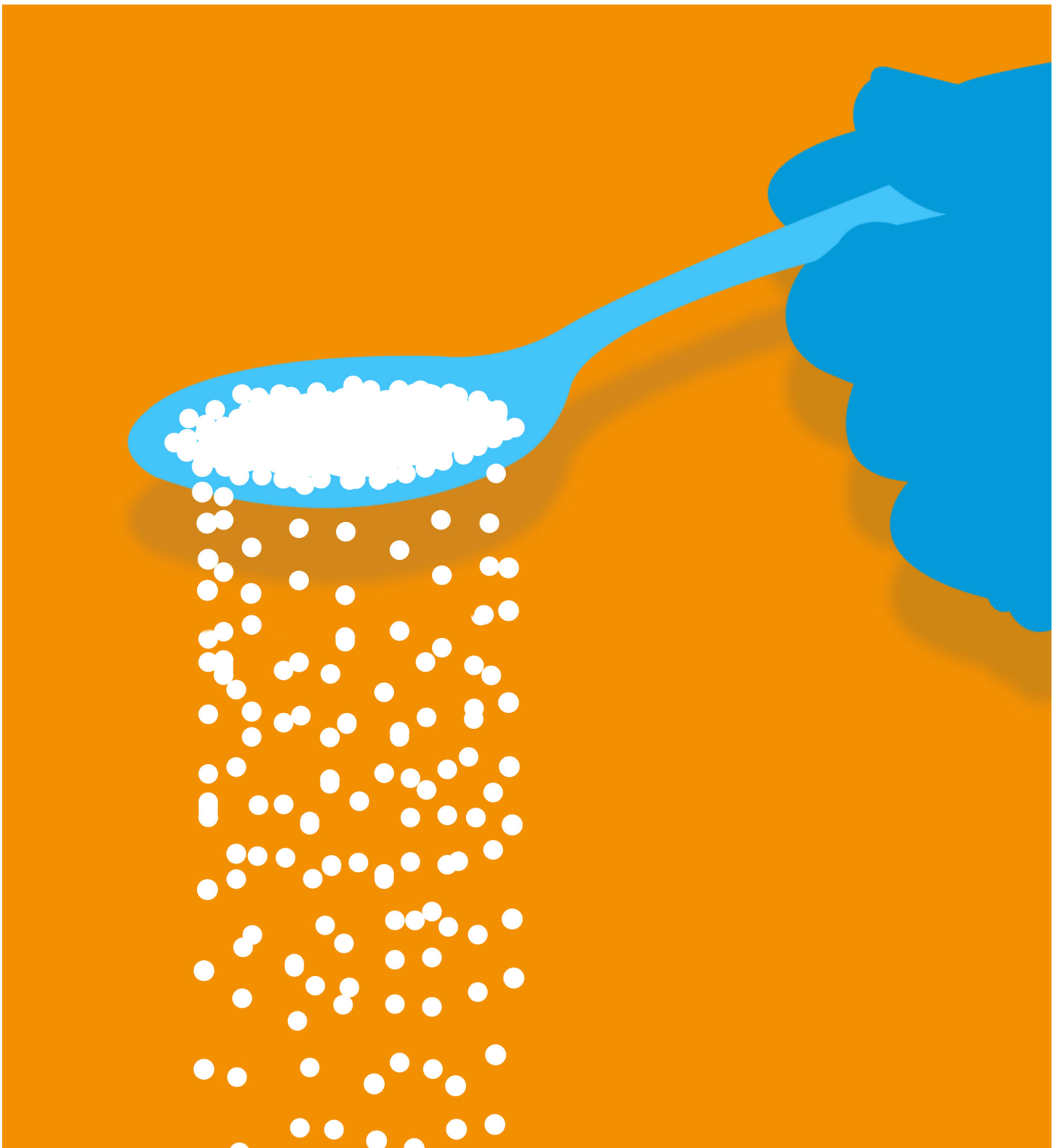


Sílice y silicatos amorfos para flujo de polvo y transporte de líquidos



Mantener la fluidez: agentes de flujo libre y transporte de líquidos

Ejemplos de aplicaciones

- Chile en polvo
- Sucedáneos de cremas o natas
- Huevo en polvo
- Tomate en polvo
- Queso rallado
- Sal
- Sucedáneos de la sal
- Portador de aromas/colorantes
- Portador de aditivos alimentarios
- Portador de aceites esenciales

FLUJO DE POLVO Y ANTIAGLOMERANTE

Un flujo de polvo deficiente o el apelmazamiento en los sectores de aditivos alimentarios, piensos para animales y química industrial pueden implicar un tiempo de proceso y de costos significativo, y pueden afectar de forma negativa a la calidad final del producto. La gama de sílices amorfas de PQ Corporation puede evitar estos problemas, ya que contribuye al flujo y sirve de antiaglomerante

TRANSPORTE DE LÍQUIDOS

La dosificación precisa de ingredientes líquidos de alto valor, como colorantes, aromas y aditivos alimentarios, incluyendo metionina y cloruro de colina, así como compuestos de caucho de alta viscosidad, puede garantizarse mediante el transporte de estos en la gama de productos Neosyl de PQ Corporation. Además de proporcionar una mejor dispersión, se consigue un uso más económico de los ingredientes mediante una dosificación y entrega precisas.

VENTAJAS DE LOS PRODUCTOS CON FLUJO LIBRE, ANTIAGLOMERANTES Y TRANSPORTE DE LÍQUIDOS

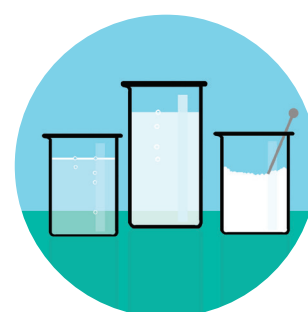
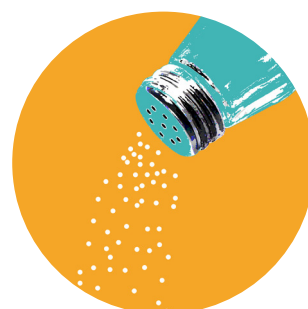
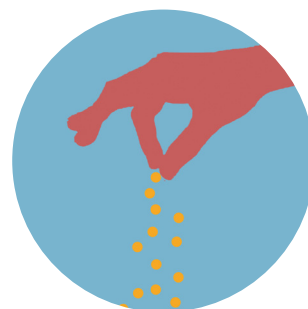
Flujo libre: Ahorro en tiempo de proceso y costos gracias a una mejor manipulación.

Antiaglomerante: Calidad del producto asegurada mediante la eliminación de grumos y aumento de la vida útil del producto.

Capacidad de transportar líquidos: Permite transportar un gran volumen de líquidos

Transporte de líquidos: Permite un mejor manejo de productos de alta viscosidad y una dosificación controlada de aromas/colorantes de alto valor.

La humedad, la presión y la temperatura pueden contribuir a que los productos se apelmacen, hagan grumos, creen vacíos y obstrucciones, o que afecten negativamente al uso final, la calidad y la vida útil del producto. Los agentes específicamente fabricados con flujo bajo y antiaglomerantes evitan estos problemas y proporcionan una calidad garantizada durante toda la vida útil del producto



Propiedades típicas

GRADO	AC	GP FF	NEOSYL® GP LC	TS	TC10	GASIL® 23D	MICROCAL® ET	ALUSIL® ET
Tipo	Sílice hidratada	Sílice hidratada	Sílice hidratada	Sílice hidratada	Sílice hidratada	Sílice hidratada	Calcio Silicato	Sodio Silicato de aluminio
Absorción de aceite (g/100 g)	160	250	255	245	250	290	140	145
Tamaño de partícula (µm)	15	18	18	12	<9	4.6	9	9
Densidad aparente (g/l)	180	130	130	110	75	150	190	220
pH (5 % aq)	6.5	7	7	6	6	6.5	10	10.5
Pérdida por secado (%)	3.5	5	5	5	5	3	2	3.5
Pérdida por ignición (%)	4	4	4	4	4	3	7	7
Área de superficie (m2/g)	180	200	200	200	200	360	60	100
Análisis del producto inflamado								
Sílice (como SiO2) %	98	98	98	98	98	99	78	82
Calcio (como CaO) %	-	-	-	-	-	-	20	-
Alúmina (como Al2O3) %	-	-	-	-	-	-	-	8.5
Sales sol (como Na2SO4) %	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	<0.5
Plomo (como Pb) ppm	<5	<5	<5	<5	<5	<5	<5	<5
Arsénico (como As) ppm	<2	<2	<2	<2	<2	<2	<2	<2
Regulación								
Código UE	E551	E551	E551	E551	E551	E551	E552	E554
US FDA CFR21	§§172.480	§§172.480	§§172.480	§§172.480	§§172.480	§§172.480	§§172.410	§§182.2727
N.º CAS	112926-00-8	112926-00-8	112926-00-8	112926-00-8	112926-00-8	112926-00-8	1344-95-2	1344-00-9
EINECS	231-545-4	231-545-4	231-545-4	231-545-4	231-545-4	231-545-4	215-710-8	215-684-8

Recomendaciones

GRADO	AC	GP FF	NEOSYL® GP LC	TS	TC10	GASIL® 23D	MICROCAL® ET	ALUSIL® ET
APLICACIÓN								
Crema	•	•						
Espicias	•	•		•	•	•		
Potenciador del sabor			•	•		•		
Sal	•	•		•				
Fertilizante		•		•				
Tomate en polvo				•	•	•		
Azúcar/endulzantes	•						•	
Queso (rallado)							•	
Queso (en polvo)		•						
Bebidas en polvo	•							
Detergentes		•						•
Transporte de líquidos (general)			•				•	
Piensos para animales			•				•	
Surfactantes secos			•	•				
Aromas en polvo		•			•	•		
CMR		•		•				
Pigmentos		•				•		•
Pesticidas		•				•		
Premezclas de mortero y cerámica		•		•				
Antiespumantes				•	•	•		

Servicio técnico

PQ Corporation ofrece un servicio técnico y analítico de alto nivel para asegurar el rendimiento óptimo de sus productos.

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Neosyl, Gasil and Microcal

Free Flow and Liquid Carrying

Food and Industrial Applications

Introduction

Speciality silicas and silicates act as free flow and anticaking agents to deliver benefits in powder handling and also serve as efficient carriers for viscous or sensitive liquids, semi-solids or pastes.

In free flow and anticaking applications, fine particle size silicas or silicates coat the surface of the host powder particles to reduce their cohesion and provide a barrier to agglomeration. For liquid carrying applications, coarser grades have high porosity to absorb the liquid and form a free flowing powder that is easy to handle and dose.

The Neosyl®, Gasil® and Microcal® ranges are in full compliance with international nutrition regulations. They are amorphous structures produced to provide products that are safe for manufacturing, transportation and handling. They are produced on plants that are certified ISO 9001, ISO 14001, FAMI QS (including HACCP) and ISO 22000.

Why use Neosyl®, Gasil® or Microcal®?

Due to their fine particle size or inherent stickiness, some powders have poor flow, and may cake during transport or storage, making them difficult to handle or dose.

Fluctuating temperature and humidity, application of pressure, crystallisation, sintering, moisture uptake and irregular particle shape are all factors that contribute to poor flow and increased caking in powders.

Fine silica or silicate particles ensure good flow and reduce caking by acting as spacers to separate host powder particles. Furthermore, the products readily absorb liquid, oil or fat from the surface of the host particles to reduce stickiness.

Hygroscopic powders, such as fruit powders, salt, vegetable extracts, ground spices or spice mixtures are a few examples where Neosyl®, Gasil® and Microcal® are used to improve flow and assure quality.

The addition of 0.5% to 2% of Neosyl®, Gasil® or Microcal® is sufficient to improve the processing and storage of sticky ingredients such as milk powder, or non-dairy creamer, as well as hygroscopic products such as fruit powder or salt.

The combination of a 'spacer effect' and moisture absorption, keeping the product surface dry, prevents caking during production, transport and storage.

Mode of action of flow aids for dry, hard, powders

All particles interact by Van-der-Waals forces, Figure 1. For small particles, these forces are sufficiently strong to cause the particles to agglomerate and cause in poor powder flow.

Flow aid particles are much smaller than the host powder particles and less than 1% is usually sufficient to cover the surface of these to create roughness which reduces the attraction forces, Figure 2.

Figure 1. Particles interacting by Van der Waals forces.

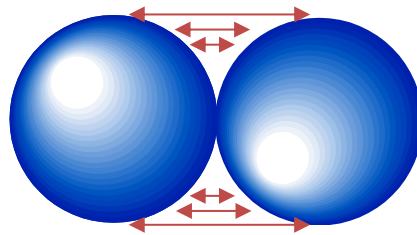
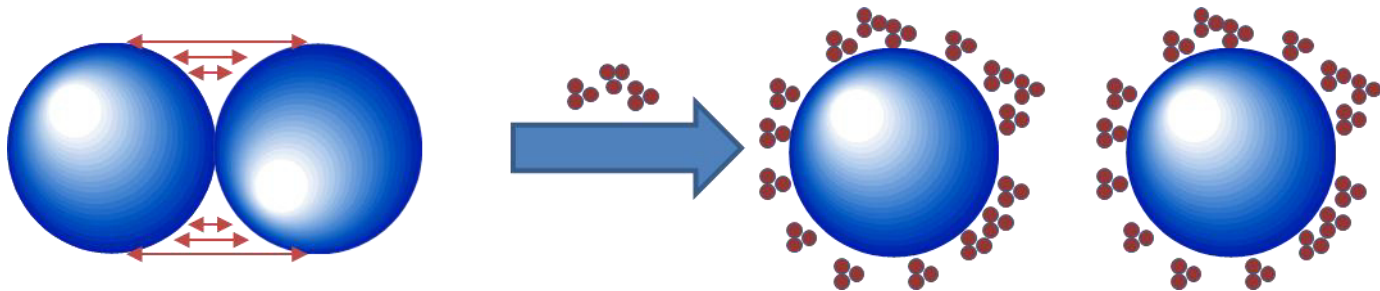


Figure 2. Neosyl®, Gasil®, Microcal cover the host powder's surface and act as a spacer.



Powder particles sticking together.

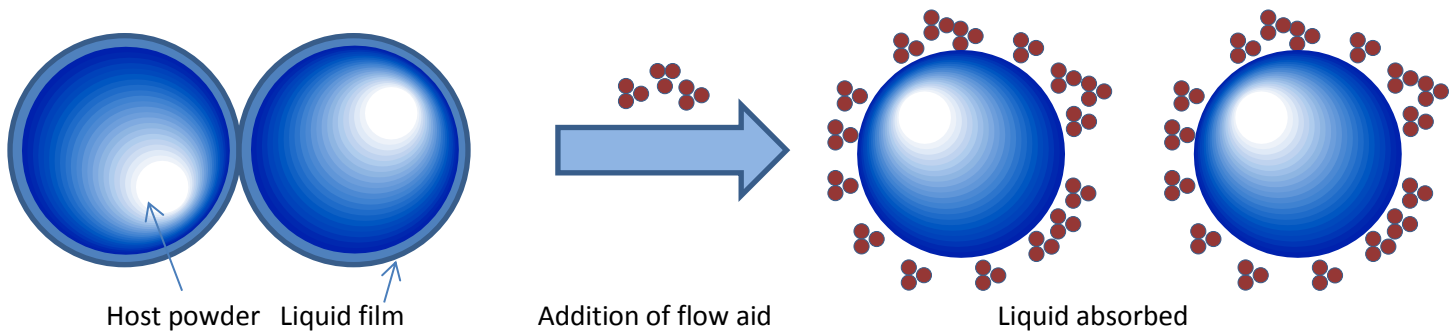
Addition of flow aid.

Separated powder particles.

Mode of action of flow aids for wet powders

Wet powders flow poorly due to a surface liquid film that may be water, oil or fat, holding them together. The addition of less than 2% of flow aid improves the flow and storage properties of such powders by coating the powder particles, absorbing the liquid film to reduce interactions and to prevent bridging between the particles, Figure 3.

Figure 3. Silica absorbs liquid from a wet powder's surface.

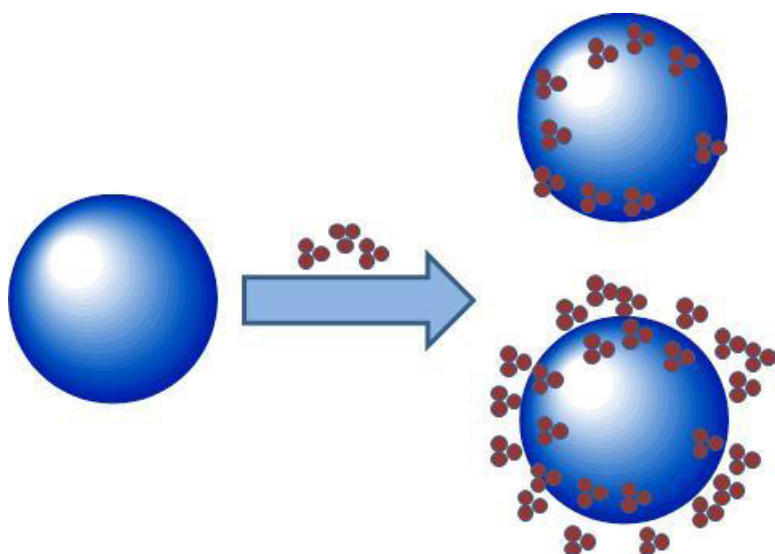


Flow aids / Anticaking aids for soft powders

Soft powders, such as waxes or emulsifiers cake very easily when pressure is applied and show a strong tendency to cake during long term storage or transport, particularly when exposed to fluctuating temperatures.

As with hard powders, Neosyl®, Gasil® and Microcal® cover the surface of soft powders to prevent sticking, however higher addition levels, up to 5%, are needed especially when a long period of protection is required. The reason for this difference is that a proportion of the anticaking aid may penetrate the soft powder surface, reducing efficiency. It is important therefore to add sufficient aid to allow for the loss in efficiency, Figure 4.

Figure 4. Penetration of soft powders.



Neosyl[®], Gasil[®] and Microcal[®] help process powders easily and accurately

Poor powder flow leads to hold ups, erratic dosing and poor quality.

Salts may pick up moisture from the air, causing formation of saturated brine on particle surfaces. The characteristic relative humidity leading to this effect is determined by the mineral content of the salt. For pure common salt at 20°C this is 75% R.H. Commercial salts however contain hygroscopic minerals such as magnesium chloride or calcium chloride and liquefy at R.H. of 33% and 31% respectively, thus problems may be experienced at low humidity. Fluctuating temperature or humidity during storage, or transport, leads to repeated dissolution and recrystallization, resulting in hard caking.

Addition of flow aid to coat the particles can help the flow and storage properties of these hard powders.

Neosyl[®] and Gasil[®] help in spray drying

Neosyl[®] or Gasil[®] silicas reduce caking on the inner wall of the spray drier caused by coffee creamer, vegetable, egg, or whey powder.

Adding silica directly into the spray tower to absorb surface oil or water provides an efficient means to apply flow aid and saves a mixing step.

Addition of the flow aid may be accomplished at a number of dosing points:

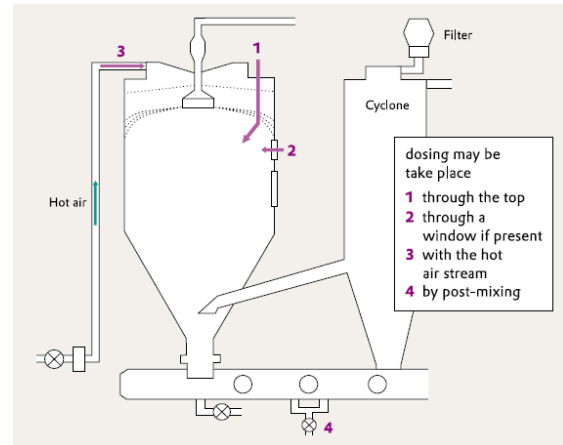
1. Through the top.
2. Through a window.
3. With the hot air stream.
4. Post mixing.

Addition through the top, a window or inlet assures the most efficient performance; while adding in the hot air stream may be effective.

Adding the flow aid post mixing helps convey the material into other processes or to packaging, but overall the earlier silica is added, the more effective the action.

Neosyl® and Gasil® help in milling

Milling low melting powders or products with high moisture can lead to caking in the mill. Addition of flow aids during the grinding process enables coating of the host particles, so inhibiting caking, and improving powder flow and reducing coating of the mill. Coating the powder in-situ protects it in subsequent processing or transportation or storage steps.



Neosyl®, Gasil® and Microcal® help avoid caking during transport and storage

Varying temperature and humidity during transport and storage may lead to caking, affecting quality, appearance and making handling difficult. Addition of Neosyl®, Gasil® or Microcal® prevents agglomeration and caking so assuring consistent quality over the product lifetime.

Neosyl® and Gasil® help the end consumer

Free flowing powdered soups or beverages are assured, even in challenging environments such as vending machines, by the high moisture absorption capacity of Neosyl® and Gasil® silicas.

Recommended products

The table below provides a summary of some of the more common free flow and anti-caking and liquid carrying applications for Neosyl®, Gasil® and Microcal®. Recommendations are for typical products within the respective application group.

Application	Neosyl ¹		Gasil ²		Neosyl	Microcal ³
	AC	TS	23D	GM2	GP	ET
Coffee creamer	++	+	++	++		
Spice blend	+	++	++	++		
Table salt	++	+	++	++		
Fertilizer		++	++	++		
Tomato powder			++	+		
Choline chloride					++	+
Rubber and plastic additives					++	+
Sugar		++				++
Vitamin E					++	
Cheese						++
Powdered drinks	+	++	++			
Savoury pre mix	+	++	++			
Detergents		++			++	
Flavour/ seasoning		++				
Emulsifiers					+	++
Coffee powders		+	++			
CMR	+	++			++	
Fruit pieces	++		+			

¹ Precipitated silica

² Silica gel

³ Calcium silicate

Neosyl®, Gasil® and Microcal® as a carrier

Precise dosing of viscous liquids or sticky pastes into a blend is a difficult process. The problem is overcome by converting these to free flowing powders using a carrier powder.

The flow property of the mix is influenced by the particle size of the carrier used, and coarse grades generally flow better than fine grades. The liquid carrying capacity is determined by the carrier porosity and the liquid viscosity; high porosity and low viscosity enables more to be carried.

Neosyl®, Gasil® and Microcal® are completely compatible with animal feed acids used to improve digestion and to protect against infection. The products improve dosage rates of acids such as propionic, formic, acetic, lactic, and phosphoric as well as short and long chain fatty acids.

The table below provides examples where liquid, semi-solid or pasty substances are converted to free flowing powders by addition to the carrier.

Absorbate	Addition Level (%)	Carrier
Powder de-foamers	25-35	Neosyl® TC10
Rubber and plastic additives	25-35	Neosyl® GP Neosyl® TS
Choline Chloride 50%	65-75	Neosyl® GP Neosyl® TS

Mixing technology

Free Flow and Anticaking

When mixing solids, the process can be influenced by particle stability, particle size distribution, density, moisture content and other properties. For hard dry powders mixing is quite intense to fully disperse the flow aid. For wet powders, mixing should be less intense to avoid damaging the flow aid structure which may reduce the effectiveness. For soft powders mixing should be adjusted to the powder characteristics to minimise the potential for them to become softened or compacted.

Mixers differ in their action; ploughshare, paddle, and cone mixers, and ribbon blenders operate by applying a pushing force to the powder; other machines such as tumblers or V-Cone blenders mainly use gravitational force. Jet mixers and fluid bed mixers use an airstream. Other methods can be used to effectively disperse silica, for example dosing into mills or spray towers.

Tumble mixers are very gentle and suited to handling very soft powders. Cone mixers too are quite gentle, but may require longer mixing time. Paddle mixers, while being gentle, offer the benefit of homogenising the mixture and are a very good choice for soft and hygroscopic powders where the flow aid porosity needs to be preserved. Ploughshares® apply more energy than these other mixers but may still be used for soft powders. Generally, Ploughshares® and paddle mixers need shorter mixing times and can be adapted to shorter times for hygroscopic powders and longer times for dry, hard powders. Ribbon blenders are quite intense and suited to dry, hard powders.

Ploughshare mixers, paddle mixers or ribbon blenders provide efficient means to intimately mix the flow or anticaking aid with the host powder. The filling level should not normally exceed 70% of the mixer volume, and will usually take just a few minutes.

For carrier applications

Generally the carrier should be added to the mixer first and the substance to be carried added to the powder. Liquids should be added continuously as finely distributed as is practical. Gentle mixing is ideal, but not essential; the key is to not break the carrier pore structure, so causing the liquid to be lost.

Ploughshare® and paddle mixers are very well suited to perform these mixing tasks; having short mixing time and very low shear.

Food additive certification

Neosyl® precipitated amorphous silica, Gasil® gel silica and Microcal® precipitated calcium silicate comply with 21 CFR (Code of Federal Regulations, USA) §§ 172.480 and §§ 172.410 Silicon dioxide is listed as “anti-caking agent” which “may be safely used at a level not exceeding 2%”, and

Neosyl® precipitated amorphous silica and Gasil® gel silica comply with food additive requirements for E551, and Microcal® with E552, according to EU Directive 2000/63/EEC. The products are FAMI QS, Kosher and Halaal certified.

Handling, packaging and storage

Packaging and handling

Neosyl®, Gasil® and Microcal® are delivered in multiply bags of various weights. Products are also offered in ‘super sacks’ that require less manual labour and reduce the risk of external contamination in a closed system. Bulk deliveries may also be available.

Storage

Neosyl®, Gasil® and Microcal® are largely chemically inert and their composition fixed, however their high surface area may result in adsorption of volatile substances (although for moisture this is reversible). It is recommended therefore the products are stored unopened in a dry place, protected from moisture and

organic vapours. During prolonged storage the products may become compacted, leading to a small increase in tamped density, affecting related properties.

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