

## SPECIAL KNEADING CYLINDER "NIC"

Developed to significantly increase the compounding quality level

### Background

Recently, traditional compounding processes have been subject to simplification for the purpose of resource conservation or manufacturing cost reduction and many plants of various fields have been already converted from batch process to continuous process. Twin screw extruders are used in many of these new processes now. It has been over 20 years since we first placed our twin screw extruder TEX on the market and various kinds of extruder screw design have been developed to suit the demands of each field. However, there is hardly any case to develop cylinder to improve kneading performance. Kneading is performed in the clearance between cylinder inside and top of screw, what is called "Tip clearance". Compounding quality level can be increased by improving the structure of tip clearance. We took notice of cylinder structure that is another constituent of tip clearance and developed the special kneading cylinder "NIC" with a unique channel structure on cylinder inside. Here, we introduce the detailed information of NIC.

### Structure

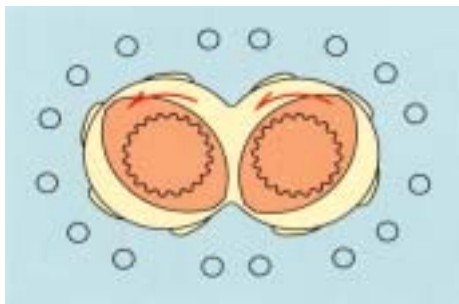


Fig. 1 Section of NIC

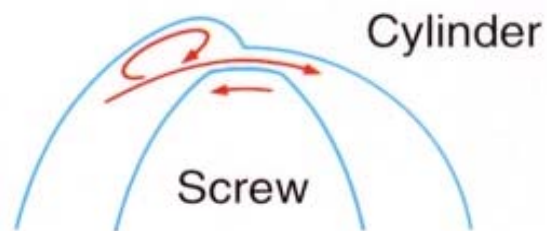


Fig. 2 Kneading effect in tip clearance

### Application

1. Polymer blending (e.g. ABS+AS, PP+EPR ...)
2. Powder filler compounding (e.g. talc, calcium carbonate, magnesium hydroxide...)
3. Master batch compounding (e.g. Carbon black, titanium oxide ...)
4. Other compounding that high-level micro dispersion is required

### Advantages

1. Excellent kneading performance
  - 1) Uniform kneading can be achieved with NIC installed in the optimum location
  - 2) Kneading effect can be improved with NIC because larger amount of polymer passes through tip clearance.
  - 3) Kneading at low temperature is achieved because localized heating is prevented due to lower shear speed in NIC, which has the larger average tip clearance.
2. Energy saving
  - 1) Energy consumption can be reduced by 10~20 % compared to standard types of cylinder.
  - 2) Discharged polymer temperature is reduced because of lower energy consumption.
3. Coloration performance
  - 1) Color change of any tone, for example from black to white, can be achieved because of kneading in the high-viscosity area to prevent localized heating.
  - 2) The unique structure prevents polymer from accumulating and deteriorating in the channels.
4. Higher processing capacity  
 The unique channel structure of NIC helps to achieve higher processing rate compared to the standard types of cylinder.

***Kneading performance***

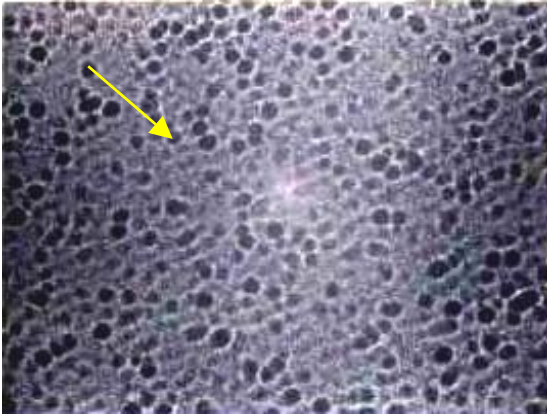


Photo 1 Standard cylinder (×15)  
ABS+30%SAN  
1200kg/h-600rpm (TEX65)

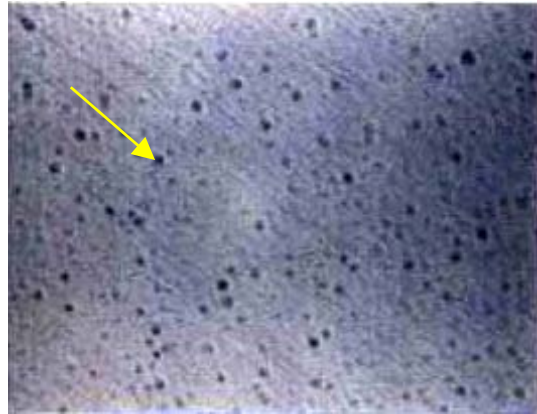


Photo 2 NIC (×15)  
ABS+30%SAN  
1200kg/h-600rpm (TEX65)

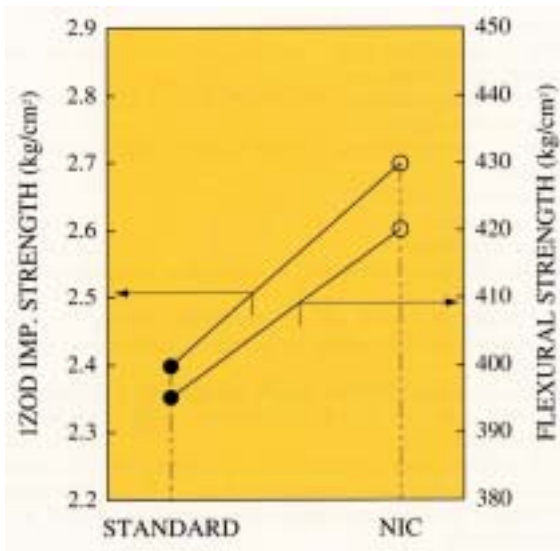


Fig. 3 Bumper Grade  
(PP+24%EPR+11%TALC)

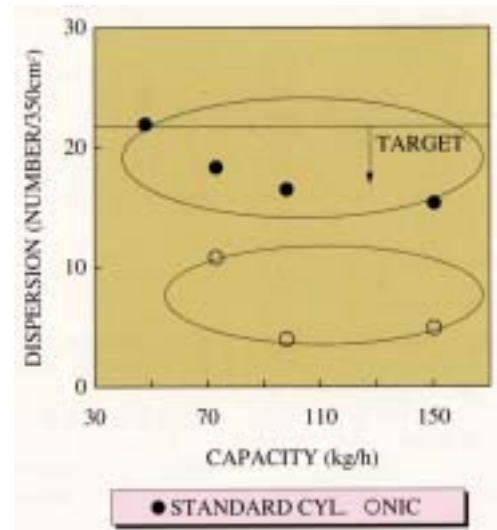


Fig. 4 Dispersion of Carbon Black  
(PE+40%CARBON BLACK)

We believe that TEX with NIC must be a standard compounding technology of the times. Test equipment is available for your confirmation test in our Plastics Machinery Developing Center in Hiroshima, Japan. You can make trial on TEX with NIC with your plastics material to evaluate the performance.

***Patents concerned***

Patent in USA	No. 5516205	Twin screw kneading extruder
Patent in Japan	No. 2958248	Kneading extruder

**For more information ; THE JAPAN STEEL WORKS, LTD.**

<b>Sales Dept./Tokyo</b>	Hibiya Mitsui Bldg., 1-2, Yurakucho 1-chome, Chiyoda-ku, Tokyo, Japan 100-8456 Phone : +81-3-3501-6134 Fax : +81-3-3595-4621
<b>Hiroshima Plant</b>	6-1, Funakoshi-minami 1-chome, Aki-ku, Hiroshima-city, Japan 736-8602 Plastics Machinery Dept. Phone : +81-82-822-5515 Fax : +81-82-824-1512
<b>Home page address : <a href="http://www.jsw.co.jp/">http://www.jsw.co.jp/</a></b>	