

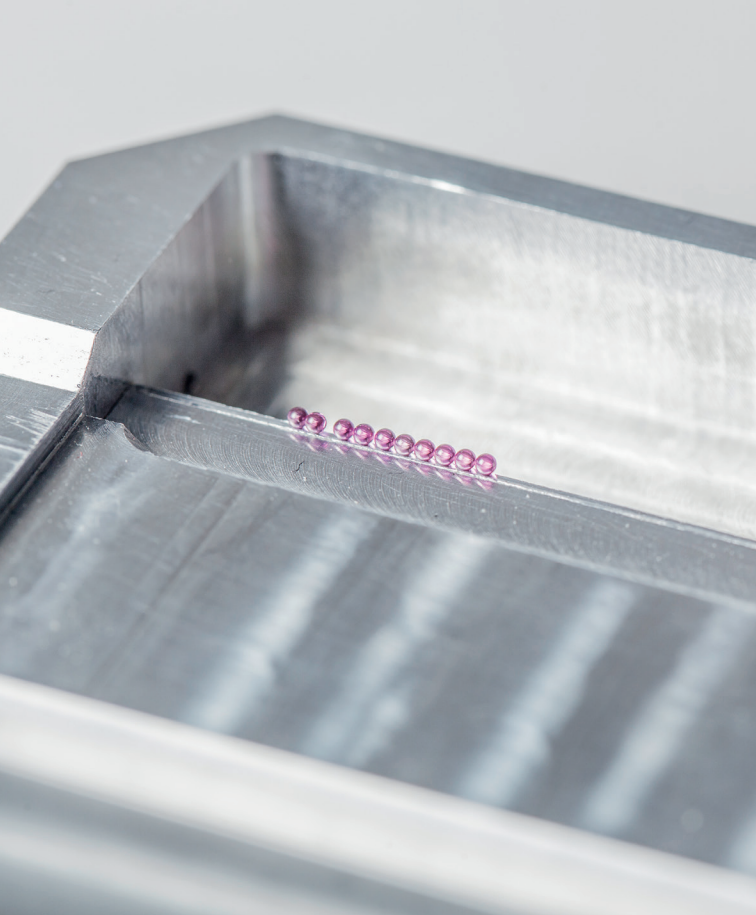


Fraunhofer

IPA

FRAUNHOFER INSTITUTE FOR
MANUFACTURING ENGINEERING AND AUTOMATION IPA

IPA.FLUIDSORTING – SEPARATING AND FEEDING MICROCOMPONENTS





Starting point

As products continue to be miniaturized, the components integrated into them also become smaller and smaller. Added to this, such tiny components are much more sensitive to external influences. As a result, handling and assembling such parts is becoming an ever-increasing challenge – especially when they are well below a millimeter in size and are only just visible with the naked eye. In such cases, the process forces and surface effects acting on the components bring conventional vibratory feeder systems to their technical limits. It becomes highly difficult or even impossible to singularize components and place them in a defined order for subsequent processing.

Solution approach

IPA.FluidSorting is a solution that has been developed, in particular, for parts smaller than 1 mm in size – such as cog wheels, optics, coated O-rings and even electronic components – that are supplied in an unsorted manner, e.g. as pourable goods. The idea is based on the phenomenon observed in Nature that allows water beetles to stand on or slide across the water surface due to surface forces. If small or lightweight

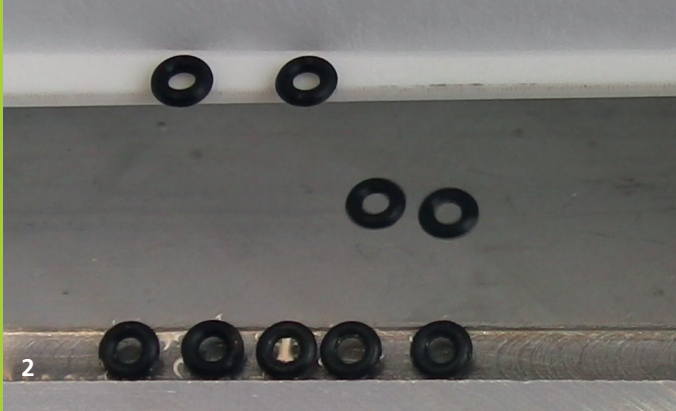
- 1 *Miniaturized components.*
- 2 *O-rings sliding down over the surface of a liquid.*

components are placed on the surface of a liquid, they behave in a similar way. If the liquid surface is curved, this causes the components to slide down to the edge, or to different obstacle, that is at a lower level.

Construction and functioning principle

Forming the basis of the future development of application-specific solutions, the prototype essentially contains the IPA.FluidSorting unit and an integrated fluidic supply unit. In order for the process to function, the liquid surface has to have a defined shape. For this purpose, the unit contains a reservoir that can be filled and emptied with liquid by means of pump and valve systems connected to it. An essential part of the reservoir is the channel structure incorporated into the lower edge of the basin that forms a boundary and collects the components.

To process them, the parts located in a container are carefully placed on the surface of the liquid. The required curvature of the surface is set beforehand via the filling level of the reservoir. Gravity causes the components to move towards the edge of the liquid, which is determined by the geometry of the limiting channel structure. The width and depth of the channel structure are specifically made to receive the component concerned and can also be designed with defined slots to enable parts to be

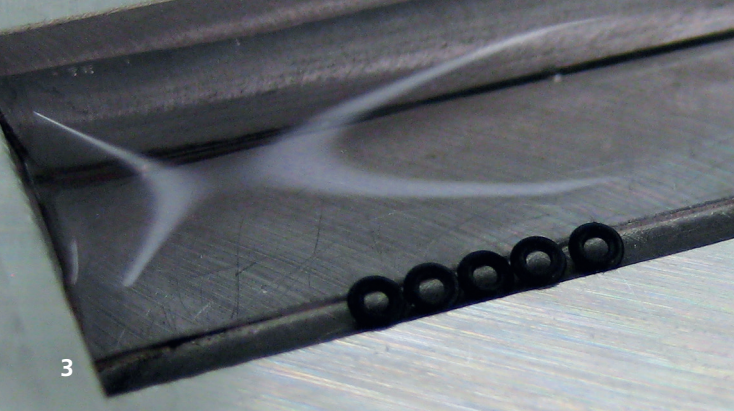


arranged separately. Specific vibrations force any components adhering to one another to be detached.

Once all the components have been arranged in the channel structure, pumps lower the level of the liquid. In doing so, a barrier prevents the parts from floating away with the liquid being drained off. Now sorted, the components can be picked up specifically and directly using tweezers or a pick-and-place system, for example. If a magazine is required for external processing reasons, the channel structure can be incorporated into a removable receiver module.

Should the components need to be dried, the channel structure can be closed with an appropriate cover, thus enabling a flow of air to be directed through the ensuing closed channel. Components can also be rinsed with ultra-pure water to reduce the risk of residues adhering to them.

In the event that components need to be fed continuously, a further channel can be constructed to gently transport the parts by the current generated. If processed components are defective or their position needs to be altered, a supplementary sorting step can be added. In this step, the incorrectly-orientated part is diverted via controllable points into a side arm branching off from the main channel and then fed back into the process while faulty parts can be removed.



Range of services

The process has been proven to be suitable for a broad spectrum of components. The integration of IPA.FluidSorting into a system has paved the way for developing customized solutions. The process is especially suitable in cases where the limits of conventional technology are reached.

We offer:

- Feasibility studies for processing customer-specific microcomponents with IPA.FluidSorting
- Application-specific process modifications
- Development of a prototype to meet your requirements

TITLE *Sorted microspheres with a diameter of 1 mm.*

3 *O-rings arranged in a channel structure.*

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If you require more information about our range of services or specific advice, please get in touch with our contact partners.

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