Planetary Centrifugal Mixer With Vacuum Device Machine

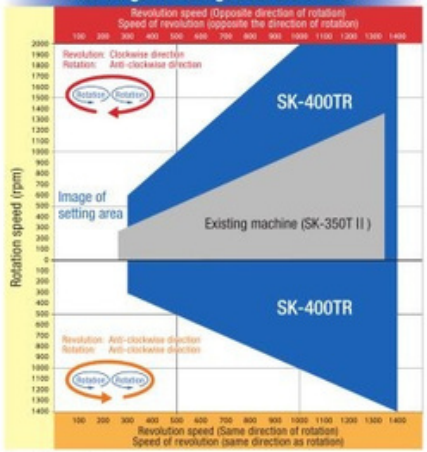
SK-400TR

Kakuhunter

Drastically enhanced mixing and degassing force with new technology!
It enables to achieve mix and degas for short time even high viscous materials.

To increase max rotation speed, it increased about three times wider setting area than existing models.
Due to wider setting area, mixing force enhanced 1.5 times and degassing force enhanced 1.4 times more.
In this way, SK-400TR enables to achieve to mix and degas for difficult materials which is struggling to mix with existing machine.

A wide range of settings with the SK-400TR



Easy operation by LCD touch panel!

Applied LCD touch panel on control panel, thus it enables to perform easy operation with detailed information display.

Specifications

Container size:	400ml x 2 cups, Gross weight 350g (container included)
Revolving speed:	Opposite direction on revolution and rotation: Revolution speed 300-1400 rpm Rotation speed 0-2000 rpm
	Same direction on revolution and rotation: Revolution speed 300-1400 rpm Rotation speed 0-1400 rpm
Revolution setting:	9 Steps
Rotation setting:	10 Steps (There is limitation for rotation speed)
Setting time:	10-300 sec.
Step mode:	1-5 steps
Memory Channel:	Fixed CH 10CH
Condition setting Channel:	User settable CH 90 CH
Power source:	Three phase AC 200-240V 50/60Hz
Electric Consumption:	About 2.0 kW
Outer dimension:	W552 x D650 x H750(mm) (Exclude handle part)
Main unit weight:	About 100kg

* It differs machine throughput depending on materials characteristic.
* Revolving speed may change depending on materials characteristic.
* Detailed specification may change without prior notice.

(Manufacturer)

Shashin Kagaku Co., Ltd.
Product Company

ISO 9001 BUREAU VERITAS Certification

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(Sales Distributor)

2023/03/00 0000

SHASHIN KAGAKU
PRODUCT COMPANY

Kakuhunter

New Release machine with unprecedented function.

NEW

Planetary Centrifugal Mixer With Vacuum Device Machine

SK-400TR

New Technology (Changeable rotation function) equipped model!
Mixing force 1.5 times, Degassing Force 1.4 times evolution!

Changeable Rotation Function! NEW

To keep rotation direction is as usual, new function which revolving direction is changeable either clockwise or anti-clockwise for revolution.
Under vacuum pressure, it may change material property, however it enables to achieve high precision degassing even atmospheric pressure condition.

Drastically increased revolving speed of rotation!

To keep centrifugal force of revolution, it enables to achieve setting which revolving speed pf rotation can be surpassed to revolving speed of revolution.
Mixing force is drastically enhanced, thus it can correspond to various materials case.

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https://www.kakuhunter.com/en/

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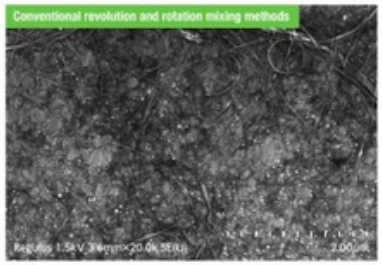
Planetary Centrifugal Mixer With Vacuum Device Machine
SK-400TR Kakuhunter

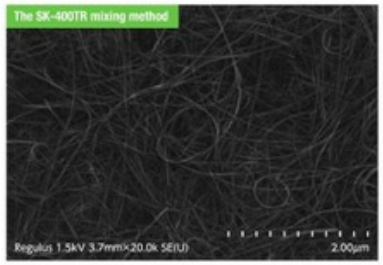
Examples of high performance materials and mixing degassing tests

Carbon nanotubes | Nano cellulose | Aluminum oxide | Epoxy resins

Nano dispersion of hard-to-disperse agglomerated carbon nanotubes

Carbon nanotubes (hereafter "CNT") are tube-shaped substances known for their exceptional strength, heat transfer properties, and conductivity. CNTs are divided into two main categories: single-walled CNT (SWCNT) and multi-walled CNT (MWCNT). SWCNTs are particularly light, yet possess 20 times the strength of steel and 10 times the thermal conductivity and 1,000 times the electrical conductivity of copper. Because of those properties, they are expected to be deployed across a wide range of applications, including use in fuel cells and capacitors in batteries, wiring material, semiconductor devices, thin films, medical devices, automobiles and aircraft, construction, and more. However, CNTs demonstrate strong cohesion because of the Van der Waals force, which presents the largest obstacle both to their application in chemical and physical operations and in the manufacturing of CNTs. Numerous dispersion methods to address this issue have been proposed.



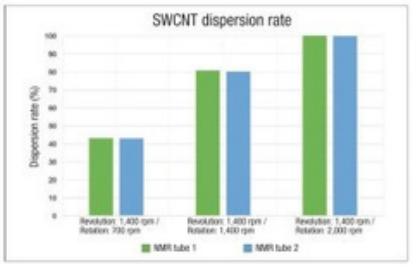


Issues in dispersing CNTs

- Compared to MWCNTs, SWCNTs have strong cohesive properties and are difficult to disperse into a solvent.
- When subjected to ultrasonic baths, high output cavitation damages CNTs, while localized cavitation creates uneven dispersion and extreme temperature rises cause thermal denaturation.

Solutions provided by the Kakuhunter SK-400TR

- High shearing causes agglomerated CNTs to break apart and disperse into nanofibers.
- Enables dispersion that inhibits CNT damage and nanofiber tearing.
- No extreme temperature rises inhibits thermal denaturation.
- Separate controls allow revolution and rotation to be set independently, creating the optimal dispersion conditions for materials.



Target materials 【Filler】 SWCNT 0.4 wt%
【Solvent】 NMP, dispersants

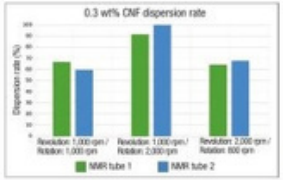
Kakuhunter conditions 【Conventional mixing】 Revolution: 1,400 rpm / Rotation: 700 rpm
Revolution: 1,400 rpm / Rotation: 1,400 rpm
【SK-400TR mixing】 Revolution: 1,400 rpm / Rotation: 2,000 rpm

Comparative evaluation FE-SEM Magnification ×20.0 k
Magno Meter SED VT
Comparing the dispersion rate of the materials dispersed, with the SK-400TR measured at 100%.

Dispersion example 1 Intercomparison of micro-fibrous cellulose specific surface area – Optimal dispersion conditions –

Material: Micro-fibrous cellulose, purified water Equipment compared: SK-400TR, SK-300S II

The Magno Meter XRS from Mageleka, Inc.

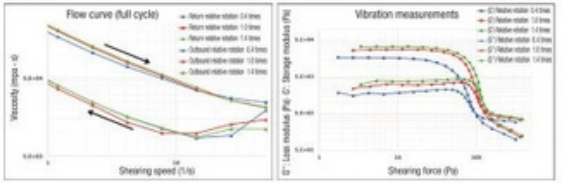


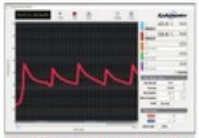
The relaxation time of aqueous cellulose solutions (0.3 wt%) dispersed under several conditions using the SK-400TR and SK-300S II were measured with a Magno Meter XRS from Mageleka, Inc. The degree of dispersion under each condition was then compared, with 100% assumed for dispersion with the SK-400TR (Speed of revolution: 1,000 pm / Speed of rotation: 2,000 rpm), as it had the shortest relaxation time. With its high speed of revolution (revolution g-force) and low speed of rotation, the SK-300S II demonstrated low dispersion.
Generally, a high revolution g-force is required to increase dispersion, but high-quality dispersion can be achieved with a high speed of rotation relative to an appropriate speed of revolution (revolution g-force) to create an adequate flow.

Dispersion example 2 Evaluating the dispersion of highly concentrated materials – The effects of different speeds of rotation relative to the speed of revolution –

Materials: Alumina powder, photocurable resin, dispersing agent Container: 400 ml Subject of comparison: Different speeds of rotation with the SK-400TR

The MCR302e from Anton Paar Japan K.K.



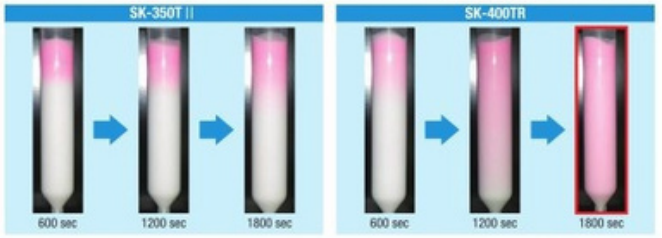


Material temperature measured in real-time
Repeating the mixing and cooling processes inhibits heat-related deformations in the material

A large shearing force is required to disperse highly concentrated aluminum oxide (82 wt%). Rotation was set to either 0.4, 1.0, or 1.4 times that of revolution and the materials were then mixed under conditions that would change the shearing force. The rheological properties were evaluated using an MCR302e rheometer from Anton Paar Japan K.K. Except for 0.4 times rotation, the dilatancy phenomenon from shearing speed 20 (1/s) improved with 1.0 and 1.4 times relative rotation, as shown in the graph on the right also shows, vibration measurements showed a strong central structure, progressed cracking, and improved dispersion. In addition to the SK-400TR's individual revolution and rotation speed control system that allows for changes in rotation relative to revolution, adding the force of rotation to the large shearing force creates high-quality slurry, which not only increases dispersion and stability, but also leads to improvements in other processes like coating and discharge.

Dispersion example 3 Comparison of the fluidity of highly viscous materials in elongated containers

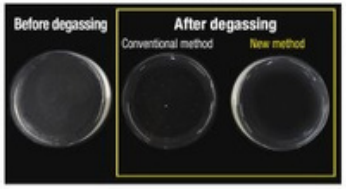
Target materials: Alumina powder, silicone oil Container: 50 ml syringe Equipment compared: SK350T II, SK-400TR

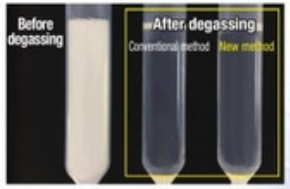


The SK-400TR allows for the dispersion of highly viscous materials in elongated containers, something that has traditionally been difficult to accomplish. An aluminum slurry (40 wt%, 20 Pa・s) was poured into a syringe and a pigmented aluminum slurry was then added. Fluidity was evaluated by the change in pigmented area by mixing time. The highly viscous slurry flowed extremely well with the SK-400TR, which allows redispersion to be carried out in syringes filled with electric or chemical materials.

Degassing example Epoxy resin degassing – The difference between conventional and new directions for revolution and rotation –

Target materials: Epoxy resin Container: 400 ml (left picture), 50 ml syringe (right picture)





Ultrafine air bubbles remained when using conventional directions of rotation (Revolution: clockwise Rotation: counterclockwise), but exceptional degassing was achieved with the new method used in the SK-400TR (same direction for both revolution and rotation: counterclockwise). This is also a suitable method for degassing highly volatile materials using vacuum models, where degassing is difficult.