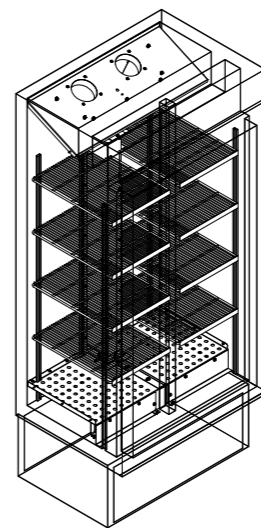
PEDESTAL DRYERS

Drying capacity: 700W
Power consumption: 230VAC 2A

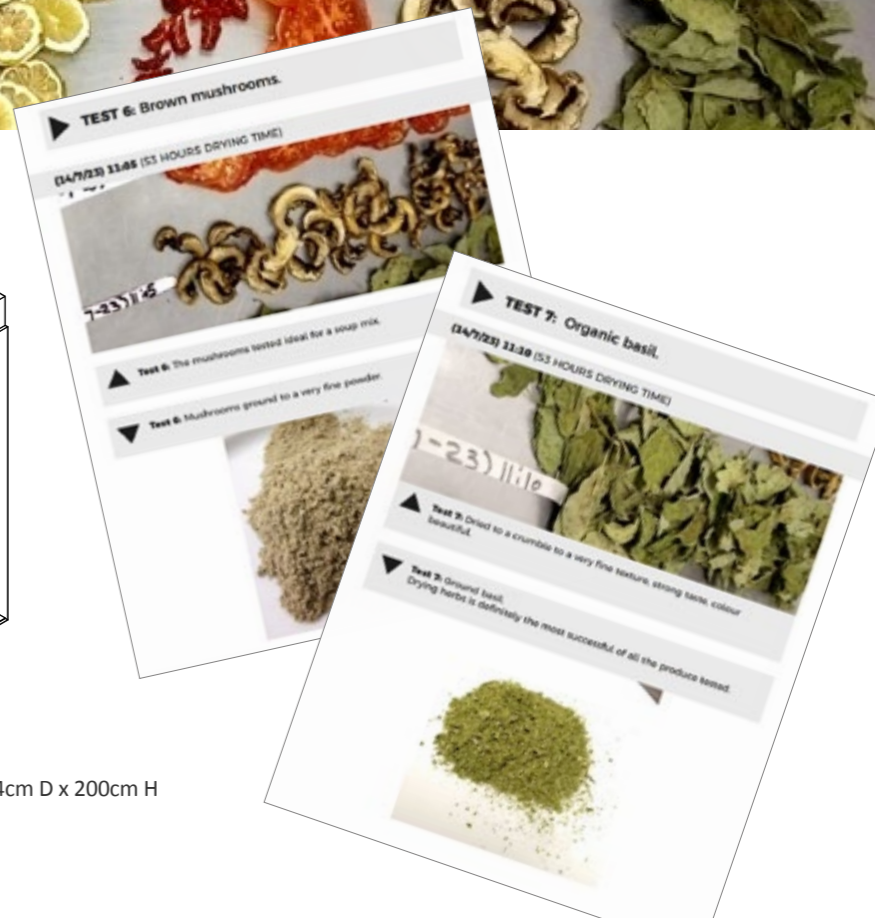
With the consistency of quality and quick drying as a given, the pedestal drier units can be used by a large range of small businesses i.e., butcheries, home industries, farmers and shops offering biltong, droëwors, herbs, dried fruits, and snacks. Wastage of rotten products is reduced as you can now dry the product for preservation for consumption later. Freshly dried products can be rehydrated to the same standard as when harvested. Vegetables can be used in soups, stews pasta and salads whereas dried fruit is a delicious snack and perfect for use in baking.

The load can be up to 40kg of wet product and after drying, the produce can be frozen in sealed packets of chosen serving sizes. This method of drying followed by freezing retains the fresh colour and taste. No preservatives or sulphur treatments are needed. UV radiation can be added as an option for surface decontamination.

Laboratory testing of sample batches for quality and nutritional values makes the drier ideal for quick verification.



Dimensions: 88cm W x 64cm D x 200cm H
Weight: 170kg





DRYCORE™
BC/NB
ITEMS

DRYING FACILITIES

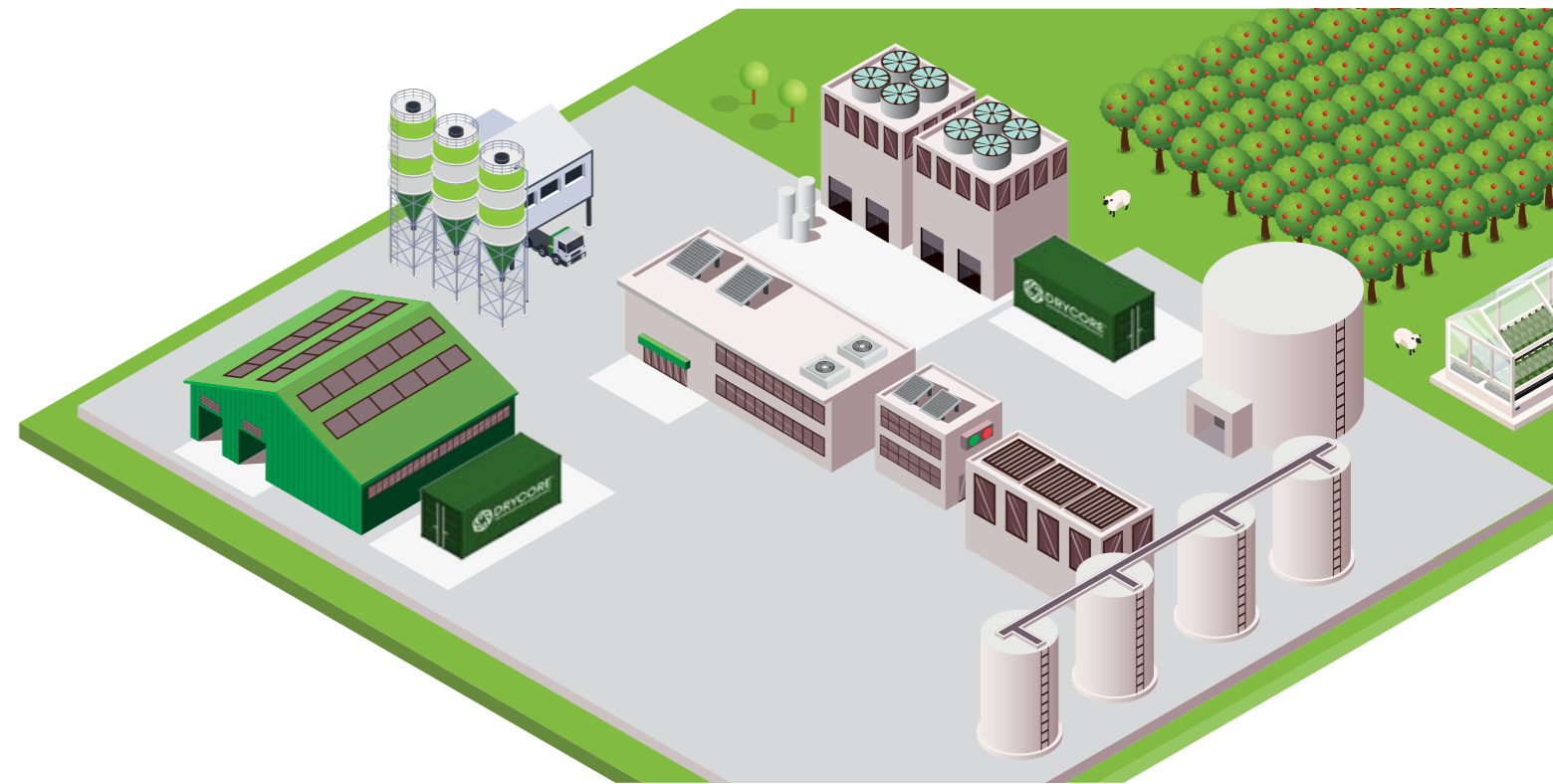
CUSTOMISED NEW OR EXISTING BUILT-DRY FACILITY

Central processing plants form an integral part of the agricultural produce value chain. Presently farmers have to supply their products below a certain percentage of moisture content to the processing or storage facility. This implies first drying at the source on the farm, either still on the base plant or through other drying methods, usually involving heat. Bottlenecks in the drying of the product and potential loss of quality have been identified as issues in getting the best yield possible.

Purpose-built facilities can be designed and built to dry different products at different temperatures achieving the correct moisture levels. This will also include storage and preservation areas to maintain the product's optimal temperature and humidity. Factors such as handling of the product, the type of product, drying time, theft and storage are all taken into account when this option is considered. The advantage of this option is the use of a facility meeting the specific requirements of the end-user with complete control over the process of drying the product timeously and ensuring that quality is maintained.



PURPOSE-BUILT DRYING FACILITIES





ENERGY EFFICIENT

The **DRYCORE™** system typically delivers 2,2kW cooling per 1kW electric power input which equates to a coefficient of performance of 2,2. For macadamias, this yields a cost of 20 - 30 cents (ZAR) per kg. On the smaller cooling capacity, the option of solar can definitely be considered for daytime energy saving.



MICROBE RESISTANT

Bacteria and Virus micro-organisms in agriculture product environments, as well as treatments, are fairly well defined. The **DRYCORE™** process being at low temperatures assists in inhibiting the growth and spread of unwanted microbes. In addition, UV-C treatment can be added as an option to further reduce these. Total sterilisation with Ozone can also be offered on request.



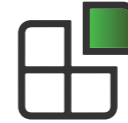
OPTIMIZED TEMP.

Each product has a specific optimum temperature for a drying process. If this set-point remains constant during the drying process, the product will have the best specific nutritional characteristics and value.



WEATHER PROOF

The essence of the **DRYCORE™** system is a closed and controlled environment. The temperature inside the unit remains within 1 degree Celsius of the set-point irrespective of ambient temperature, sunlight, rain or humidity. This ensures an optimal drying process.



MODULAR SYSTEM

The complete system is contained as one singular design with the only installation requirement being the electrical plug-in power connection. The cooling plant is also a modular subsystem which can easily be removed and replaced with a bigger or smaller unit should the need arise.



FOOD LOSS & WASTE

Farmers in South Africa suffer food loss and waste yearly on their farms, which negatively impacts the yield of their produce. Adding a drying facility at the farm for drying their products, which cannot be sent to market, will enable farmers to minimise food wastage to almost zero. By taking action to limit food wastage, farmers can contribute to the worldwide challenge of food insecurity and food loss.



REAL TIME MONITORING:

REALTIME MONITORING

- ▶ All System Temperatures
- ▶ Warnings & Errors
- ▶ Fluctuations

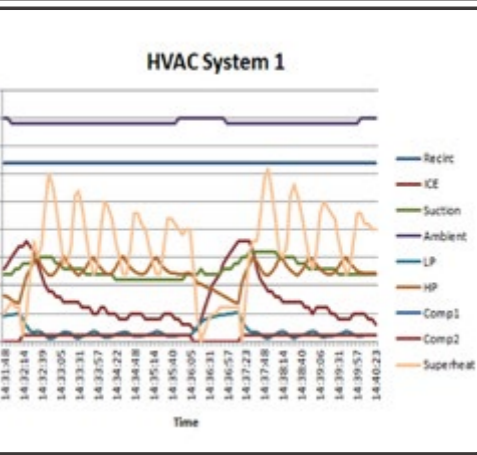
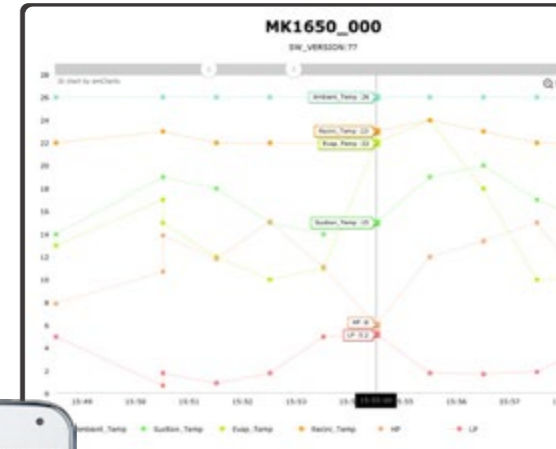
MANAGE

- ▶ System Parameters
- ▶ Verify & Adjust
- ▶ Statistics & Diagnostics



THE RESULT

- ▶ Keeping your finger on the pulse from your office / home
- ▶ Make use of any device via Internet & Bluetooth
- ▶ Immediate warning / error notification for pro-active response
- ▶ See system status in real-time
- ▶ Change system parameters remotely
- ▶ Receive real-time notifications to enable preventive action



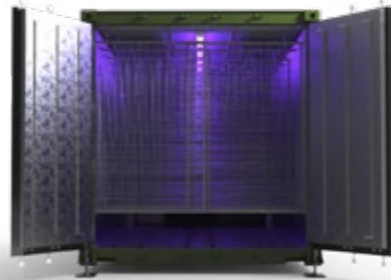
UV-C FILTRATION AND OZONE STERILIZATION



DS5



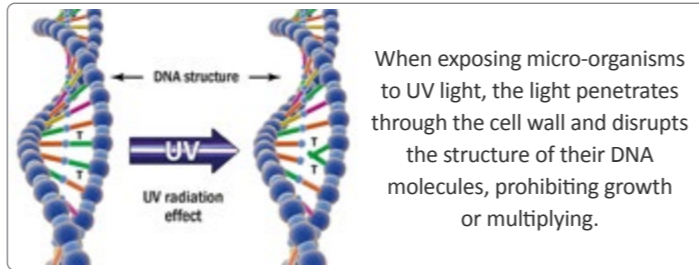
DFV1



D1M

UV-C FILTRATION

UV-C filtration has been around for many decades and is a proven technology, used in various germicidal applications throughout the industry. The UV-C irradiation produced by these lights damages the nucleic acid of unwanted organisms by forming covalent bonds between certain adjacent bases in the DNA and thereby prevents the organism to grow or multiply.



UV-A (long-wave) from 315 nm to 400 nm.

UV-B (medium-wave) from 280 nm to 315 nm.

UV-C (short-wave) from 100 nm to 280 nm.

UV-C FILTRATION BENEFITS

UV-C can be utilized for air and surface decontamination purposes. Typically, surface decontamination units will run for short periods of time when nobody is near the coverage area of the unit. The necessary safety switches and sensors are integrated with these units to ensure no direct contact with UV-C. Air decontamination units will run constantly and ensure the air stream which flows through the unit, is free of contaminants.

- ✓ No by-products are required or emitted.
- ✓ Long lamp life of up to 15 000 hours.
- ✓ Improved indoor air quality and surface cleanliness.
- ✓ UV-C is absorbed by most materials, including standard flat glass.

OZONE STERILIZATION

Ozone is produced when oxygen (O_2) molecules are dissociated by an energy source into oxygen atoms and subsequently bind with an oxygen molecule to form an unstable gas which is then used to decontaminate air, surfaces, and water. These ozone molecules are considered highly reactive since it will oxidize almost anything it comes into contact with to convert itself back to oxygen. Ozone will oxidize the essential cell structure of any micro-organisms such as viruses and bacteria. After damaging the cell structure, the cell practically falls apart and dies. This can be used to sterilize units between cycles and ensure no cross-contamination or microbe spread.





DRYCORE™

Specialised agricultural drying solutions

Get in touch:

Get in touch: Des Fourie (Business Development Project and Research Coordinator)
des.fourie@drycore.co.za | (+27) 82 650 0842 | www.drycore.co.za