VERDERMIX STATIC MIXERS

Static Mixers
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Production
Verdermix Static Mixers

The Verdermix series Static Mixers is a well balanced program for almost all types of industry. With over 30 years of experience, Verdermix has a broad process knowledge for mixing fluids and gasses.

Verdermix developed a standard modular system which can easily be adapted to preferred customer specifications. The customer can count on expertise, technical advice and excellent service. Verdermix only uses first class materials, components and accessories to ensure a long service life, even in severe applications.

Customer benefits
- Low investment costs
- Low maintenance cost, no moving parts
- Low energy consumption
- Quick and intense reaction between the mixed liquids and/or gasses
- High level of mixing efficiency
- Low volume/hold up of the processed products
- Easy and simple installation, start up & operation
- No tanks or agitators are needed because of inline production process
- Small footprint
- Available in a wide range of metallic and plastic materials
- Prompt delivery time

Why we use the HELICAL shaped mixing element
- Lowest pressure drop per mixing element
- The smallest chance of clogging
- Generating/combining 3 mixing principles
- Suitable for low and high viscosities
- Can handle the biggest solid particle per diameter
- Most hygienically element shape

Low maintenance
Reliable operation

VERDERMIX®
Verdermix Applications

Verdermix static mixers are used for mixing of
- Liquid – Liquid
- Liquid – (Wetted) Solids
- Liquid – Gas
- Gas – Liquid
- Gas – Gas

Main Applications
- Blending of different media (liquids & solids)
- Dilution of liquids
- Dispersing of liquids
- Creating or maintaining a suspension
- Temperature exchange
- Gas dispersing in liquid (contacting)
- Gas absorption in liquid
- Evaporation of liquid into gas

Examples Water treatment applications
- Diluting polymers
- Mixing-in diluted polymers into (waste)water
- Creating homogeneous temperature
- pH control
- Handling media with high risk for clogging

Examples (Petro) chemical applications
- Handling aggressive media
- Gas/liquid contacting or absorption
- Blending fuels & additives

Examples Food processing applications
- Fruit particles into Yoghurt (without damaging)
- Homogenization & Cooling/heating sweet masses
- Mixing in colors & flavors
- Carbonization of beer with CO²
- Beer & syrup mixing
**Working Principle**

The static mixer uses a small part of the pump energy that is readily available in your process line. Mixing is accomplished in three ways:

1. **Flow Division**
   Each time a product stream passes over an element, it is split in half, separated, creating layers. The number of separations, \( X = 2^n \) (\( n = \) number of elements). This means that with 20 elements in line more than 1 million layers are created.

2. **Flow Conversion**
   The product is pushed over the elements, spiral walls, causing the product in the center to move radial to the outer diameter and the product on the outside to move vice versa. This leads to a difference in speed between the product molecules causing shearing of the product.

3. **Flow Inversion**
   The product direction of rotation changes with each element, receiving rapid inversion of inertial force, which agitates the product.

For products with a Reynolds number <2300 (laminar flow) the main mixing mechanism is flow division. For products with a Reynolds number >4000 (turbulent flow) the main mixing mechanism is the combination of flow conversion and inversion.
Sizing your Static mixer

The next information and graphs are for quickly helping you to roughly size your static mixer. For a 100% correct selection we advise you to contact your local Verder company or Verdemix directly.

**Determine the Static Mixer Nominal Diameter**

<table>
<thead>
<tr>
<th>DN size</th>
<th>DN15</th>
<th>DN20</th>
<th>DN25</th>
<th>DN32</th>
<th>DN40</th>
<th>DN50</th>
<th>DN65</th>
<th>DN80</th>
<th>DN100</th>
<th>DN125</th>
<th>DN150</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5 m/sec</td>
<td>1.520</td>
<td>2.850</td>
<td>4.550</td>
<td>8.500</td>
<td>11.400</td>
<td>18.100</td>
<td>30.700</td>
<td>43.300</td>
<td>72.500</td>
<td>96.500</td>
<td>165.000</td>
</tr>
<tr>
<td>2.0 m/sec</td>
<td>1.230</td>
<td>2.000</td>
<td>3.500</td>
<td>6.000</td>
<td>9.000</td>
<td>14.500</td>
<td>24.000</td>
<td>33.000</td>
<td>57.500</td>
<td>77.000</td>
<td>130.000</td>
</tr>
<tr>
<td>1.5 m/sec</td>
<td>0.920</td>
<td>1.500</td>
<td>2.700</td>
<td>4.500</td>
<td>6.800</td>
<td>11.000</td>
<td>18.000</td>
<td>24.500</td>
<td>43.000</td>
<td>58.000</td>
<td>98.000</td>
</tr>
</tbody>
</table>

The mentioned liquid speeds are indicative. In fluid mechanics a liquid speed of 2,5m/sec is general advised as a maximum liquid speed. For the static mixer it is no problem to go over this “limit”.
Determine the amount of helical mixing elements needed for your process

To do so, you first need to calculate the Reynolds number for your process. The Reynolds number is a dimensionless number and commonly used in fluid mechanics. It is also the most important factor for static mixer selection.

\[
Re = \frac{\rho v D_H}{\mu} = \frac{v D_H}{\nu} = \frac{Q D_H}{\nu A}
\]

where:
- \(D_H\) is the hydraulic diameter of the pipe; L (m).
- \(Q\) is the volumetric flow rate (m\(^3\)/s).
- \(A\) is the pipe cross-sectional area (m\(^2\))
- \(v\) is the mean velocity of the fluid (SI units: m/s).
- \(\mu\) is the dynamic viscosity of the fluid (Pa·s of N·s/m\(^2\) of kg/(m/s))
- \(\nu\) is the kinetic viscosity (\(\nu = \mu/\rho\)) (m\(^2\)/s).
- \(\rho\) is the density of the fluid (kg/m\(^3\)).

(For more detailed information see: http://en.wikipedia.org/wiki/Reynolds_number)

Definition for Coefficient of Variation (C.o.V. or C.V.)

The coefficient of variation (C.o.V.) is defined as the ratio of the standard deviation \(\sigma\) to the mean \(\mu\).

\[
C_v = \frac{\sigma}{\mu}
\]

which is the inverse of the signal-to-noise ratio. It shows the extent of variability in relation to mean of the population.

Put simple: C.o.V. < 0.05 means a mixture better than 95% homogeneous.

(For more detailed information see: http://en.wikipedia.org/wiki/Coefficient_of_variation)
# Overview

## Static Mixers

<table>
<thead>
<tr>
<th>VERDERMIX VMV SERIES</th>
<th>VERDERMIX VML SERIES</th>
<th>VERDERMIX VMS SERIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>The standard series of Verdermix static mixers. The mixing elements are fixed inside the tube.</td>
<td>Similar to the VMV series but with retractable mixing elements for easy cleaning or unblocking.</td>
<td>Static mixer for the food &amp; pharmaceutical industries. All wetted parts are electro polished. The mixing elements are not detachable.</td>
</tr>
</tbody>
</table>

## Standard materials

<table>
<thead>
<tr>
<th>Material</th>
<th>VMV</th>
<th>VML</th>
<th>VMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon steel</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stainless steel 304</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Stainless steel 316</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>PVC</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>PP</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>PE</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>PVDF</td>
<td>✓</td>
<td>✓</td>
<td></td>
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</tbody>
</table>

## Optional materials

<table>
<thead>
<tr>
<th>Material</th>
<th>VMV</th>
<th>VML</th>
<th>VMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>On request</td>
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<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

## Standard connections

<table>
<thead>
<tr>
<th>Type</th>
<th>VMV</th>
<th>VML</th>
<th>VMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIN flanges</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>ASA flanges</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Welding ends</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Screwed connectors</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

## Optional connections

<table>
<thead>
<tr>
<th>Type</th>
<th>VMV</th>
<th>VML</th>
<th>VMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk couplings(DIN 11851)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Flanges DIN11864</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Others on request</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

## Other options

<table>
<thead>
<tr>
<th>Option</th>
<th>VMV</th>
<th>VML</th>
<th>VMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Build on injection point(s)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Heating/cooling jacket</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Plastic coating for chemical resistance</td>
<td>✓</td>
<td>✓</td>
<td>X</td>
</tr>
</tbody>
</table>
Verdermix
Production

Verdermix static mixers are engineered and build in The Netherlands with our production facility only 10 minutes from our main office in Vleuten/Utrecht.

Verdermix BV is a member of the Verder Group liquids division.

Any questions? You may still have questions and/or comments after reading this brochure. Please feel free to contact us on +32 (0) 51 51 92 80. You can also contact us via email: info@verdermix.com