



# GEA MIXING FORMULA<sup>®</sup> High Shear Mixers

The most versatile mixing  
system available



## GEA MIXING FORMULA® High Shear Mixers

Mixing is one of the most demanding unit operations in today's process industries and a critical step in the production of high-quality end products.

Affecting both batch cycle times and total cost of ownership, selecting the most appropriate mixing technology is crucial.

GEA has a wealth of experience in supplying solutions for liquid/liquid and liquid/powder blending. We supply numerous different batch and continuous mixing and blending systems to the hygienic process industries and beyond. Our scope of supply includes both standard units as well as in-house custom-designed systems for a wide variety of applications.

Continuous mixing solutions are often the preferred choice when high product throughputs are required or

a considerable amount of automation is involved. GEA can also supply the most appropriate and compliant process technology, unit or complete mixing solution.

GEA offers mixing solutions that are versatile, hygienic and also suitable for multipurpose manufacturing, including high shear batch mixing, continuous inline blending, continuous inline mixing and modular or bespoke processing solutions. We also supply a wide range of liquid handling solutions, from components to equipment and complete process lines for use in home care production plants.



# GEA INLINE FORMULA® SOL High Shear Mixer

The unique and extremely versatile GEA INLINE FORMULA® SOL High Shear Mixer can be used to improve an existing production line or replace existing equipment. More than just a tank with a bottom-mounted high shear mixing device, the customizable multirotor integrated in the GEA INLINE FORMULA® SOL High Shear Mixer comprises a high shear mixing device for effective dispersion and a centrifugal pump that feeds the downstream process.

Concept of the INLINE FORMULA® SOL High Shear Mixer is based on two different working principles - the one-pass process vs the multi-pass process (as illustrated).

Typical applications include beverages, such as juice, soft drinks and dairy products such as recombined milk, nutritional formula.

The advantages of using the INLINE FORMULA® SOL High Shear Mixer are among others:

- A continuous process that can run inline with the downstream process
- Just-in-time production – preparation of the batch at the time needed
- No or only short product storage time of the mixed product before further processing

## Computational Fluid Dynamics

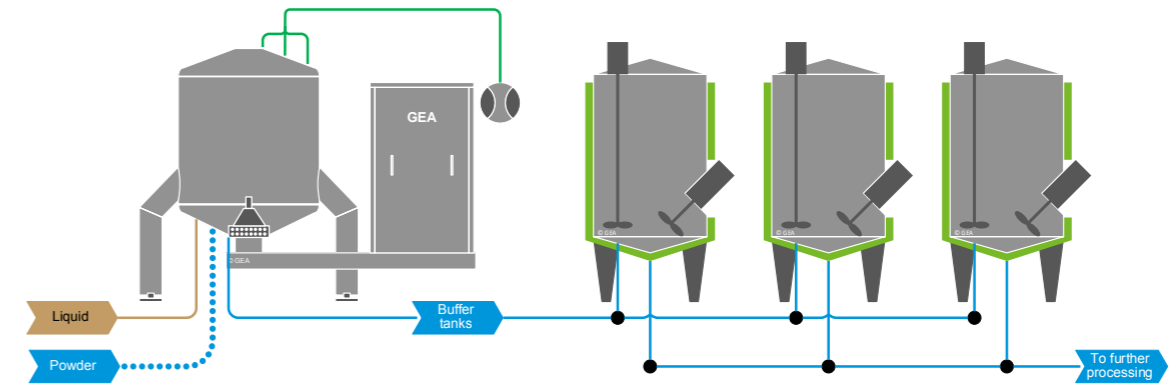
To optimize the design and functionality of the INLINE FORMULA® SOL High Shear Mixer, GEA scientists looked to Computational Fluid Dynamics (CFD) to create a virtual prototype of the machine. By running simulations of the flow of ingredients within the INLINE FORMULA® SOL High Shear Mixer, it was possible to develop a more detailed understanding of the process and analyze certain key parameters required to achieve a product with the desired structure.

Using this information, GEA was able to both increase the performance of the INLINE FORMULA® SOL High Shear Mixer and reduce its power consumption, making it even more effective and cost-efficient.



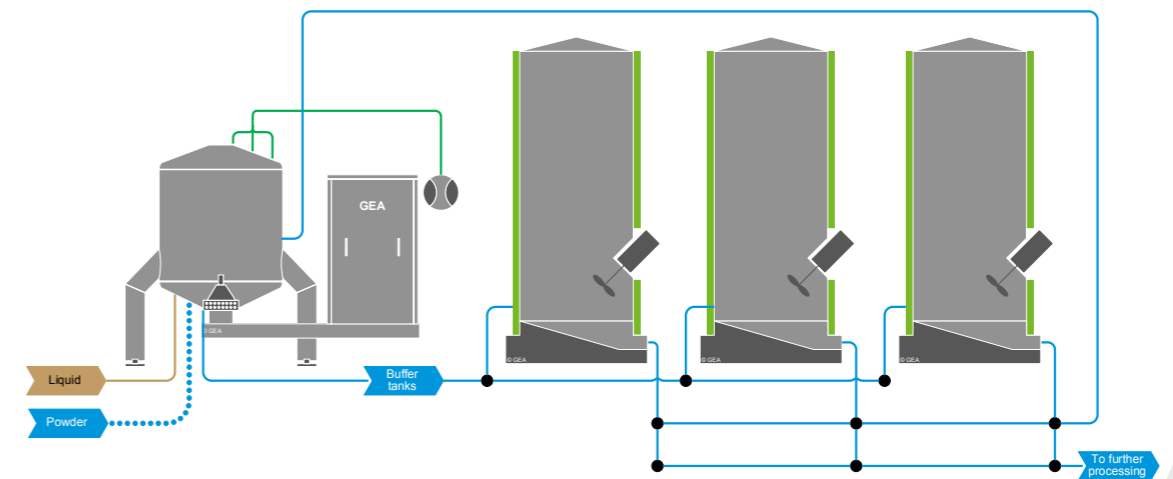
## Inline mixing - one-pass process

GEA INLINE FORMULA® SOL High Shear Mixer



## Inline mixing - multi-pass process

GEA INLINE FORMULA® SOL High Shear Mixer



# GEA BATCH FORMULA® PRO High Shear Mixer

Placed at the bottom of the tank, without needing a recirculation loop, the high shear mixing device integrated in the GEA BATCH FORMULA® PRO High Shear Mixer facilitates the production of uniform products.

As such, this one-pot processing solution decreases energy use, saves time and optimizes both clean-in-place (CIP) processes and manufacturing profitability.

The BATCH FORMULA® PRO High Shear Mixer benefits from

- high shear and no shear in the same tank
- rapid dissolution of powders into liquids without fish eyes or agglomerates
- stable suspensions
- gentle product handling
- hygienic design and total batch-to-batch drainage
- multiple application versatility for highly viscous products

In the BATCH FORMULA® PRO High Shear Mixer, powder is introduced via vacuum below the liquid surface to instantly wet the ingredients. Capable of handling difficult applications such as highly viscous products and/or those requiring micro-bubbles, the BATCH FORMULA® PRO High Shear Mixer is extremely flexible and is available with the following features:

- vacuum for the instant wetting and deaeration of powders
- dimple jacket
- direct steam injection
- flash cooling and/or evaporation by vacuum
- a wide range of stators and knives

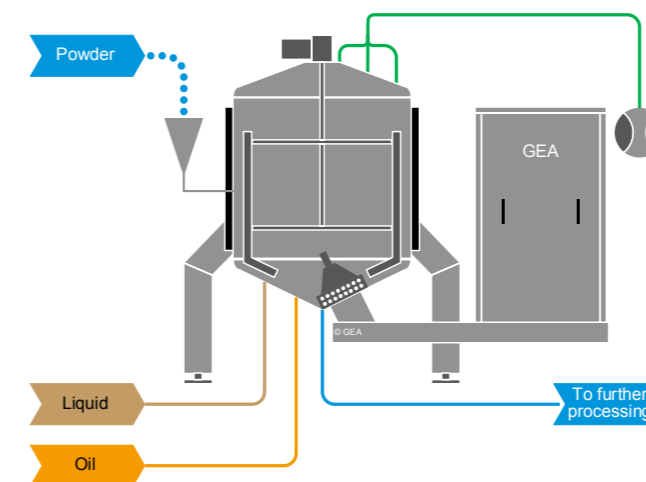
Typical applications include foodstuffs such as dressings, soups and peanut butter, household products such as detergent and window cleaners and personal care products such as creams, lotions, face masks and toothpaste.



Hygienic design and total batch-to-batch drainage

## Batch mixing

### GEA BATCH FORMULA® PRO High Shear Mixer



# Application overview

## Typical application differences between inline and batch mixing

Mixing of different products requires different ways of mixing. The below indicative list represents examples of production with the INLINE FORMULA® SOL High Shear Mixer and BATCH FORMULA® PRO High Shear Mixer. Please contact us with your specific product requirements for a customized process description.

### GEA INLINE FORMULA® SOL High Shear Mixer

One- or multi-pass mixing of easily dissolvable powders in liquid up to 700 cP.

- Milk recombination
- Juice concentration
- Beverage preparation
- Base slurries
- Nutritional formula

### GEA BATCH FORMULA® PRO High Shear Mixer

Batch process mixing of low- and high-viscosity products.

Results in a unique, homogeneous finished product – ready for filling.

- Fruit juice with pulp
- Coffee and chocolate beverage
- Mayonnaise and ketchup
- Soup concentrate
- Shampoo, cream and ointment
- Process cheese, cream cheese, liquid diet margarine



# World leader in mixing process solutions

GEA is one of the world leaders in providing technically advanced mixing process solutions for a wide range of applications. Our knowledgeable staff use good engineering practices and deliver completely integrated and reliable, hygienic mixer systems that meet the most stringent regulations.

From concept to pilot-scale trials and final analysis in on-site laboratories, our staff are available to consult with customers to determine the optimal process conditions for specific applications on a case-by-case basis.

### Optimize production with the GEA BATCH FORMULA® PRO High Shear Test Mixer

Providing an opportunity to optimize specific production processes on a small scale, the BATCH FORMULA® PRO High Shear Test Mixer is a cost-efficient option to trial and develop a formulation prior to investing in a standard, full-scale BATCH FORMULA® PRO High Shear Mixer.

As such, the BATCH FORMULA® PRO High Shear Test Mixer can also help to reduce valuable time-to-market. Small-scale tests can be done to clarify important process parameters, including when to add ingredients, temperature profile and run times, which expedites scale-up and process development.

For some customers, the BATCH FORMULA® PRO High Shear Test Mixer may simply be a stepping stone to full-scale manufacturing; for others, it's the ideal, cost-efficient, small-scale production solution.



# GEA Service – For your continued success

Working with GEA Service means partnering with a dedicated team of service experts. Our focus is to build, maintain and improve customer performance throughout the entire lifecycle of the plant and its equipment.

### Beginning of life services

Getting you started with seamless support for instant productivity and performance

### Lifetime services

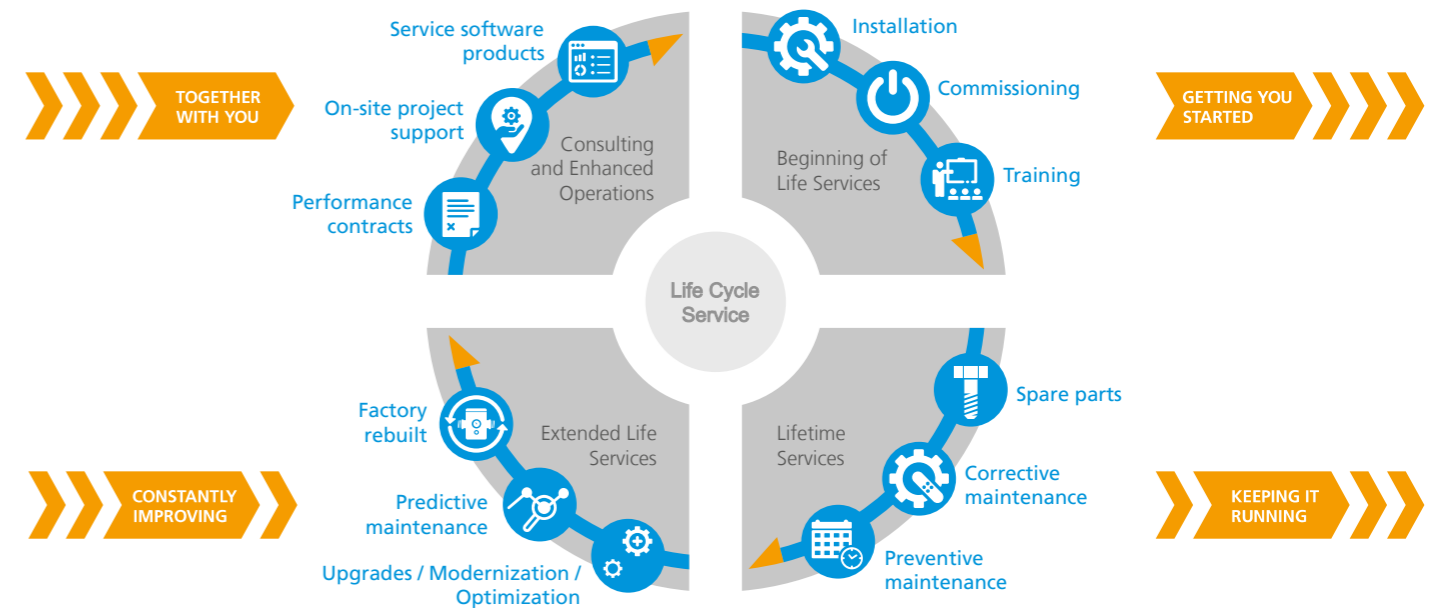
Keeping it running with the cost-efficient way of ensuring safety and reliability

### Extended life services

Constantly improving by sharing our knowledge to safeguard your investment

### Consulting & enhanced operations

Together with you by enduring commitment to you and your business



## We live our values.

Excellence • Passion • Integrity • Responsibility • GEA-versity

“Engineering for a better world” is the driving and energizing principle connecting GEA’s workforce. As one of the largest systems suppliers, GEA makes an important contribution to a sustainable future with its solutions and services, particularly in the food, beverage and pharmaceutical sectors. Across the globe, GEA’s plants, processes and components contribute significantly to the reduction of CO<sub>2</sub> emissions, plastic use as well as food waste in production.

GEA is listed on the German MDAX and the STOXX® Europe 600 Index and also included in the DAX 50 ESG and MSCI Global Sustainability indexes.

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