High-Pressure Pumps and Homogenizers

Leading Technologies. Individual Solutions.
Established in 1947, today Niro Soavi is an international leader in High-Pressure Pumping and Homogenization. It is part of GEA, a global technology leader with more than 150 operating companies worldwide.

Niro Soavi North America’s service, administration, and warehouse facilities are located in Bedford, New Hampshire. Niro Soavi North America has employed numerous regional sales and service engineers and technicians as well as regional spare parts stocking distributors – all part of the vision of being the best homogenizer partner in North America, in machine supply as well as service.

Niro Soavi North America is a full service technology center covering all your needs for units, systems, service and application development.

Niro Soavi North America is a reliable partner in your industry demonstrating an unmatched degree of application knowledge and expertise with more than 500 machines installed in North America and 5,000 worldwide.
Niro Soavi is a world leader in high pressure pumping and homogenization technology and offers an unparalleled range of high-efficiency machines i.e. operating pressures, flow rates and features to match your specific production and regulatory requirements.

- High-pressure pumps
- High-pressure homogenizers
- Homogenizing valves – including NanoValve® technology
- Homogenizer cGMP skid systems
- Homogenizer parts and spare parts
- Controls and automation

Special design features and options include:

- Pumping valves can be changed freely between poppet and ball valves depending on the application.
- First and second stage homogenizer valves are adaptable modular parts prepared for easy reconfigurations.
- Non aseptic machines can be upgraded to full aseptic design.
- Interchangeable pumping pistons (plungers) - chrome plated, tungsten carbide or ceramic.
- The ceramic pumping pistons are made of solid ceramic and can be turned around for usage at both ends. Thermal cracking is less likely to occur with solid ceramic as opposed to coated ceramic plungers.
- The homogenizer valve parts can be changed to suit your applications as they develop.
Niro Soavi technology can be used in numerous applications in the food, dairy, beverage, pharmaceutical and biotechnology industries. Thousands of Niro Soavi machines have been installed in these markets. Following are some of the main process applications all involving Niro core technologies.

...for Food, Dairy, and Beverage Industries

- Niro Soavi homogenization system, in aseptic design, integrates with UHT and HTST systems.
- Niro Soavi high-pressure pumping and homogenization system integrated with Niro evaporation and spray drying technologies.
- Niro Soavi high-pressure pumping integrates in meat and poultry high pressure processing systems.
- Niro Soavi VHP technology provides stable flavor emulsions for both liquid and solid flavor applications.
- Niro Soavi VHP technology enables the extraction of valuable nutraceuticals for health food formulations.
• Homogenization of cosmetic products in order to secure stable emulsions with micron level particle sizes and high water content.

• Homogenization of dispersions providing a stable and even distribution of particles.

• Niro Soavi VHP technology for high-efficient particle and cell rupture applications.

• Niro Soavi VHP technology for extraction of intracellular materials.

Note: Niro’s GEA Liquid Processing Group in Columbia, MD is the exclusive supplier of Niro Soavi’s range of cGMP high-pressure pumps, homogenizers, and homogenizer skid-mounted systems to the pharmaceutical and biotechnology industries.

Multi-purpose biotechnology cell rupture skid system
Testing

- Pilot plant testing facility.
- Comprehensive rental machine program including tabletop, pilot-, skid- and production size units.
- Particle size distribution analysis and digital photo analysis.

Baby lotion at 250 bar with 20% water added

Baby lotion at 250 bar

Baby lotion

Differential Volume

- Non-homogenized product
- Homogenized product

Before homogenization

After homogenization

Particle Diameter (micron)

Volume (%)
### Niro Soavi Machine Models
The relationship between capacity and operating pressures is given in the table below.

#### Metric Units (GB & US)

<table>
<thead>
<tr>
<th>Machine Model</th>
<th>Max. Foot Print</th>
<th>Max. Machine Size</th>
<th>Max. Pressures (bar)</th>
<th>Max. kW</th>
<th>Foot Print W x D mm</th>
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<tbody>
<tr>
<td>NS1001</td>
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<td>22,000</td>
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</table>

- **Model Maximum Flow Capacity (GPH):**
  - NS1001: 1,500
  - NS2002: 2,200
  - NS2002/60: 2,900
  - NS3006/18: 4,400
  - NS3011: 5,100
  - NS3015: 5,800
  - NS3024/18: 6,500
  - NS3037: 7,300
  - NS3075/45: 8,700
  - NS3075/55: 10,000
  - NS3011/90: 15,000
  - NS3015/50: 17,000
  - NS3037/30: 22,000

- **Machine Model Nomenclature:**
  - N: Niro
  - S: Soavi
  - 3: Number of pistons, e.g. 3
  - 0: Motor size, e.g. 75 kW (100 HP)
  - H: Homogenizer (H), High-Pressure Pump (P), Laboratory Unit (L)

- The capacity data are subject to updates and revisions.

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### Imperial Units (GB & US)

<table>
<thead>
<tr>
<th>Machine Model</th>
<th>Maximum Pressures (psi)</th>
<th>Max. Flow Capacity (GPH)</th>
<th>Max. HP</th>
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<td>NS3015/50</td>
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<tr>
<td>NS3075/55</td>
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</table>

- **Machine Size W x D inches:**
  - NS1001: 20 x 24
  - NS2002: 24 x 28
  - NS2002/60: 28 x 32
  - NS3006/18: 32 x 36
  - NS3011: 36 x 40
  - NS3015: 40 x 44
  - NS3024: 44 x 48
  - NS3037: 48 x 52
  - NS3075/45: 52 x 56
  - NS3075/55: 56 x 60

- **Model Maximum Flow Capacity (GPH):**
  - NS1001: 1,500
  - NS2002: 2,200
  - NS2002/60: 2,900
  - NS3006/18: 4,400
  - NS3011: 5,100
  - NS3015: 5,800
  - NS3024: 6,500
  - NS3037: 7,300
  - NS3075/45: 8,700
  - NS3075/55: 10,000

- **Machine Model Nomenclature:**
  - N: Niro
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- The capacity data are subject to updates and revisions.
Handling fluids under high pressure, up to 1,500 bar / 21,750 psi under continuous full-scale operation, is a technology in its own right. This incorporates the disciplines of machine design, strength of materials, and a significant fluid mechanical knowledge, which combines the highest skills in mechanical engineering and more than 50 years of expertise.

Homogenization is a fluid mechanical process that involves the subdivision of particles or droplets into micron sizes to create a stable dispersion or emulsion for further processing.

This is an important stage in the treatment for many products. It provides improved product stability, shelf life, digestion, and taste. Homogenizing can also significantly reduce the amount of additives required. It prepares feeds so that subsequent spray drying produces the best quality of powders. This is especially important for baby foods and many dairy and food products.

After homogenization, the particles are of a uniform size, typically from 0.2 to 2 micron, depending on the operating pressure. The homogenizer is the most efficient device for particle and droplet size reduction. The actual properties of the product vary with pressure and product type in a complex relationship. In general, higher processing pressure produces smaller particles.

The process occurs in a special homogenizing valve, the design of which is the heart of the homogenizing equipment. The fluid passes through a minute gap in the homogenizing valve. This creates conditions of high turbulence and shear, combined with compression, acceleration, pressure drop, and impact. Causing the disintegration of particles and dispersion throughout the product.
The patented NanoValve® enables homogenization in standard milk applications to take place at a lower homogenizing pressure through a more efficient valve design for low pressure and a high flow rate application.

A properly designed positive displacement pump is crucial to the homogenization process. This involves Finite Element Method (FEM) and Finite Volume Method (FVM) for mechanical structure and fluid mechanical analysis. A constant sourcing of the best stainless steel, high alloy compositions and new ceramic materials enables the incorporation of highly abrasive resistant and durable components.

Operating continuously at full industrial scale from 600 to 1,500 bar (8,700 to 21,750 psi) requires a unique mechanical design. Niro Soavi identifies this class of machines as VHP (Very-High-Pressure).

The special Niro Soavi rupture type (R-type) valve is particularly suitable for cell rupture applications. This proprietary Niro Soavi technology can also be applied to existing production units in order to improve performance on old machines.

The Soavi crankcase is heavy duty cast iron, containing the power end components that create the reciprocating movement of the pumping plungers. The crankshaft is machined from a solid forged bar and supported by roller bearings at the ends, and by sleeve bearings between each crank pin.
Homogenization is often wrongly categorized together with mixers, mills and other low pressure blending devices. Niro Soavi is benchmarking high-pressure homogenization and has for a long time educated the industry via the leading technology forums about the substantial differences between traditional blending devices and the added benefits that can only be achieved in a Niro Soavi high-pressure homogenizer.

The difference is considerable from a technological point of view and more importantly the result in any product application is dependent on the right choice of technology. The increasingly more complex food and dairy recipes as well as biotech cell rupture applications require true and reliable high-pressure technology.
Services

After Sales Service and Spare Parts

- Full spare parts coverage and service
- 24-hour emergency spare parts and technical service
- Preventive maintenance programs
The Niro Soavi product and service range provides the best of both European and North American standards.

- **FDA approved materials.**
  FDA approved and certified materials, in addition to 3A approved plastic and rubber materials, are available.

- **ISO 9001 approved.**
  The Niro Soavi machines are manufactured and tested in accordance with the ISO9001 credited QA program. This includes full testing of each machine verified by a test certificate audited by Det Norske Veritas (DNV).

- **3A sanitary standard.**
  Niro Soavi has an active role in the continuous fulfillment and improvement of the 3A sanitary standards.

- **USDA accepted.**
  Niro Soavi has obtained an acceptance based on a focused cooperation with the USDA.

- **cGMP compliance.**
  Niro Soavi is designing its products in compliance with cGMP. Customized control systems are available in line with GAMP guidelines.

This total knowledge base is unmatched in the industry and secures the optimum solution for our customers’ specific needs.