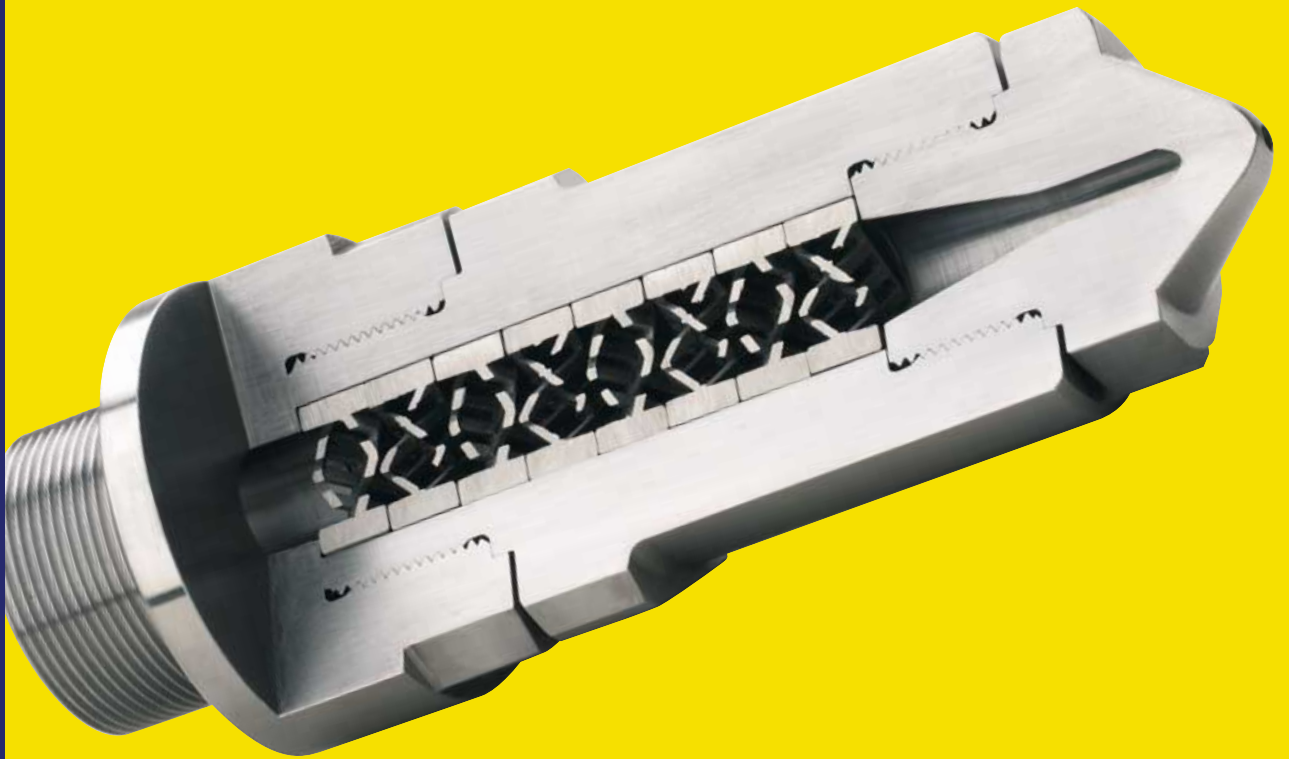


NICKERSON STATIC MIXING NOZZLE - HOMOGENOUS MELT INJECTION MOULDING

Better melt flow.



Better cash flow.





Mixing of two epoxy resins with mixing elements. The cutaway clearly demonstrate the progressive increasing number of layers formed along the mixer resulting in a more uniform distribution of colourants.

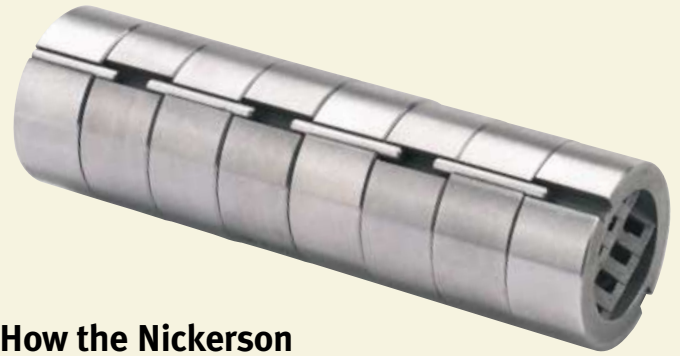
Nickerson Static Mixing Nozzle Better mixing with fewer rejects and big savings in materials

The Nickerson Static Mixing Nozzle is designed to give the highest level of melt homogenisation performance in all operating conditions and using most types of materials, even recycled plastics.

This outstanding homogenization performance means parts are produced to narrower tolerances virtually eliminating spots, streaks and clouds of colourant.

Reject rates are therefore reduced considerably and you can make savings in materials and colourant costs of as much as 40%.

All in all, the Nickerson Static Mixing Nozzle system is not only more economically priced than similar mixing nozzles. It can also pay for itself in a matter of weeks, if not days, depending on the size of your output.



How the Nickerson Static Mixing Nozzle quickly pays for itself

A thermally homogeneous melt flows uniformly through the channels of a die

Reduced streaks and clouds of colourants, parts without spots

Reduced cycle times

Improved melt flow

Narrower tolerances, improved fitting to dimensions

Reduced reject rate

Enlarged application range, also with older presses

Improved part quality even using recycled material

See how quickly you could get your money back:

NOZZLE AND PRODUCTION DATA	
Static mixing nozzle used	NSM-27-8Z
Cost of nozzle*	£1400
Production hours per day	24
Total shot weight	1640 gm
Total cycle time	48 seconds

*includes heater band, thermocouple and tip

COLOURANT DATA	
Material cost	£5 per kg
Original % of colourant used	2%
Original colourant costs per shot	16.4p
New % of colourant used	1.5%
New colourant cost per shot	12.3p

ACTUAL SAVINGS ACHIEVED IN REDUCED COLOURANT COSTS			
Per shot 4.1p	Per hour £3.08	Per day £73.80	Per Week £516.60

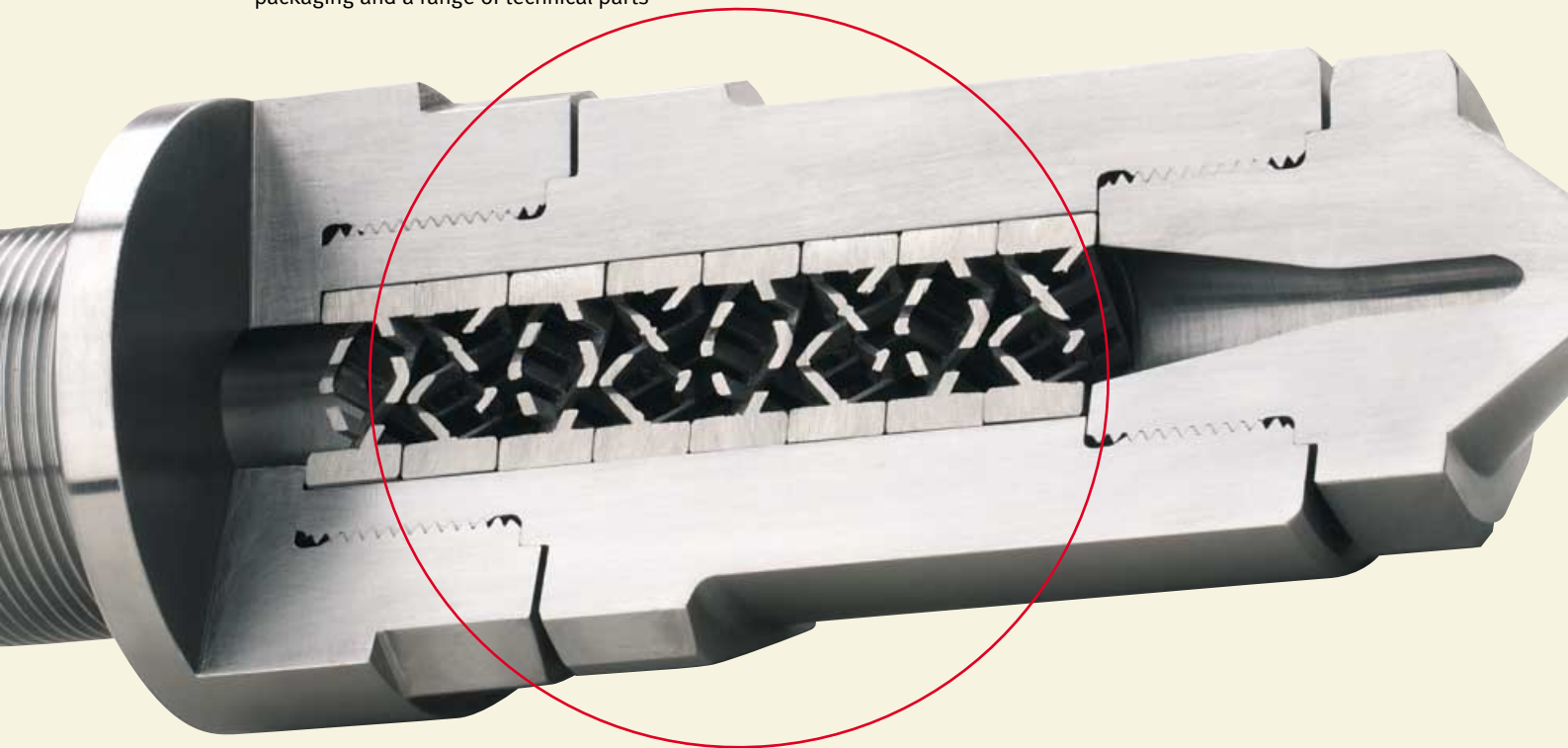
**Estimated % reduction
in colourant used: 25%**

This payback period is conservative. It is calculated on savings in reduced colourant costs and makes no provision for additional savings in reduced levels of scrap due to poor colour dispersion or reduction in colour change over time.

**Cost of nozzle £1400 ÷
Savings per day £73.80 =
Payback period 19 days**

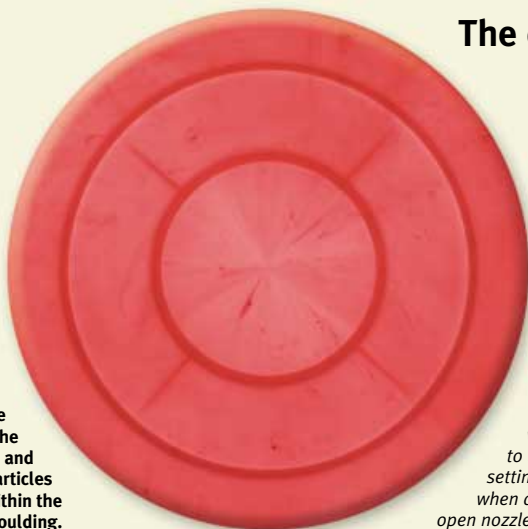
The benefits of the Nickerson Static Mixing Nozzle

- The specially arranged grooves and notches guarantee quick and easy assembly of the mixer
- The mixing section consists of a total of 8 individual elements but depending on your individual requirements these can be adjusted easily by 1 element.
- The NSM mixing parts are available in a range of flow channel diameters: 12, 18, 22, 27, 33 and 40 mm
- The mixing nozzle can be used to produce packaging and a range of technical parts
- The system has proven self-cleaning properties
- It gives easy access to all wetted surfaces of the NSM parts allowing for simple inspection and additional cleaning if required
- The faces of each NSM part and the sealing face of the end parts are ground to guarantee a proper seal
- The use of very strong stainless steel together with the unique type of construction creates a practically indestructible NSM part with a minimum material thickness
- It can resist extremely high loads and is practically indestructible

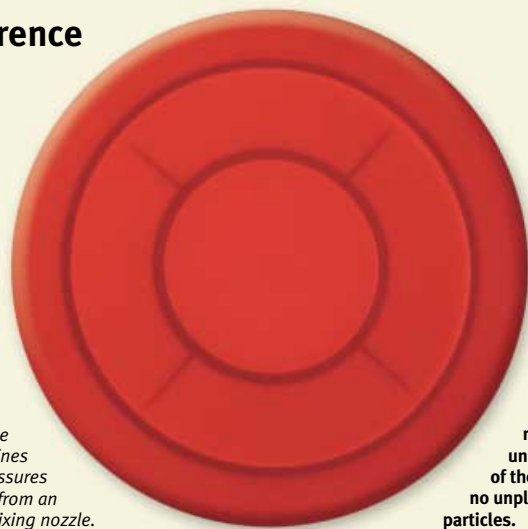


The difference

Moulding produced using a standard open nozzle with a 2% master batch additive, note the patchiness of the colour dispersion and the unplasticized particles contained within the moulding.



NB: No changes were made to the machines settings or pressures when changing from an open nozzle to the mixing nozzle.



Same product, same 2% master batch additive but processed through a Nickerson Static Mixing Nozzle. The darker colour is the result of a good homogenous mix resulting in a uniform distribution of the colourant with no unplasticized particles.



Internally heated version available

Internally heated versions of these nozzles are available in all sizes.

- More thermally efficient
- Heaters less prone to damage
- High watts per square inch
- Heater easily replaceable

Designed without any compromise

Nickerson Europe have designed this static mixing nozzle to give you optimum performance WITHOUT COMPROMISE.

Unlike other static mixing nozzles available, we have designed a unique nozzle tip for each different size static mixer in our range. We firmly believe that anything less is a compromise, as the flow of material is channelled through the mixer and out of the nozzle far too aggressively.

Each of our nozzle tips is perfectly matched to it's relevant sized static mixer to ensure optimum performance of the nozzle at every stage.



Complete assembly with heater band



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freecall : 0500 - 121141
e-mail : sales@crystalwaretut.co.uk

15th August 2003

Dear Sirs

RE: Nickerson Europe Static Mixing Nozzle

At Crystalware we have found the Nickerson static mixing nozzle to be absolutely trouble free after 3 months of extensive testing.

Having trialed this nozzle we have since purchased another internally heated unit. We have one running on a 350 ton Toshiba and the other on a 550 ton Sandretto machine. Both machines have run on their original programs, with no need for any first or second stage pressure increase, no additional decompression and up to a 50% decrease in back pressure.

Colour changes have also improved with the complete elimination of streaking and a much better dispersion of colour within the moulded product.

We have tried other similar mixing nozzles in the past and always found we needed to increase pressures and speeds in order to fill the mould. On random co-polymer we had to change back to a standard open nozzle to be able to achieve good mouldings.

This has not been the case with the Nickerson static mixing nozzle. Your nozzle eliminated all of our processing problems without any sacrifice to cycle times and we would highly recommend its use for similar applications.

Best Regards

Mathew Thomas
Technical Manager



Crystalware Ltd. Registration : Cardiff 3769687 www.crystalwaretut.co.uk

Better mixing produces better quality moulded parts

Static NSM mixing elements are installed into a purpose built nozzle. During the injection process the NSM mixing elements mix the entire melt flow continuously in a radial direction. Differences in the polymer mass, because of temperature, viscosity or MFI (= Melt Flow Index) will be eliminated and colourants will be distributed uniformly. The result is a homogeneous melt, which flows uniformly through the channels of a die. This is essential for the production of defect free high quality moulded parts.



An easy assembly system which is virtually indestructible

A NSM mixing part contains several specially arranged bars set into a ring, which mix the melt flow. The bars of the NSM parts are devised to provide the most efficient mixing and optimum melt flow with no hang up areas. Each ring has either two grooves or two pins.

These are arranged in a way that automatically forms a complete NSM mixing element. The system of specially arranged grooves and pins guarantees the correct assembly of the mixer. It can also resist extremely high loads and is practically indestructible.

In a standard set up, the mixing nozzle NSM contains 8 NSM mixing parts. Depending on your individual requirements, these can be adjusted easily. At present the NSM mixing parts are available with a flow channel diameter of 12,18,22,27, 33 and 40 mm.

In addition it has to be considered, when selecting the size, whether a NSM mixing nozzle is being installed for the production of a particular part only, or for general processing

With the NSM mixing elements, the desired degree of homogeneity is achieved by continuously splitting the flow into layers that expand over the entire flow channel. The mixing test shown using blue and white coloured epoxy resins demonstrates clearly the outstanding mixing performance of the NSM mixing elements.

Why is additional homogenisation so important?

An unsatisfactory homogenised melt creates imperfect moulded parts with colourant streaks or clouds, surface defects, a wide variation in part weight, distortion and parts which often exceed dimensional tolerances.

During the plasticising process, the active screw length is reduced and thus the homogenisation length is also reduced. Therefore, melt parts prepared at the end of the process show a deficiency in homogeneity which can be corrected by the KMN mixing nozzle during the injection process.

Handles a wide range of applications

With this system, practically all thermoplastic materials can be processed without problems and it has successfully produced a range of packaging and a variety of technical parts. The shear forces in the mixing nozzle are relatively small, therefore, agglomerates of solids will not be reduced in size. Processing material containing fillers is also possible. However the use of PVC is strongly cautioned and depends on the degree of stabilisation of the recipe.

Cleaning

When changing colourants or polymers, the content of the mixing nozzle will be changed completely within a short time. These excellent self-cleaning properties have been well proven in practice. In addition, cleaning can be carried out using a fluidised bed-cleaning bath, a vacuum oven or purging with a cleaning compound. There is easy access to all wetted surfaces of the NSM parts for easy inspection and extra cleaning, if required.

Choosing the optimum mixer nozzle size

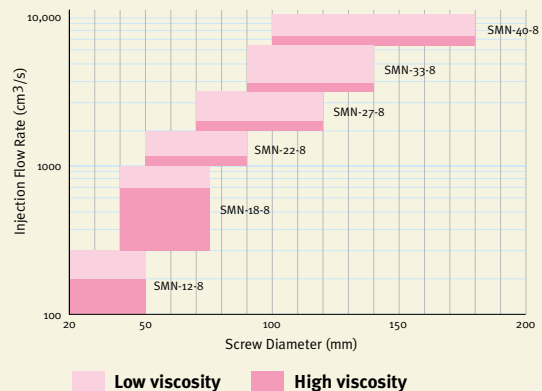


Diagram for estimating the size of a mixing nozzle (basis: approx 100 to 150 bar pressure drop)

The selection of the correct size of the mixing nozzle can be made using the diagram to the right? It depends on two major factors:

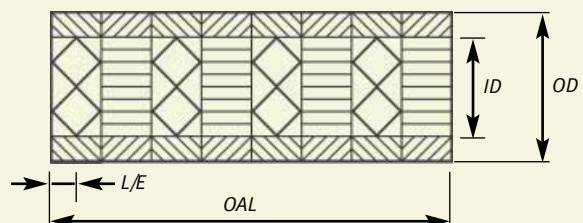
1. Injection flow rate depending on diameter and the velocity of the axial movement of the screw during injection
2. Viscosity of the melt depending on the MFI of the material, processing temperature and the resulting shear rate in the NSM mixer of the mixing nozzle

For very viscous materials and/or very short injection times, a nozzle of the next larger size than recommended by the table should be selected.

If required Nickerson Europe can supply you with a detailed questionnaire, which when completed by yourselves, will allow us to calculate the optimum size of mixing nozzle for your specific application

Dimensions

The standard version of the NSM mixing nozzle contains 8 elements. The faces of each NSM part as well as the sealing face of the end parts are machined to guarantee correct seating. Material of construction: Stainless Steel 17-4 PH = DIN W. No. 1.4542



Length of special executions:
 $L_m = L_e \times \text{number of NSM mixing parts}$

Size	Standard design with 8 NSM mixing parts			
	ID (mm)	OD (mm)	L/E (mm)	OAL (mm)
NSM-12-8	12	18	8.0	64
NSM-18-8	18	26	11.25	90
NSM-22-8	22	30	13.5	108
NSM-27-8	27	35	16.5	132
NSM-33-8	33	43	20.0	160
NSM-40-8	40	50	24.0	192



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The ultimate mixing solution

But don't just take our word for it...



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Facsimile

To: Nickerson Europe
Fax No: 01933 400461
c.c.
Date: 10th September 2003
Subject: PERFORMANCE OF NICKERSON STATIC MIXING NOZZLES AT LINPAC MATERIALS HANDLING

From : J. Parkes
Ref :

As an established injection moulder supplying market leaders in the foodstuffs sector, quality is paramount to our business. For some time we had been experiencing variation in the cosmetic appearance of product when using particular colours of Masterbatch. Initial trials were carried out using a Nickerson Static Mixing Nozzle. Results were instantaneous, mouldings demonstrating uniform colour across all surfaces and colour saturation being measurably improved. As the manufacture of the product continued, the Nozzle continued to consistently demonstrate excellence in the dispersion and uniformity of colour across the moulded component.

In production, the Nickerson Static Elements were found to demonstrate significantly less back-pressure than a previously tried similar type of Mixing Element, (good mouldings were produced without altering machine settings used with an open nozzle), as well as allowing for faster colour change. It was also established that use of this Mixing Nozzle could enhance the moulding process through the removal of melt inconsistencies and so improve the mechanical characteristics of mouldings as well as their appearance.

Following these initial trials, our company has now committed to fitting Nickerson Nozzles to the majority of our machines.

Signed: .....(Senior Technician)

Signed: .....(Quality Engineer)

LINPAC Materials Handling is a division of LINPAC Mouldings Ltd
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