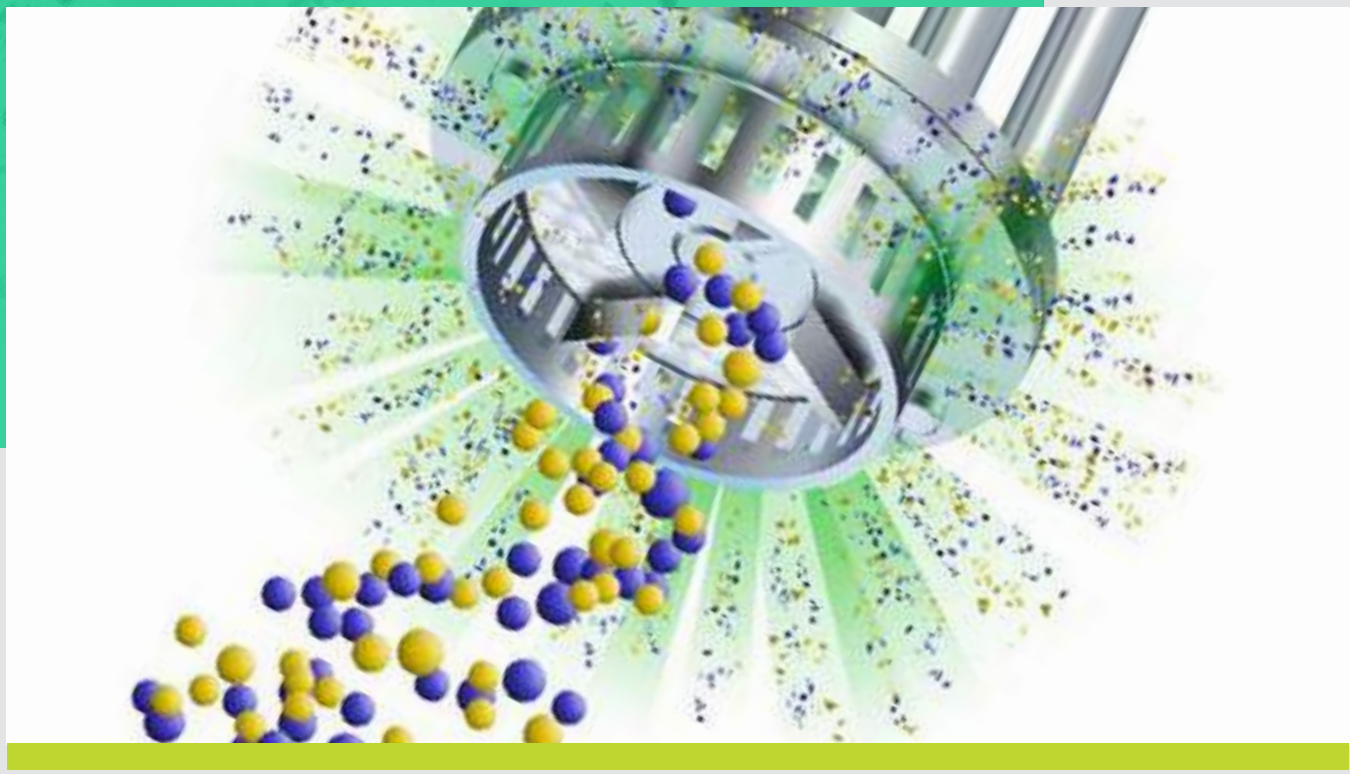
DIMERCO

Catálogo de Productos

MÁQUINAS PARA PROCESOS INDUSTRIALES



VERSIÓN 2025

ÍNDICE

Años de experiencia trabajando con mezcladores de alta cizalla en una amplia variedad de aplicaciones, respaldan el profundo conocimiento de Silverson en procesos de mezclado.

Si no encuentras información específica para tu proceso, no dudes en contactarnos, te ofrecemos asistencia y asesoría por nuestro equipo de expertos.

Solutions for Your TOUGHEST
MIXING Applications in
FOOD

Preparation of Samples for Aflatoxin Testing

SILVERSON
THE FIRST NAME IN HIGH SHEAR MIXERS

Preparation of Samples for Aflatoxin Testing

Aflatoxins are produced by various types of moulds which can grow on foodstuffs such as pistachio nuts, peanuts, cereals, dried fruit, etc. Much of the information in this report can also be applied to testing for other mycotoxins and ochratoxins.

Permitted levels of these toxins are very low - typically 5 ppb or less. Analysis is carried out to ensure these limits are not exceeded, and the sampling and test procedure is controlled by legislation in many countries. However, the preparation for testing is not presently covered by any standardised method. For example, European guidelines state, “Finely grind and mix thoroughly each laboratory sample using a process which has been demonstrated to achieve complete homogenisation.”*

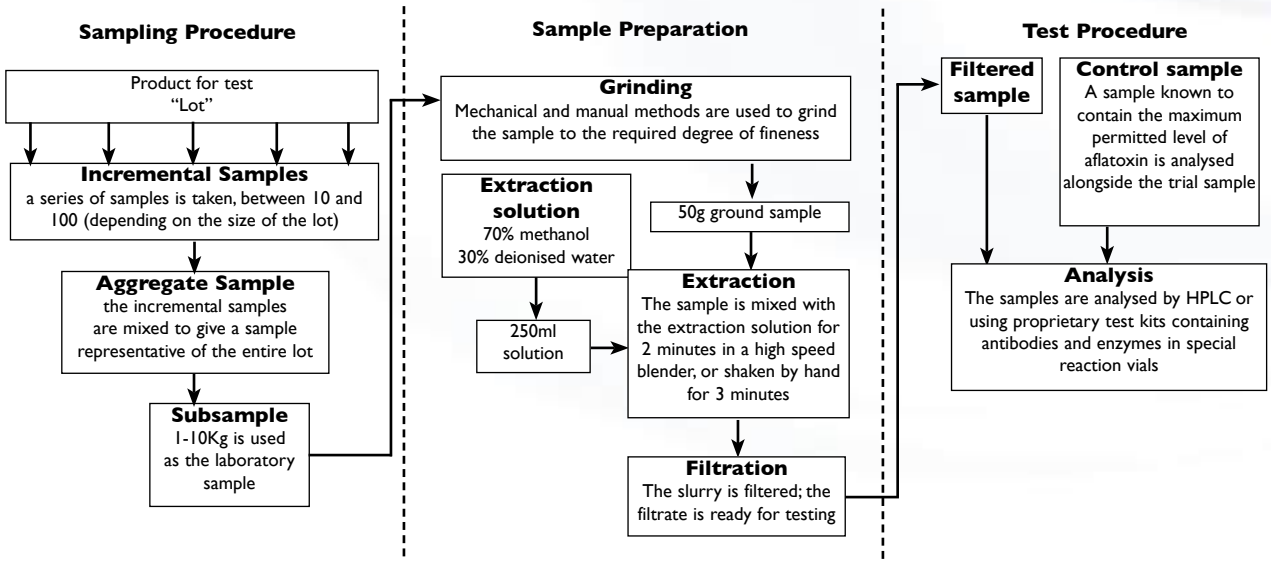
Experimentation by a number of authorities has identified that preparation of samples by slurrying offers significant advantages over dry milling. Silverson high shear mixers have been used for this research, and it has been found that the aflatoxin content of repeated samples prepared by slurrying was more consistent than those prepared by dry milling. Silverson mixers are now used as the standard method in several countries.

The Process

As mentioned above, in the absence of a standardised procedure, there are many variations in the efficiency of the preparation (or extraction) process, according to the method and type of equipment used.

The volumes used for sample preparation will also vary according to the product being tested. 30 - 40 Kg samples are not uncommon.

A typical procedure would be as follows:



*European Commission Directive 98/53/EC

The Problem

Sample preparation is subject to a number of problems:

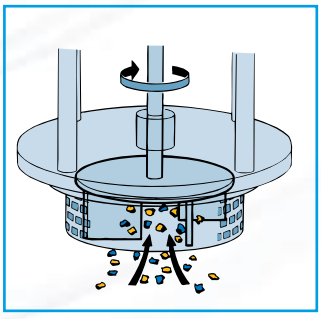
- Efficient particle size reduction and homogenisation of the sample before extraction is essential in order to obtain accurate and repeatable results.
- Some methods of disintegrating solids, especially on a small scale in the laboratory are difficult to validate, and can lead to inconsistency between batches.
- Grinding equipment may be difficult to clean, raising potential contamination/ hygiene issues.
- The extraction stage is subject to many variations due to the methods used, as described in the previous diagram. Again these are difficult to validate.
- Dry grinding can cause excessive heat.
- Viscosity varies enormously from water-like to a thick slurry.

The Solution

Experimentation has identified that preparation of samples by slurrying using equipment such as a Silverson high shear mixer offers significant advantages over dry milling:

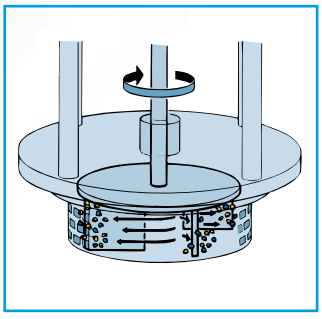
- The lowest possible CV (coefficient of variation) is obtained.
- Smaller particle size can be achieved.
- Better homogenisation of samples.
- Consistent results across a range of viscosities.
- Materials of a wide range of sizes can be processed.

This efficiency and consistency between batches is derived from the mixing action of the Silverson workhead, which operates on the rotor stator principle as follows:



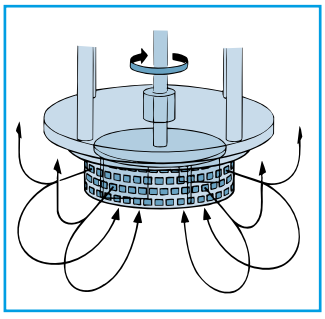
Stage 1

The high speed rotation of the rotor within the workhead creates a powerful suction which draws the liquid and solids upwards into the workhead.



Stage 2

Centrifugal force drives the materials towards the periphery of the workhead where they are subjected to a milling action in the clearance between the tips of the rotor blades and the inner wall of the stator.



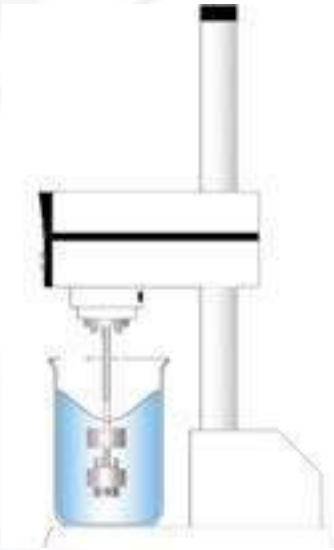
Stage 3

The solids are forced out through the stator and projected back into the body of the mix. In a short mixing cycle the entire contents of the vessel pass through the workhead, progressively reducing particle size to form a completely homogeneous product.

The Advantages

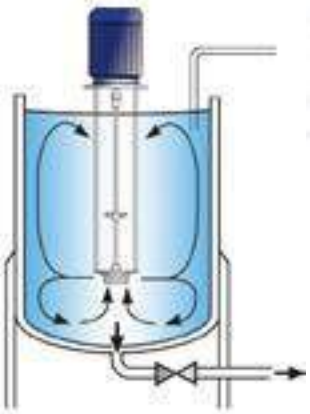
- Minimised cleaning requirements.
- Greatly reduced processing times.
- Laboratory units allow accurate forecasting of the performance of larger units when scaling-up.

Silverson manufactures laboratory and production scale mixers suitable for this application:



Laboratory Mixers

- Suitable for samples of up to 3 kilos
- Special Duplex Disintegrating workheads are used for this application; other interchangeable workheads are available, allowing the unit to be adapted for a range of laboratory mixing applications
- Several instrumentation options are available, including tachometers, ammeters and facilities to link to printers, database systems or other computer controlled apparatus



High Shear Batch Mixers

- Suitable for batches of up to 1000 litres
- Can be used on mobile floor stands
- Can easily be moved from vessel to vessel

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Issue No. 51FE4

Solutions for Your TOUGHEST
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Manufacture of Clouding Emulsions for Soft Drinks

SILVERSON
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Manufacture of Clouding Emulsions for Soft Drinks

Clouding agents are used in soft drink manufacture to give a more natural appearance to products with a low juice content; they can also mask sedimentation and “ringing” - where colouring/flavouring oils rise to the surface of the container during storage. Clouding agents are normally supplied as emulsions similar to flavour emulsions. A typical formulation would contain the following:

- Clouding Agent: The clouding effect is obtained from fractions of oils with as neutral a flavour as possible. Citrus oils are the most widely used; vegetable oil is used, but less common due to poor resistance to oxidation.
- Stabiliser: The emulsion is stabilised with gum, typically gum arabic.
- Weighting or Densifying Agents: Added to prevent “ringing.” Originally Brominated Vegetable Oil (BVO) was common, but its use is now restricted. Typically resin gums such as damar gum are used.

The Process

Typically cloud emulsions are oil-in-water emulsions. A typical manufacturing process would be as follows:

- The gum (stabiliser) and any other additives would be dispersed into water to form the continuous phase of the emulsion.
- The citrus oil or other clouding agent is premixed with the weighting agent, added to the vessel and mixed to form a pre-emulsion.
- The pre-emulsion is then passed through a high pressure homogeniser to obtain the required globule size.

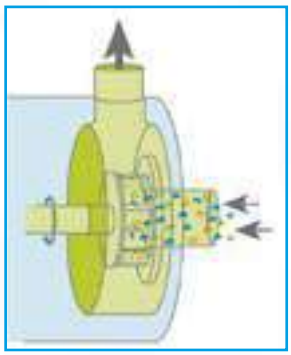
The Problem

Preparing a pre-emulsion with conventional agitators can lead to a number of problems:

- Powders must be added at a controlled rate to reduce agglomeration of particles.
- Conventional systems do not produce sufficient shear to break agglomerates down.
- Agitation of the solution and dispersion of powders becomes more difficult as the viscosity increases.
- Long processing times are required to complete dispersion and achieve a satisfactory consistency.
- A uniform pre-emulsion is required by the high pressure homogeniser. This is not possible using conventional agitators.
- Obtaining full yield of stabilisers is difficult using traditional methods.
- Partially hydrated material can build up on the shaft of the mixer and on the vessel wall.
- The net result of conventional mixing is the product having to be passed several times through the high pressure homogeniser to obtain the desired globule size.

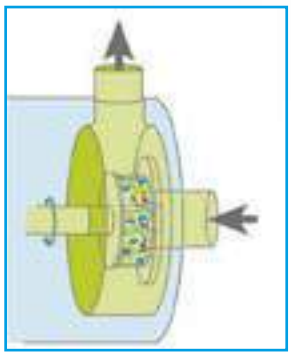
The Solution

A Silverson High Shear mixer can overcome these problems. The high shear action of the rotor/stator workhead hydrates and disperses the powdered ingredients and produces a finely dispersed pre-emulsion as follows:



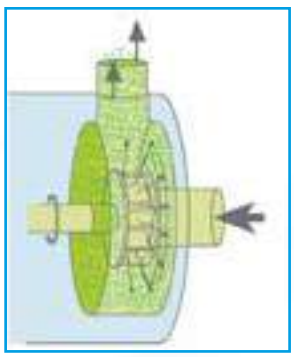
Stage 1

The vessel is charged with liquid and the mixer is started. The powdered ingredients are then added. The high speed rotation of the rotor blades creates a powerful suction which draws the liquid and powdered ingredients into the workhead.



Stage 2

Centrifugal force drives the materials to the periphery of the workhead where they are sheared in the gap between the rotor and stator. The product is forced out of the stator and projected radially back into the body of the mix as fresh ingredients are drawn into the workhead.



Stage 3

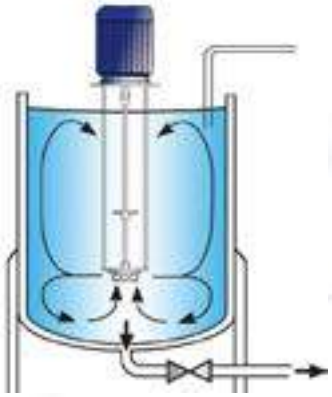
The oil phase ingredients are added to the vessel and an emulsion is rapidly formed. In a short mixing cycle all the material passes through the workhead, progressively reducing particle/globule size to produce a stable, fine pre-emulsion.

The Advantages

- After processing with a Silverson mixer, a single pass through a high pressure homogeniser is normally sufficient to achieve the required globule size in the end product.
- The high pressure homogeniser can be eliminated in some cases.
- Typically a globule size of down to 1µm is achievable.
- Ability to start up or stop process quickly for processing of ingredients on demand.
- Agglomerate-free mix.
- Consistent product quality and repeatability.
- Stable pre-emulsion.
- Maximised yield of raw materials as thickening agents are fully hydrated and other ingredients fully dispersed.
- Dramatic reduction in mixing times.
- Improved vessel hygiene.

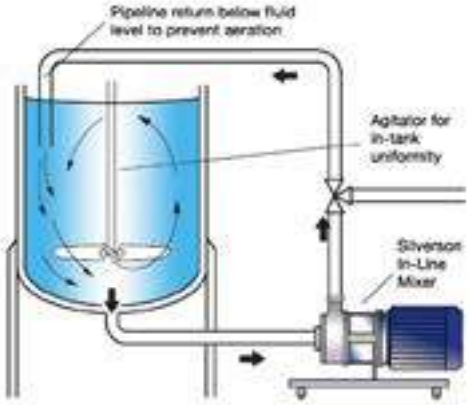
There are several products in the Silverson range suitable for this application, the selection of which is dictated by individual process requirements including batch size:

High Shear Batch Mixers



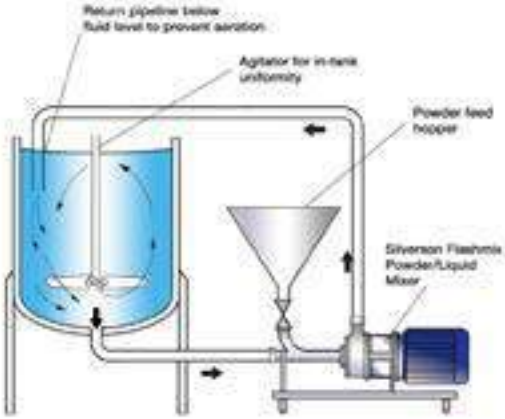
- Suitable for batch sizes up to 1000 litres
- Many units can be used on mobile floor stands
- Small units available for R&D and pilot production

High Shear In-Line Mixers



- Ideal for larger batches
- Aeration free
- Easily retrofitted to an existing plant
- Self-pumping
- Can be used to discharge vessel
- Ultra Hygienic models available

Silverson Flashmix



- Ideal for larger batches
- Capable of incorporating large volumes of powders
- Minimised aeration
- Minimised cleaning requirements
- Suitable for higher viscosity mixes
- Suitable for operation at higher temperatures
- Minimum operator input required

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Issue No. 44FE4

Solutions for Your TOUGHEST
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High Speed Reclamation of Confectionery

SILVERSON
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High Speed Reclamation of Confectionery

Confectionery may require reclamation or reworking for a number of reasons, for example when high speed production lines stop because of a problem downstream, such as a fault in coating machines or a breakdown in the packing line. Another cause of waste product is when sweets are rejected as being mis-shapen or otherwise out of specification. Ingredients produced on a continuous basis are often diverted into scrap bins until the line is running again, as stopping production may be difficult and costly. The reclamation of confectionery waste can be difficult, which in the past has resulted in product simply being scrapped. However, the high cost of raw materials such as sugar and cocoa means that it is increasingly important to try to reclaim and rework "off-spec" product.

The Process

The reworking process varies considerably according to the type and form of material being handled. This can vary from raw materials and ingredient blends to "finished" products:

- Individual gums and boiled sweets can be added to hot water and agitated until they gradually dissolve to result in a uniform mixture.
- Agglomerated masses or large solids would first require grinding or chipping to smaller pieces before being processed in a similar manner.
- Hard, friable solids and insoluble ingredients may need milling or grinding to a manageable particle size.
- Often a closed vessel is required, as the operating temperature required to melt or dissolve the solids can lead to loss of volatile ingredients, particularly flavourings, through evaporation.

Chocolate confectionery has additional requirements:

- If even small amounts of water are introduced into molten chocolate it can "set" immediately.
- Chocolate also tends to work harden.
- Temperature must be carefully controlled to prevent burning or caramelisation of the product.

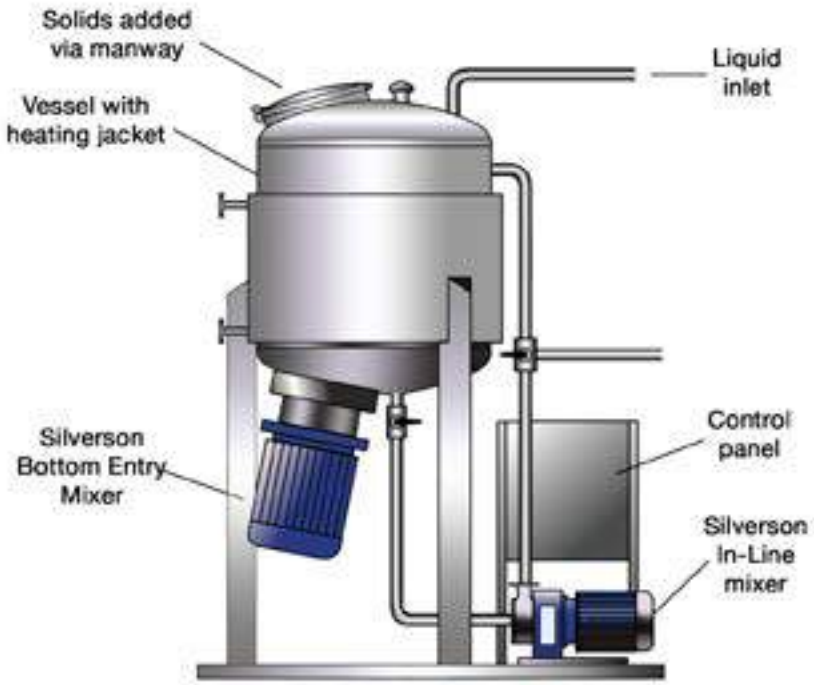
The Problem

Several problems can be encountered when using conventional agitators to reclaim confectionery:

- Long mixing times are required to completely solubilise the waste and obtain a uniform and usable product.
- Large lumps and agglomerates in the mix can cause serious damage to the agitator.
- Incomplete solubilisation can lead to unsatisfactory product consistency.
- Holding the product at raised temperatures for long periods can impair the flavour and quality.
- The structure of gelatine based confectionery breaks down at temperatures above 70˚C (160˚F), requiring the addition of more gelatine after reworking to regain the gelled structure.

The Solution

Silverson has developed a complete new system specifically for reclamation of larger solids and agglomerated confectionery. The system consists of a jacketed vessel, fitted with a High Shear Bottom Entry mixer and an In-Line mixer in a recirculation system. The unit is skid mounted and has an integral control panel. Operation is described below. Small solids can be reclaimed using the Silverson Duplex Disintegrator/Dissolver unit.



In a typical operating procedure the vessel is first charged with the base fluid, most commonly water. This is heated to the required working temperature before the Bottom Entry mixer is started and the product for reclaim is added. Large solids can be added without the need for pre-grinding. The mixer exerts a powerful suction which draws the materials down into the workhead, where they are rapidly reduced to granular size.

When particle size is sufficiently reduced the In-Line mixer can be started. The materials are drawn into the recirculation line and pass through the In-Line mixer's workhead which subjects the materials to intense high shear. The self-pumping unit then returns the product to the vessel as fresh ingredients are simultaneously drawn in.

The combination of heat, vigorous agitation and intense high shear accelerates the solubilisation process and quickly reduces the entire contents of the vessel to a homogeneous mixture without appreciable deterioration in product quality or flavour.

The In-Line mixer can also be used to transfer the processed rework back to the production line, in some cases without the aid of a positive pump.

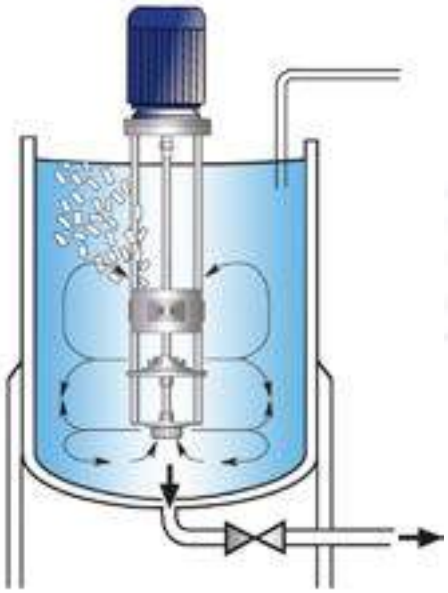
When processing chocolate confectionery, one of the constituents of the end product such as cocoa butter, or even a proportion of the original product is first added to the vessel to provide sufficient liquid to cover the workhead. Where solid chocolate is added to the vessel, an integral scraper unit can be fitted to provide gentle agitation and uniform heating of the product until molten. To speed up this part of the process the Bottom Entry mixer can also be run to disintegrate large solids once the liquid level covers the workhead.

The Advantages

- Dramatically reduced processing times.
- Improved product uniformity and consistency.
- Hygienic construction.
- The vigorous in-tank movement provided by the Bottom Entry unit can eliminate the need for scraped surface agitation in the vessel.
- Can be custom-built to suit individual process requirements.
- CIP spray balls can be incorporated into vessel design.
- Jacketing on the vessel and (where required) the In-Line mixer can be used for temperature control to stop product being damaged by overheating, or setting on cooling, for instance where gelatine based confectionery is being processed.
- Different levels of automation, instrumentation can be incorporated at the design stage. The unit can also be linked to ancillary equipment or process computers if required.

Duplex Disintegrator/Dissolver

For processing smaller solids, the Duplex Disintegrator/Dissolver can be used in place of conventional in-tank agitation. The Duplex has twin workheads, facing in opposite directions. The upper workhead pulls materials down from the surface of the mix and subjects them to an initial disintegration before expelling them radially back into the mix. The lower workhead then draws the liquid and solids upwards from the base of the vessel and further reduces the particle size, accelerating the solubilisation process and ensuring a homogeneous end product is obtained.



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Issue No. 30FE4

Solutions for Your TOUGHEST
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Production of Cream Liqueurs

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Production of Cream Liqueurs

Cream liqueurs are an emulsion of cream with an alcoholic spirit such as brandy, whisky, vodka, etc. which may be in highly concentrated form. Most products contain several other added ingredients which may include sugar, full fat milk powder, non-fat milk solids, flavourings, colouring, preservatives and a thickening agent such as sodium caseinate, which also acts as a stabiliser to prevent the cream and alcohol from separating.

The Process

The basic manufacturing process consists of three stages:

- Dispersion of powdered ingredients into either the alcohol, cream or aqueous phase as appropriate.
- Premixing of the phases to form a pre-emulsion.
- Homogenisation, normally using a high pressure homogeniser to obtain a stable emulsion which will not separate in the bottle.

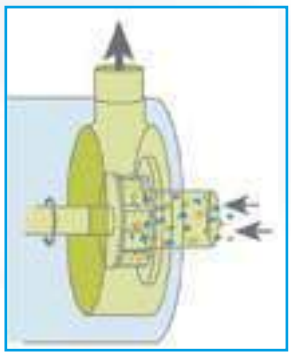
The Problem

A number of problems can be encountered when using conventional agitators:

- Long mixing times are required to completely wet out, disperse and/or dissolve the ingredients.
- Powders such as caseinate and milk powder are very cohesive and have a tendency to form agglomerates which agitators cannot easily break down.
- Caseinates are difficult to dissolve and will rapidly increase in viscosity, especially if added directly to the cream.
- Agitators do not impart enough shear to form the stable pre-emulsion of low globule size required by the high pressure homogeniser.
- Several runs through the high pressure homogeniser may be required to obtain the required product.
- Many ingredients are heat sensitive.
- Loss of alcohol through evaporation must be avoided.

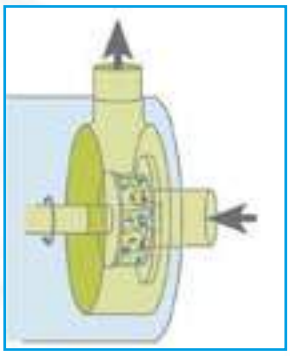
The Solution

These problems can be overcome by adding a Silverson In-Line mixer to the existing process. Batch mixers and the Silverson Flashmix powder/liquid mixing system can also be used for this application (see overleaf). Operation is as follows:



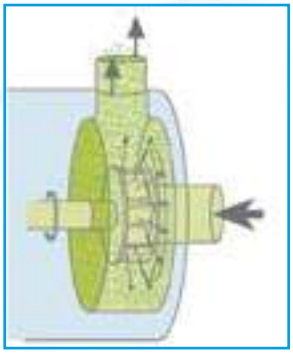
Stage 1

The high speed rotation of the rotor blades creates a powerful suction which draws the liquid and powdered ingredients into the workhead.



Stage 2

Centrifugal force drives the materials to the periphery of the workhead where they are subjected to a milling action in the gap between the rotor and the stator wall. Agglomerates in the milk powder are broken down as the powder is finely dispersed into the milk.



Stage 3

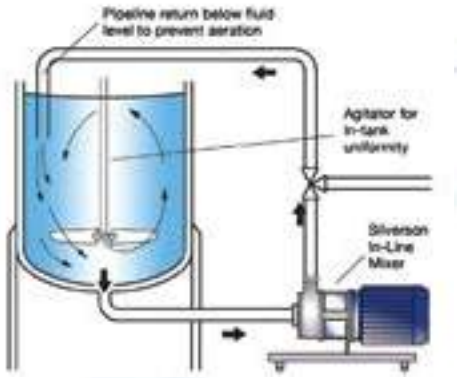
The product is forced out through the stator as fresh materials enter the workhead. In a short mixing cycle all the material passes through the workhead, progressively reducing particle size and exposing an increasing surface area to the milk, accelerating the dissolving process.

The Advantages

- Agglomerate-free mix.
- Rapid mixing times.
- Stable pre-emulsion and a more stable end product.
- The pre-emulsion is more uniform and of a low particle size, allowing faster processing through the high pressure homogeniser.

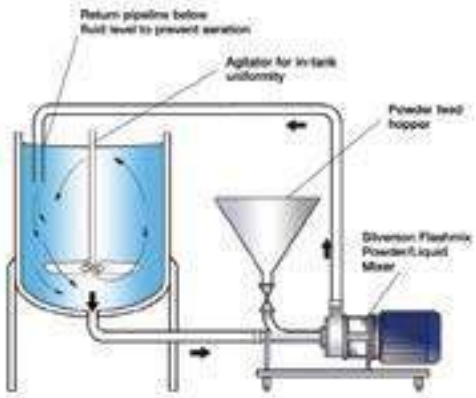
High Shear In-Line Mixers

- Ideal for larger batches
- Must be used in conjunction with an efficient in-tank agitator to wet out powder
- Aeration free
- Easily retrofitted to existing plant
- Self-pumping
- Ultra Hygienic models available



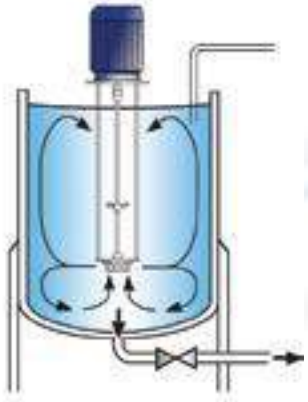
Silverson Flashmix

- Ideal for larger batches
- Capable of rapidly incorporating large volumes of powders
- Minimised aeration
- Minimised cleaning requirements
- Controlled powder addition rate
- Minimum operator input required
- Ultra Hygienic models available



High Shear Batch Mixers

- Suitable for batches of up to 1000 litres
- Can be used on mobile floor stands
- Can easily be moved from vessel to vessel



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Issue No. 36FE4

Solutions for Your TOUGHEST
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Manufacture of Smoothies

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Manufacture of Smoothies

A smoothie is made by blending raw fruits or vegetables with water, fruit juice or milk. It may also contain other ingredients such as grains, herbs or proteins.

Generally a smoothie has a higher viscosity than a juice, due to the high solids content and the natural thickening effect of some ingredients, such as banana and mango.

The Process

Smoothies are produced in a wide range of batch sizes, from individual portions in catering establishments to bulk production.

Some manufacturers use whole fruit and/or vegetables while others may buy preprepared purées and blend them. Consequently there are many different methods used to produce smoothies and many different types of equipment are used. However the processing requirements are largely the same:

- Where smoothies are produced from purées and juices, the mixing system must be able to blend liquids of widely varying viscosities.
- When working with whole fruit and/or vegetables, a range of equipment may be required to chop and purée the solid ingredients, particularly if frozen solids, hard or fibrous raw materials are being used.
- The mixing system must be capable of dispersing any powdered ingredients such as milk proteins and other nutritional supplements.
- After the initial disintegration stage further processing may be required to obtain the required smooth consistency and mouthfeel.

The Problem

The manufacturing process is subject to a number of problems:

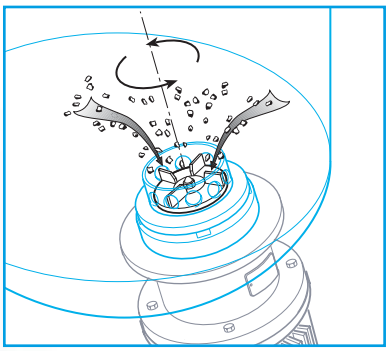
- The small scale blending equipment widely used for this process has no production equivalent. Replicating the results from the laboratory or pilot production can therefore be very problematic on scaling up.
- Repeatability between batches is difficult to obtain.
- Poor processing can lead to unsatisfactory texture and mouthfeel.
- Conventional agitators cannot readily blend liquids of widely differing viscosities. Long mixing times may be required to achieve a uniform blend.
- Powdered ingredients can be difficult to incorporate and disperse, especially if added to higher viscosity smoothies.

The Solution

These problems can be overcome using a Silverson High Shear mixer. The high shear action of the rotor/stator workhead can rapidly disintegrate and pulp fruit and vegetables of all shapes and sizes, including hard solids. Operation is as follows:

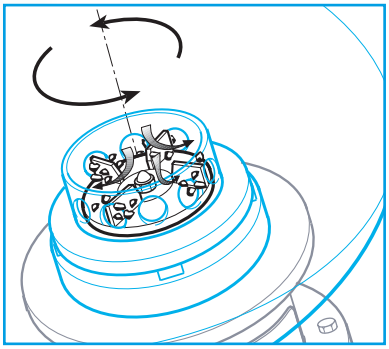
Stage 1

The vessel is charged with liquid and the mixer is started. The fruit and/or vegetables are added to the vessel and drawn into the rotor/stator workhead where they are rapidly disintegrated.



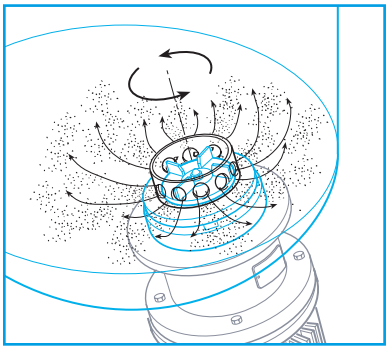
Stage 2

Centrifugal force drives the materials towards the periphery of the workhead, where they are subjected to intense high shear in the gap between the rotor and stator wall. The product is forced out of the stator and projected radially back into the body of the mix.



Stage 3

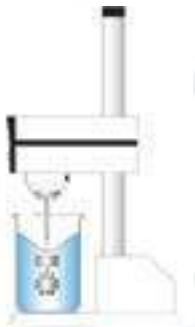
Fresh materials are simultaneously drawn into the workhead. In a short mixing cycle all the material passes many times through the workhead, producing a smooth, uniform mixture.



The Advantages

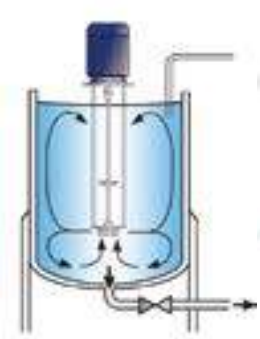
- Rapid disintegration and pulping of solids and incorporation of any powdered ingredients.
- Capable of blending liquids of widely differing viscosities.
- Interchangeable workheads available from coarse disintegrating heads to ultra-fine screens, allowing the user to obtain the desired consistency.
- Consistent, repeatable results.
- Scalable results across the entire Silverson product range.

The batch size, formulation, type of ingredients and the viscosity of the end product dictates which Silverson model is best suited to processing requirements:



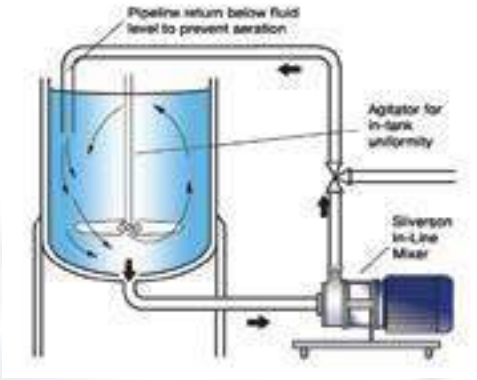
High Shear Laboratory Mixers

- Built to the same tolerances as production models, providing easy and accurate means of scaling up
- Duplex assembly available for disintegration of solids



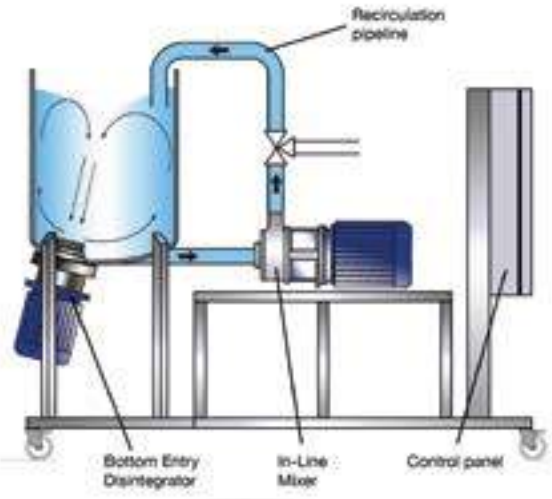
High Shear Batch Mixers

- Suitable for batches of up to 1000 litres
- Can be used on mobile floor stands
- Duplex mixers available for disintegrating larger solids



High Shear In-Line Mixers

- Ideal for larger batches
- Suitable for blending of purées via a manifold just prior to the inlet
- Provides finished smooth consistency to the product
- Easily retrofitted to existing plant
- Self-pumping
- Aeration free
- High Viscosity models available
- Designed for Cleaning-In-Place



Silverson Blending Plant

- A complete system capable of disintegrating large solids without pre-treatment
- The Bottom Entry mixer provides the initial disintegration of the solids
- The In-Line mixer further refines the product to give the required smooth consistency

For more information click here to go to www.silverson.co.uk

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Issue No. 66FE1

Solutions for Your TOUGHEST
MIXING Applications in
FOOD

Soft Drink Manufacture - Dispersion and Hydration of Functional Ingredients

SILVERSON
THE FIRST NAME IN HIGH SHEAR MIXERS

Soft Drink Manufacture
- Dispersion and Hydration of Functional Ingredients

Ingredients such as gums, starches, alginates, etc. are found in many soft drinks including fruit juices, squashes, flavoured milks and carbonated drinks. These "functional" ingredients make up a very small percentage of the overall formulation, but contribute vital properties:

- **Thickening**: Allowing the formulator to obtain the desired viscosity and texture (known as "mouthfeel"). Particularly important with low calorie or sugar free products where the bulking effect of sugar must be replaced. Many different products are used, including xanthan gum, pectin, etc.
- **Stabilising**: To keep particles (e.g. fruit pulp) in suspension. Several products are used e.g. CMC, starches, propylene glycol alginates (PGA), pectin and gums such as guar and gum arabic. Carrageenan is used to stabilise cocoa in milk drinks (covered in a separate report). Many of these ingredients will provide both thickening and stabilising effects.

The Process

Depending on the scale of production, the thickeners/stabilisers may be dispersed directly into the batch, or separate premixes may be prepared for use in a variety of products. In either case, to obtain functionality from these products, they must be correctly dispersed and hydrated. A number of process requirements must be met in order to achieve this:

- The powder/liquid blending system must be capable of incorporating powders and dispersing them throughout the contents of the mix.
- The powders must be fully hydrated to maximise yield.
- Some products are not "activated" unless particles are "individualised."
- A high degree of shear is sometimes required to activate some products and fully hydrate them.
- Some ingredient types require heating in order to hydrate.

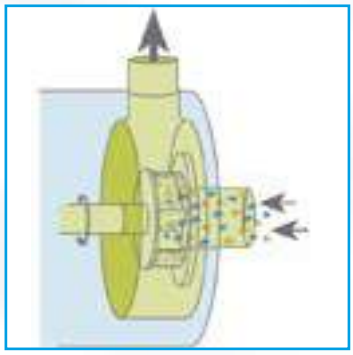
The Problem

Hydration of gums and thickeners is one of the most difficult mixing operations. When using conventional agitators, a number of problems can arise:

- Powder must be added at a controlled rate to reduce formation of lumps.
- Conventional agitation systems do not produce sufficient shear to break agglomerates down.
- Premixing of powders, (normally with sugar) is often carried out to reduce agglomeration; this increases costs and time.
- Where concentrates of functional ingredients are being prepared, the viscosity increases appreciably, making mixing more difficult.
- Long processing times can be required to properly disperse the powders and complete hydration.
- Incomplete hydration also reduces yield of raw materials.
- Many formulations contain unnecessarily high levels of these raw materials to compensate for poor yield and process inefficiency.

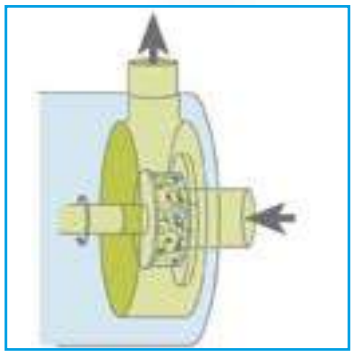
The Solution

A Silverson High Shear mixer can overcome these problems. The advantages stem from the three stage mixing/shearing action of the Silverson rotor/stator mixer. Operation is as follows:



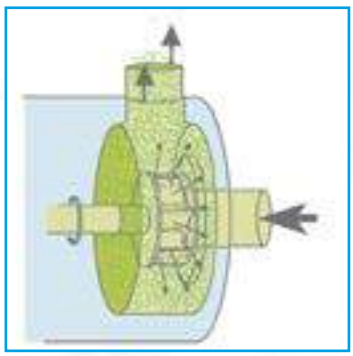
Stage 1

The vessel is charged with water and the mixer is started. Powder is added and rapidly incorporated into the water. The high speed rotation of the rotor blades creates a powerful suction which draws the liquid and powdered ingredients into the workhead.



Stage 2

The particles are deagglomerated in the gap between the rotor and stator. The product is forced out of the stator and projected radially back into the body of the mix as fresh ingredients are drawn into the workhead. All the powder is rapidly absorbed and dispersed.



Stage 3

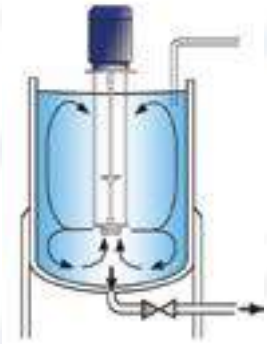
In a short mixing cycle all the material passes through the workhead, progressively reducing the particle size and exposing an increasing surface area to the surrounding liquid, accelerating the hydration process.

The Advantages

- Dramatic reduction in mixing times.
- Agglomerate-free mix.
- Dry premixing is not required.
- Maximised yield.
- Ability to start up or stop process quickly for processing of ingredients on demand.
- Consistent product quality and repeatability.
- Improved vessel hygiene.

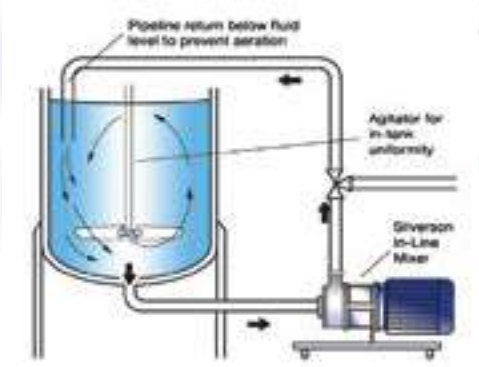
There are several products in the Silverson range suitable for this application, the selection of which is dictated by individual process requirements including batch size:

High Shear Batch Mixers



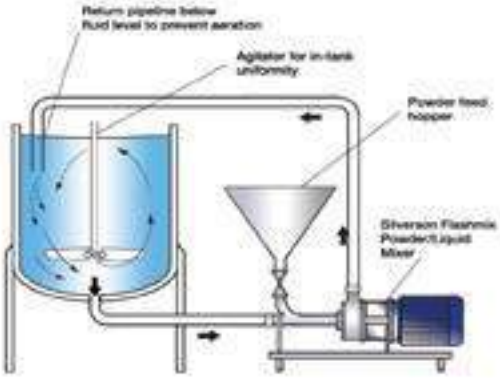
- Suitable for batch sizes up to 1000 litres
- Many units can be used on mobile floor stands
- Small units available for R&D and pilot production

High Shear In-Line Mixers



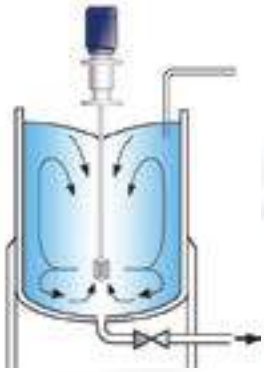
- Ideal for larger batches
- Aeration free
- Easily retrofitted to an existing plant
- Self-pumping
- Can be used to discharge vessel
- Ultra Hygienic models available

Silverson Flashmix



- Ideal for larger batches
- Capable of rapidly incorporating large volumes of powders
- Minimised aeration
- Minimised cleaning requirements
- Minimum operator input required
- Suitable for higher viscosity mixes
- Suitable for operation at higher temperatures

Silverson Ultramix



- Excellent in-tank movement
- Capable of rapidly incorporating large volumes of powders
- Ultra Hygienic CIP design
- Ideal for higher viscosity mixes
- Low maintenance

For more information click here to go to www.silverson.co.uk

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Issue No. 45FE4

Solutions for Your TOUGHEST
MIXING Applications in
FOOD

Soft Drink Manufacture - Preparation of Sugar Syrups

SILVERSON
THE FIRST NAME IN HIGH SHEAR MIXERS

Soft Drinks Manufacture - Preparation of Sugar Syrups

The sugar content of carbonated and still soft drinks varies considerably according to whether the product is to be supplied ready to drink, or as a concentrate (often referred to as a "syrup"). A typical formulation would also contain flavouring or concentrated fruit juice, acidity regulators, preservatives, stabilisers, antioxidants and colouring. With "Diet," and other "sugar-free" drinks the sugar content is replaced with artificial sweeteners such as Aspartame (covered in a separate report).

The Process

One of the first stages in a typical manufacturing process is preparation of a sugar syrup. Sugar is used in either granulated or liquid form. Liquid sugar simply requires blending with water, however when granulated sugar is used, a number of processing factors must be considered:

- Small scale production of syrups with a low sugar content can be carried out at ambient temperature. However with some concentrated products, sugar solutions at 60% or above are not uncommon, requiring heating of the water to aid dissolving.
- In large scale operations, heating to around 35˚C (95˚F) may be carried out to speed up dissolving.
- Other powdered ingredients may be dry premixed with part of the sugar, which helps to prevent them from agglomerating and "weights" light powders which tend to float.

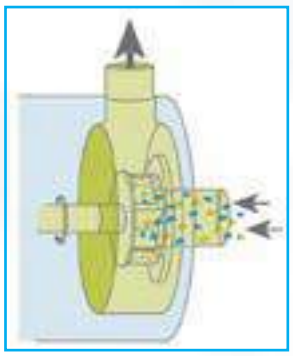
The Problem

- Liquid sugar can be considerably more expensive than granulated sugar.
- Dissolving of granulated sugar by simple agitation is a slow process.
- Conventional agitators cannot dissolve high concentrations of sugars at ambient temperatures.
- Heating the water to aid solution adds to costs and is energy inefficient.
- The cooling process further adds to costs and process time.
- Crystallisation of the syrup can occur during heating/cooling.
- Incomplete solubilisation can lead to sedimentation or even blocking of vessel outlets.

The Solution

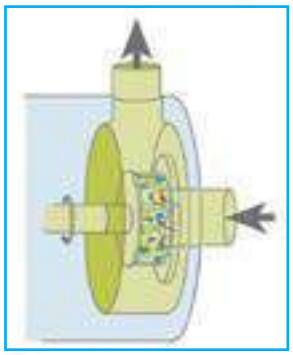
A Silverson High Shear Mixer can substantially reduce mixing times and eliminate the need for heating the water.

This can be achieved with in-tank Batch Mixers or by adding a Silverson In-Line Mixer to the existing process. This operates as follows:



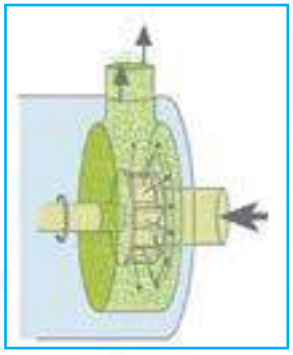
Stage 1

The high speed rotation of the rotor blades creates a powerful suction which draws the water and sugar granules from the vessel into the workhead.



Stage 2

Centrifugal force drives the materials to the periphery of the workhead where they are subjected to a milling action in the gap between the rotor and the stator wall.



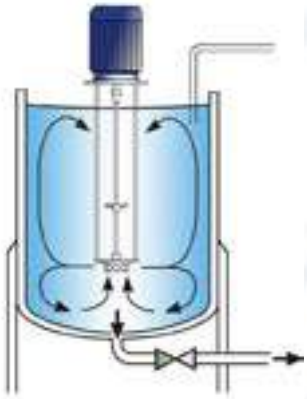
Stage 3

The product is forced out through the stator as fresh materials enter the workhead. In a short mixing cycle all the material passes through the workhead, progressively reducing particle size and exposing an increasing surface area of sugar to the surrounding liquid, accelerating the dissolving process.

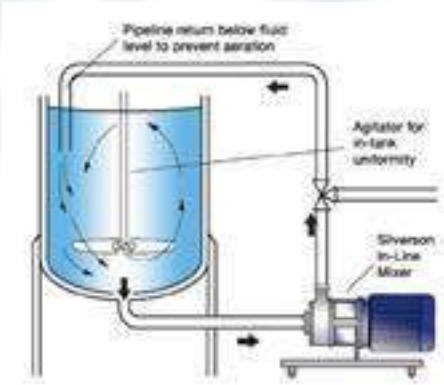
The Advantages

- The combination of granule size reduction and vigorous mixing dramatically reduces mixing times.
- A 66% sugar syrup can be produced at ambient temperature.
- Increased versatility allows the manufacturer to use sugar in granulated or syrup form.
- A Silverson mixer can also disperse and hydrate thickening and stabilising agents such as CMCs and Xanthan gum in a fraction of the time taken by other means.

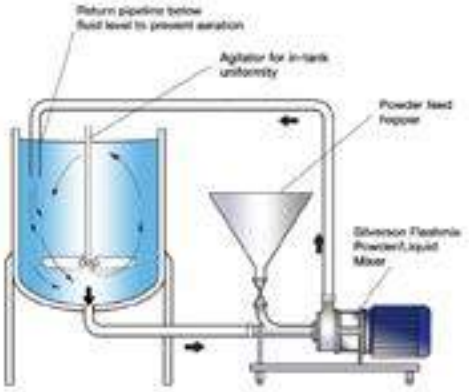
There are several products in the Silverson range suitable for this application, the selection of which is dictated by individual process requirements including batch size.



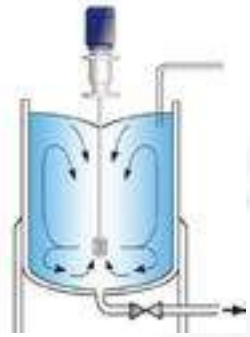
High Shear Batch Mixers
- Suitable for batch sizes up to 1000 litres
- Many units can be used on mobile floor stands
- Small units available for R&D and pilot production



High Shear In-Line Mixers
- Ideal for larger batches
- Aeration free
- Easily retrofitted to an existing plant
- Self-pumping
- Can be used to discharge vessel
- Ultra Hygienic models available
- Higher Viscosity models available



Silverson Flashmix
- Ideal for larger batches
- Capable of rapidly incorporating large volumes of powders
- Minimised aeration
- Minimised cleaning requirements
- Suitable for higher viscosity mixes
- Suitable for operation at higher temperatures
- Minimum operator input required



Silverson Ultramix
- Ultra hygienic CIP design
- Excellent in-tank movement
- Capable of rapidly incorporating large volumes of powders
- Ideal for higher viscosity mixes
- Low maintenance

For more information click here to go to www.silverson.co.uk

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Issue No. 22FE4

Solutions for Your TOUGHEST MIXING Applications in

FOOD

Soft Drink Manufacture - Dispersion of Artificial Sweeteners

SILVERSON
THE FIRST NAME IN HIGH SHEAR MIXERS

Soft Drinks Manufacture - Dispersion of Artificial Sweeteners

"Low Calorie","Sugar-free", or "Diet" soft drinks are formulated with artificial sweeteners such as Aspartame, Acesulfame K and Saccharin. These ingredients are more expensive than the sucrose sugar used in "original" formulations, however a small percentage of artificial sweetener can replace a high sugar content. A disadvantage is that they cannot replicate the viscosity and texture (properties known as "mouthfeel") of sugar based formulations and thickening agents such as CMC are often added to compensate for this.

The Process

In small scale production, liquid sweetener may be used, simply requiring blending with the water. Alternatively powdered sweetener is dispersed along with other powdered ingredients on an individual batch basis. Larger scale operations typically make up a dispersion of sweetener in bulk which is held in a vessel before use, or blended on stream with the remaining ingredients.

In each case, a number of processing factors must be considered:

- Some artificial sweeteners do not dissolve easily.
- Heating may be required to aid solubilising.
- Mixing equipment must be capable of rapidly incorporating the powders, which are very fine and have a tendency to float or "raft" on the surface of the base liquid.

The Problem

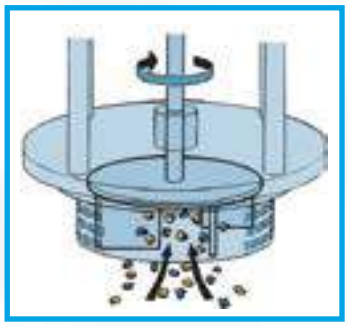
Although easier to use, liquid sweetener is considerably more expensive than powdered forms.

When dissolving powder with conventional agitators, a number of difficulties can be experienced:

- Even with heating, dissolving by simple agitation is a slow process.
- Heating of the mixture to aid solution is energy inefficient.
- The cooling process further adds to costs and process time.
- Wastage due to incomplete dissolving and build up of material on the vessel walls and parts of the agitator adds to costs.
- Dusting must be minimised to prevent waste and potential Health & Safety problems.

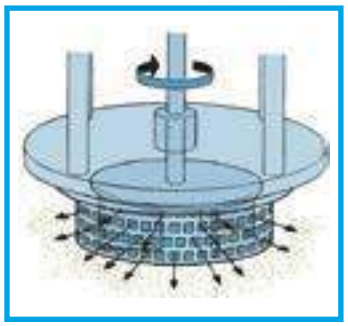
The Solution

A Silverson High Shear mixer can overcome these problems. The 3 stage mixing cycle accelerates the dissolving process as follows:



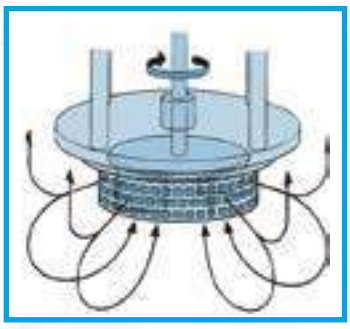
Stage 1

The vessel is charged with liquid and the mixer is started. The high speed rotation of the rotor blades creates a powerful suction which draws the liquid and powdered ingredients into the workhead where they are rapidly mixed.



Stage 2

The particles are reduced in the gap between the rotor and stator wall. The product is forced out of the stator and projected radially back into the body of the mix as fresh ingredients are drawn into the workhead.



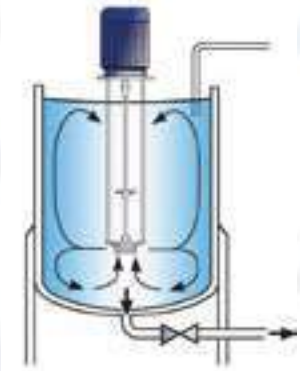
Stage 3

In a short mixing cycle all the material passes through the workhead, progressively reducing the particle size and exposing an increasing surface area to the surrounding liquid, accelerating the dissolving process.

The Advantages

- Dramatic reduction in mixing times.
- Heating is not required.
- Maximised yield.
- Sweeteners can be added along with other powdered ingredients - premixing is not necessary.
- Sweeteners will be wetted and other ingredients fully hydrated in one operation.
- Improved vessel hygiene.

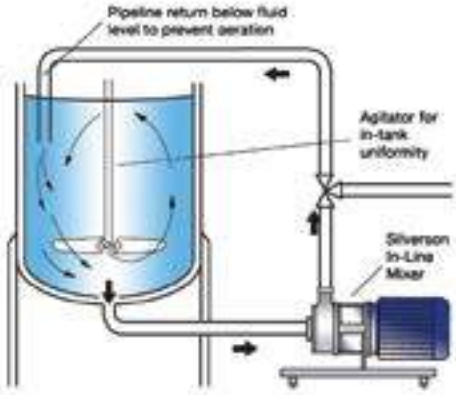
There are several products in the Silverson product range suitable for this application, the selection of which is dictated by individual process requirements including batch size.



High Shear Batch Mixers

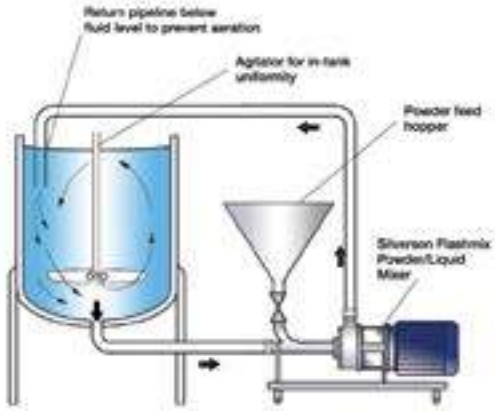
- Suitable for batch sizes up to 1000 litres
- Many units can be used on mobile floor stands
- Small units available for R&D and pilot production

High Shear In-Line Mixers



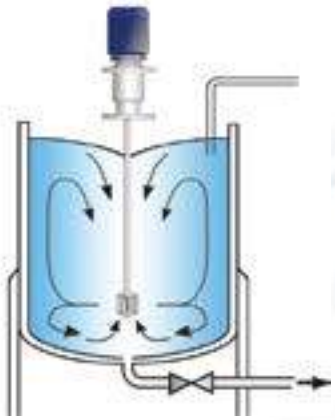
- Ideal for larger batches
- Aeration free
- Easily retrofitted to an existing plant
- Self-pumping
- Can be used to discharge vessel
- Ultra Hygienic models available
- High Viscosity models available

Silverson Flashmix



- Ideal for larger batches
- Capable of rapidly incorporating large volumes of powders
- Minimised aeration
- Minimised cleaning requirements
- Suitable for higher viscosity mixes
- Suitable for operation at higher temperatures
- Minimum operator input required

Silverson Ultramix



- Excellent in-tank movement
- Capable of rapidly incorporating large volumes of powders
- Ultra Hygienic CIP design
- Ideal for higher viscosity mixes
- Low maintenance

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Issue No. 23FE4

Solutions for Your TOUGHEST
MIXING Applications in
FOOD

Brewing Industry - Dispersion of Filter Aid Powders

SILVERSON
THE FIRST NAME IN HIGH SHEAR MIXERS

Brewing Industry - Dispersion of Filter Aid Powders

Before racking into containers most beer, particularly lager, is filtered to remove yeast and other solid matter in suspension. This reduces the storage period required to naturally clarify the beer and improves the stability and shelf life. The most commonly used filter aid (or filter media) is synthetic amorphous silica (silicon dioxide) generally referred to as kieselguhr, available under various trade names.

The Process

A suspension of powdered kieselguhr in water is prepared in a separate vessel before being introduced to the filter. The solids content can be varied according to the required dosage for the particular type of beer.

A typical manufacturing process for a kieselguhr preparation using conventional agitators would be as follows:

- The vessel is charged with water.
- The agitator, positioned so as to create a vortex, is started.
- The powder is slowly added into the vortex.
- Mixing is continued to allow the powder to become fully dispersed and to maintain the solids in suspension.

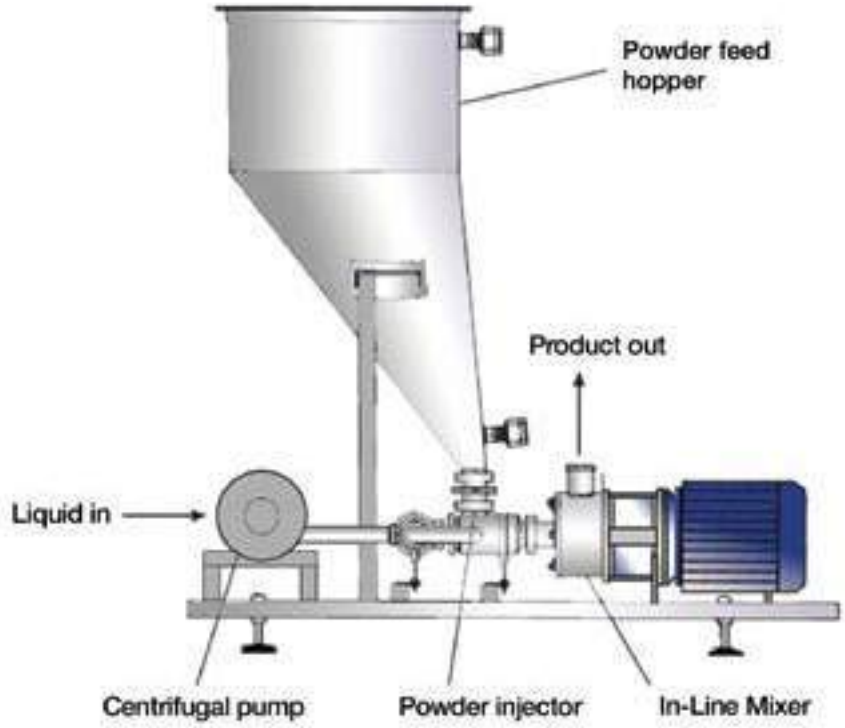
The Problem

A number of problems can be encountered when using conventional agitators:

- Kieselguhr has an extremely low density and can create considerable dust emissions.
- The powder tends to float. Vigorous agitation is required to incorporate the powder into the water, which aggravates the dust problem and increases oxygenation.
- Powder addition rate must be carefully controlled to prevent lump formation.
- Agglomerates must be reduced to a fine particle size to create a stable suspension. The washing action of an agitator cannot achieve this.
- Long mixing times are required to complete dispersion/suspension.

The Solution

Processing times can be dramatically reduced and product quality improved by using a Silverson Flashblend. This operates as follows:



Stage 1:
Water is drawn from the vessel by the centrifugal pump and passes through the venturi assembly into the In-Line mixer. The high velocity flow through the venturi creates a vacuum in the chamber below the powder hopper. The water is returned to the vessel by the self-pumping In-Line mixer.

Stage 2:
The powder is fed into the specially designed hopper. Once the water is recirculating the powder feed valve is opened. The powder is drawn into the venturi, where the water and powder streams are instantly mixed and pass immediately to the inlet of the high shear In-Line mixer.

Stage 3:
The liquid and solids are subjected to intense high shear in the workhead of the In-Line mixer. When powder addition is complete the bypass valve is opened, switching the Flashblend to high speed recirculation mode. The entire contents of the vessel pass through the Flashblend in a short mixing cycle, ensuring hydration is rapidly completed.

The Advantages

The Flashblend offers a number of advantages over conventional systems:

- Greatly reduced processing times.
- Rapid incorporation of large volumes of powders.
- Improved consistency and repeatability.
- Controlled powder addition rate.
- Minimum operator input required.
- Minimised cleaning requirements - the Flashblend is designed to be Cleaned-In-Place (CIP).
- Designed to be easily automated and linked to process computers.
- Reduced dust emissions - the Flashblend can also be integrated with dust extraction systems.
- Powder incorporation systems can be custom built to suit individual customer requirements.
- Can be integrated with bulk powder dispensing systems e.g. Big Bags (FIBC's).
- Optional hopper flow aids available for difficult powders.

For more information click here to go to www.silverson.co.uk
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Issue No. 16FE4

Solutions for Your TOUGHEST
MIXING Applications in
FOOD

Brewing Industry - Dispersion of Beer Foam Head Retaining Agents

SILVERSON
THE FIRST NAME IN HIGH SHEAR MIXERS

Brewing Industry - Dispersion of Beer Foam Head Retaining Agents

Ingredients such as propylene glycol alginate (PGA) may be added to beer to stabilise the foam head and to aid resistance to breakdown of foam in the presence of detergent residues or grease on the glass.

The Process

PGA is dispersed in water (referred to as “liquor” in the brewing industry) before being added to the beer. A typical dispersion process using conventional mixers would be as follows:

- The vessel is charged with water.
- The mixer is started.
- The alginate is added gradually into the vortex and dispersed into the water.
- Mixing continues for up to an hour (depending on batch size) to ensure thorough dispersion.
- The solution is then left to stand for several hours to allow hydration to be completed.
- The mixer is run for a further period to ensure the solution is homogeneous.
- Pasteurisation may be carried out to destroy any microorganisms.

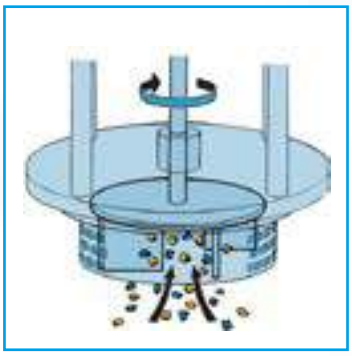
The Problem

Dispersion of this type of powder is one of the most difficult of all mixing operations. A number of problems are frequently encountered when using conventional mixers:

- PGA tends to agglomerate. Partially hydrated material on the outside of the agglomerate prevents dry particles inside from being exposed to the surrounding liquid and dissolved. Conventional agitators do not produce sufficient shear to break these down.
- Long mixing times are required to obtain the required dispersion/solution.
- Powder has to be added under controlled (labour intensive) conditions to prevent lump formation and scumline on the vessel.
- Once viscosity increase or gelling has started to occur, agitation of the solution and therefore dispersion of powder becomes increasingly difficult.
- Aeration must be avoided to prevent foaming, as owing to the nature of the product, the foam is difficult to disperse.

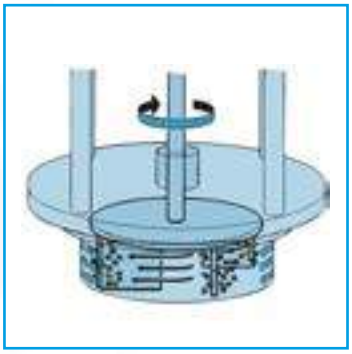
The Solution

By using a Silverson mixer, intermediate stages of production can be eliminated, product quality improved and processing times dramatically reduced as follows:



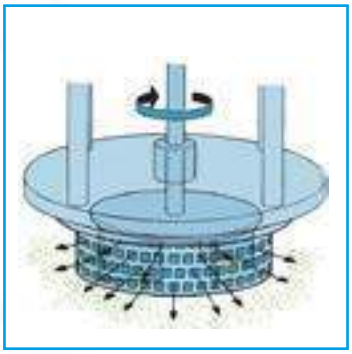
Stage 1

The vessel is charged with the required amount of water. The Silverson mixer is started and the alginate is added all at once as rapidly as possible. The high speed rotation of the rotors creates a powerful suction which draws the water and alginate particles into the workhead.



Stage 2

The materials are subjected to intense shear within the workhead. Any agglomerated particles are fully broken down in the clearance between the ends of the rotor blades and the stator wall. The product is then forced out through the stator and returned to the mix.



Stage 3

Fresh liquid and powdered ingredients are simultaneously drawn into the workhead, maintaining the mixing cycle. In a short time the product passes through the workhead many times, ensuring that thorough dispersion is rapidly completed.

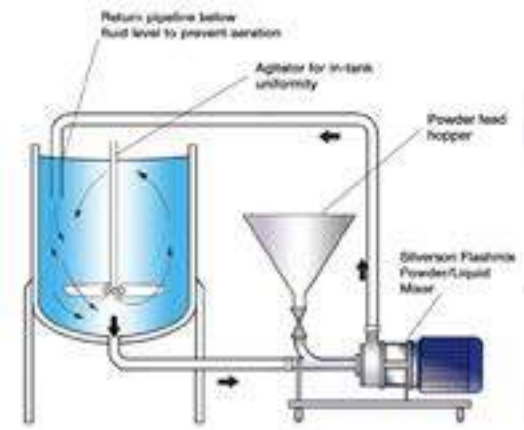
The Advantages

- Dramatically reduced mixing times.
- Rapid powder addition rate eliminates operator error.
- Consistent product quality.
- Agglomerate-free mix.
- Stable viscosity of end product.
- Thickening/gelling effect of the alginate is maximised.
- Reduced aeration and oxygenation due to shorter mixing times.

The Silverson mixer to be used is determined by the batch size, formulation, type of ingredients used and the viscosity of the end product:

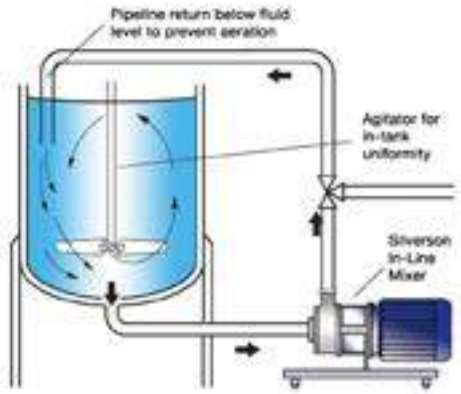
Silverson Flashmix

- Ideal for larger batches or repeated smaller batches
- Capable of rapidly incorporating large volumes of powders
- Minimised aeration
- Minimised cleaning requirements
- Suitable for higher viscosity mixes
- Suitable for operation at higher temperatures
- Controlled powder addition rate
- Minimum operator input required



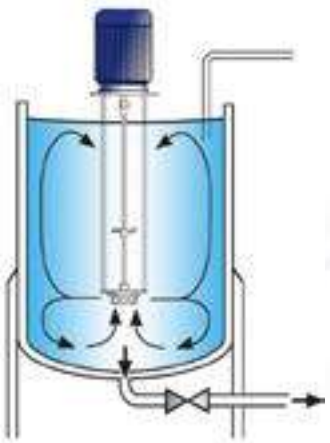
High Shear In-Line Mixers

- Easily retrofitted to existing plant
- Ideal for larger batches
- Aeration free
- Self pumping
- Can be used to discharge vessel
- Ultra Hygienic models available



High Shear Batch Mixers

- Suitable for batches of up to 1000 litres
- Can be used on mobile floor stands
- Can easily be moved from vessel to vessel



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Issue No. 17FE4

Solutions for Your TOUGHEST
MIXING Applications in
FOOD

Brewing Industry - Preparation of Isinglass Finings

SILVERSON
THE FIRST NAME IN HIGH SHEAR MIXERS

Brewing Industry - Preparation of Isinglass Finings

Lager beer is brewed using “bottom fermenting” yeast which sinks during fermentation. A storage period follows to ensure all the yeast has sunk to the bottom. Demands for a shorter storage period and increased productivity in large-scale breweries has led to the use of finings to accelerate sedimentation.

The use of isinglass finings was originally confined to traditional British and Irish beers, brewed with “top fermenting” yeast which rises during fermentation. Spent yeast and other solids are precipitated by the addition of finings, either in the barrel (with traditional “cask conditioned” beer) or in bulk prior to filtering.

Isinglass is a protein obtained from several varieties of fish. When added to the beer, the isinglass particles attract the yeast and tannins. The finings sink to the bottom, precipitating the solids to leave the beer clear and bright.

The Process

Isinglass can be supplied in a number of forms:

- Ready-to-use liquid.
- Concentrated liquid.
- Dried floculated particles.
- Powder.
- Freeze-dried powder/granules.

Although liquid forms are easy to use, there are advantages in buying finings in dried form:

- Improved shelf life and temperature tolerance.
- Solutions can be prepared to meet demand.
- Reduced storage requirements.
- Formulation can be adjusted to give optimum results in a particular type of beer.

Solutions are generally prepared separately before addition to the beer. A typical process using a conventional agitator would be as follows:

- The vessel is charged with liquor and the agitator is started.
- Flocked/powdered isinglass is gradually added to the liquor.
- Mixing continues for several hours to ensure hydration is completed.
- Further dilution may be required to give the desired working viscosity.

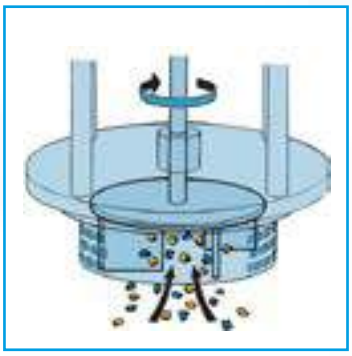
The Problem

A number of problems can be encountered when using conventional agitators:

- Potential full yield is difficult to obtain using traditional methods.
- Isinglass flakes have a low density and can create a severe dust problem.
- Floculated product is difficult to wet out, tending to float on the surface of the liquor.
- The vigorous agitation required to incorporate the isinglass can aggravate the dust problem and can cause foaming.
- Partially hydrated isinglass can build up on the vessel wall and the agitator.
- Long periods of soaking are required to complete hydration.

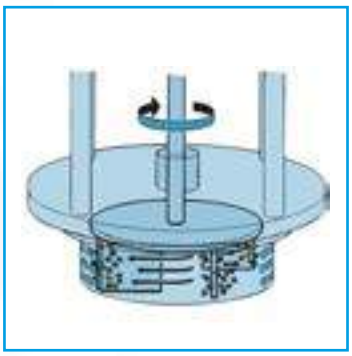
The Solution

Isinglass preparations can be made in a single step without the need for extended soaking by using a Silverson mixer. Operation is as follows:



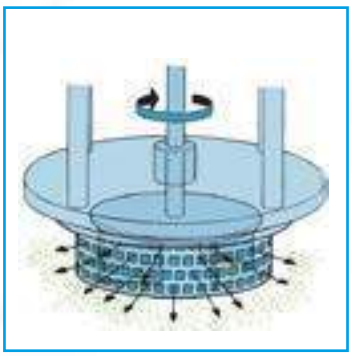
Stage 1

The vessel is charged with the required amount of liquor. The mixer is started and the isinglass is added. The high speed rotation of the rotor creates a powerful suction which draws water and the isinglass particles into the workhead.



Stage 2

The materials are subjected to intense shear within the workhead. Any agglomerated particles are fully broken down in the clearance between the ends of the rotor blades and the stator wall.



Stage 3

The product is forced out through the stator and projected back into the main body of the mix as fresh material is simultaneously drawn into the workhead. The entire contents of the vessel pass through the workhead in a short mixing cycle, ensuring hydration is rapidly completed.

The Advantages

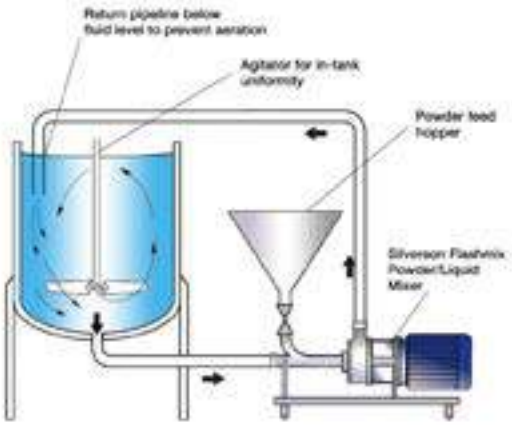
This offers a number of advantages over conventional processing methods:

- Significantly better yield than can be obtained by traditional methods.
- Dramatically reduced processing times.
- Improved product quality and consistency.
- Stable finished product.
- Improved vessel hygiene.

The batch size, formulation, type of ingredients and the viscosity of the end product dictates which machine from the Silverson product range is suited to individual processing requirements:

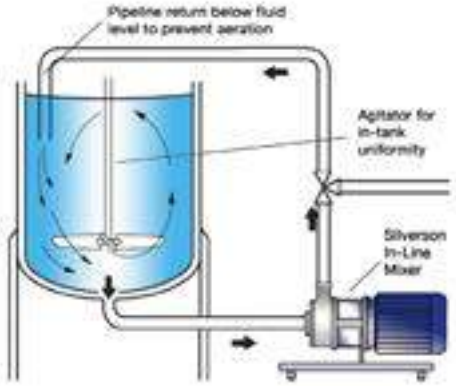
Silverson Flashmix

- Suitable for free-flowing powdered isinglass
- Ideal for larger batches
- Capable of rapidly incorporating large volumes of solids
- Minimised aeration
- Minimum operator input required
- Minimised cleaning requirements
- Controlled powder addition rate
- Dust extraction systems available
- Ultra Hygienic models available



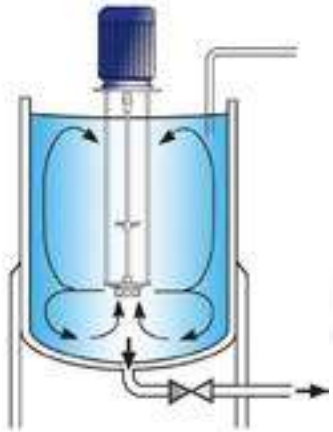
High Shear In-Line Mixers

- Suitable for floculated and powdered isinglass types
- Must be used in conjunction with an efficient in-tank agitator to wet out powder as illustrated
- Ideal for larger batches
- Aeration free
- Easily retrofitted to existing plant
- Self-pumping
- Can be used to discharge vessel
- Ultra Hygienic models available



High Shear Batch Mixers

- Suitable for floculated and powdered isinglass types
- Suitable for batches of up to 1000 litres
- Can be used on mobile floor stands
- Can easily be moved from vessel to vessel



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Issue No. 12FE4

Catálogo de Productos

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