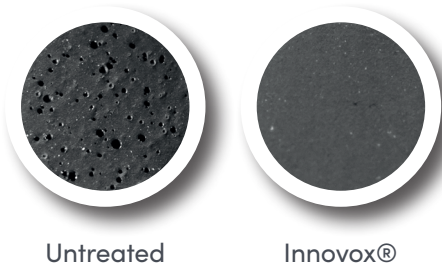


# Why use Innovox desiccant in Rubber applications



## Introduction



Innovox<sup>®</sup> calcium oxide (CaO) is used in the rubber industry as a desiccant in mineral filled compounds and pressure-less curing. Moisture also builds up in uncured rubber ingredients during storage or in high humidity environments. This can be bound up or “scavenged” and the effects of moisture neutralised by using Innovox<sup>®</sup> during processing. See Testing and Results below.

Moisture promotes porosity and irregular physical properties in rubber compounds. Poor quality raw materials and moisture can increase mixing time and appear as finished product quality issues, due to failure points or surface blemishes such as bubbles or white streaks. This can be very costly and inefficient. Addition of Innovox<sup>®</sup> will eliminate these issues and reduce scrap or re-processing costs as well as neutralising any acid present in the compound, which minimises acid related mould or die damage.

## Applications

Low pressure moulding and extrusion processes.

Commonly used in EPDM and other highly filled rubber compound systems where the presence of acidity and moisture are detrimental to processing and cure characteristics.

In process addition of Innovox<sup>®</sup> CaO promotes significant processing enhancements;

- gives dramatic improvements in porosity potential
- controls reduces cure time and increases product throughput
- promotes even, unblistered, appearance in cured compound
- reduction of scrap/reprocessing costs caused by quality failure

Automotive body seals and weather strip systems, hoses and belts, EPDM roofing systems, compounding for rubber flooring, conveyor belting, seals for household appliances etc.

## Practical

**Product choice** – Innovox<sup>®</sup> CaO is available with or without dampener. There are a range of Innovox<sup>®</sup> products to suit all applications. Innovox<sup>®</sup> can be supplied as a loose powder in bags or in a range of low melt sachet sizes for easy dosing and dust control.

**Addition rates** – Measured in parts per hundred rubber (phr), addition rates will depend upon moisture levels present and atmospheric humidity and can range from 0.5 up to 25 phr. Due to its purity and high activity, Innovox<sup>®</sup> CaO can usually be used at lower phr than less active competitor products. Typical addition would be around 5 phr in low humidity environments.

**Addition point** – The process stage at which Innovox<sup>®</sup> CaO is added will depend upon the moisture source, i.e. mineral filler moisture vs. storage or humidity moisture.

Our sales and technical team can provide support on product choice, addition rate and addition point.

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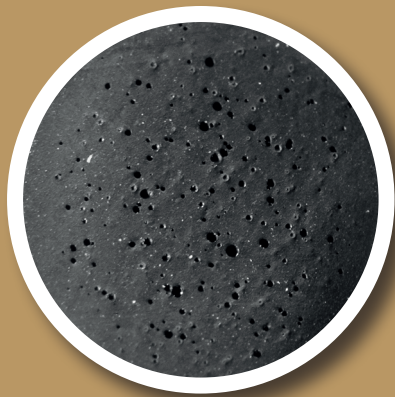
## Why Use Innovox® ?

Images courtesy of



Innovox® microfine CaO powders disperse easily and evenly throughout your product mix to give consistent results whatever your application. Reducing CaO loading by using Innovox® will improve overall cure performance and physical properties.

Inconsistent CaO powder, paste or granules can cause intermittent quality failures which can be difficult to address as shown by the pictures below.



Extruded cord made with competitor CaO product



Extruded cord made with Innovox®

Innovox® is made from CaO produced on the same site by Birch Chemicals' parent Singleton Birch. This is a high quality, consistent raw material which is packaged in a carefully controlled process.

Innovox® products are high purity and high surface area due to their chalk origin and microfine particle size. Innovox is minimum 99.5% powder, so weight for weight, Innovox® has up to 20% more active ingredient than granules or paste products.

Birch Chemicals is the chosen partner for many mainstream compounders and other satisfied customers across the globe.

# Why use Innovox desiccant in Rubber applications



## Testing & Results

A mineral filled EPDM (Ethylene Propylene Diene) rubber extrusion compound was used for the evaluation. The recipe chosen contains a high dosage of mineral filler in the form of whiting (calcium carbonate) which is known to absorb moisture and can cause porosity during pressure-less curing when calcium oxide is omitted.

The two compounds were extruded through a cord die 10mm in diameter and sheets made 6mm thick. These were all cured in a hot air oven at 200°C for 10 minutes. This was carried out to show the effect of Innovox calcium oxide on the porosity. Cross sections of the cord were photographed. (continued)

RECIPE	02584A	02584B
Density [kg/l]	1.44	1.44
KELTAN 4465	150.00	150.00
Zinc Oxide	5.00	5.00
Stearic Acid	1.00	1.00
Paraffinic Oil	50.00	50.00
N550 FEF	135.00	135.00
Whiting	200.00	200.00
PolyEthyleneGlycol 4000	2.00	2.00
ZBEC 70	1.00	1.00
MBT 80S	1.31	1.31
Sulphur M300 8	1.00	1.00
Rhenogran TP-50	3.50	3.50
INNOVOX FG Calcium Oxide	0.00	5.00
<b>Total Parts</b>	<b>551.25</b>	<b>556.25</b>

# Why use Innovox desiccant in Rubber applications



## Testing & Results

Test sheets of 2mm and 6mm were compression moulded for physical testing. Cure time was 12 minutes at 180°C. Both compounds perform similarly during the curing process.

In order to check the dispersion of the calcium oxide scanning electron microscope images were prepared. Innovox calcium oxide was found to be well dispersed.

The extruded cord from both compounds were cured in a hot air oven for 20 minutes at 200°C. Cross section of the two cords are shown below. It is clearly seen that the porosity due to the moisture in the compound without calcium oxide is eliminated when calcium oxide is added.

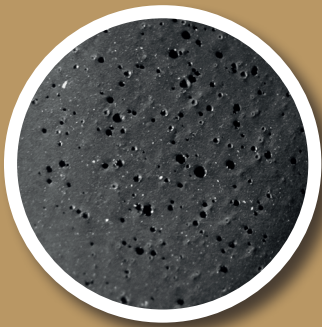


Fig 1. Without Innovox® 02584A

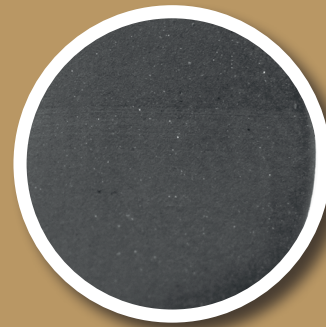


Fig 2. With Innovox® 02584B

A 6mm sheet was cured at the same time as the cords, the photo on the right below shows the effect of the Innovox calcium oxide. The photograph on the left shows that moisture in the compound expands and creates bubbles within the sheet. As the compound cures the bubbles are trapped and manifest themselves in an uneven surface.



Fig 1. Without Innovox® 02584A



Fig 2. With Innovox® 02584B

# Why use Innovox desiccant in Rubber applications



## Testing & Results

The cross section of the previous samples is shown below. The Innovox® treated sheet is at the bottom and the effect is evident.

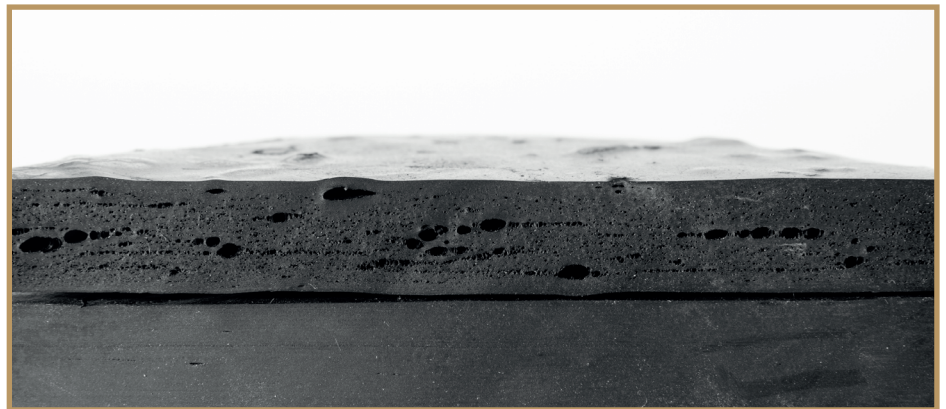


Fig 5. Cross Section of Hot Air Cured Sheets

## Compound Physical Properties

The physical properties show the typical values for a highly loaded EPDM compound. Compression moulding the samples does not allow the moisture to expand and form bubbles. At a dosage of 5 phr the Innovox calcium oxide does not have any detrimental effect on the properties tested.

## Conclusions

Innovox calcium oxide performs as a desiccant in the compound tested. It is effective as shown by the extruded cord and milled 6mm sheet cured in a hot air oven without pressure. Tests on compression moulded sheet have shown that, at a loading of 5 phr, it has no effect on hardness, tensile properties, or compression set.