NAKAYAMA
Co.,Ltd.

NAP-01

Automatic polishing and graphic analysis of nodularity for spheroidal graphite cast iron

What can NAP-01 do ?

NAP-01 automatically tells you the nodularity of your cast iron melt within 5 to 6 minutes after receiving a test piece cast by pouring your melt in a proprietary shell mold cup.

Features of NAP-01

In-line system

- Dry process

Fully automatic

- Automatic polishing
- Automatic imaging
- Automatic analysis

On-line analysis

- Six minutes for determination
- No personal bias

Features of NAP-01

In-line installation

Because of its dry system, NAP-01 can be installed in a production line. Because of its automatic system, personal bias is avoided both in the polishing step and the structural analysis step. Further, analysis result is obtained within a few minutes and hence, can be immediately fed back to the melting operation.

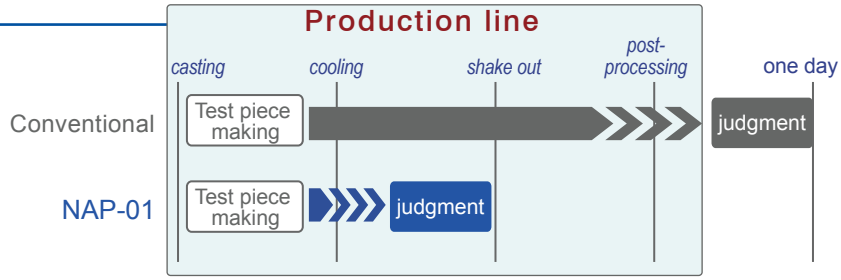
Full automatic operation

All the processes from polishing to nodularity determination are done automatically, except the initial test piece casting.

automatic polishing » automatic structure imaging » automatic structure analysis

In-line determination

Nodularity can be determined within 6 minutes at the minimum, and hence, quality judgment is done while the product is still in the production line.



Comparison with the conventional method

	NAP-01	conventional
Polishing	dry	wet
Installation	in-line	laboratory
Time for judgment	6 minutes	about one da
Polish quality	complete polish for imaging	operator dependent
Data source	averaged from 10 views for one TP	operator dependent
Record	data is stored	test piece is stored
Personal bias	none	unavoidable

Possible big cost cut by NAP-01

in-line installation | fully automatic | judgment in the line → reduced personal cost | reduced scrap in the post-process steps

1 automatic polishing

● Quick polishing

The dry process, in stead of the conventional wet process, enabled in-line installation.

● Reliable polish quality

Polishing quality is high and the time is quick (5 minute -), making in-line judgment of the product possible.

● No personal bias

Polishing is done in 6 steps to realize reliable polish quality.

Operation

Built-in liquid crystal display

Safety measure

Safety cover

Recommended TP

Analysis precision is improved by using the special consumables

Option

Multiple TP's can be set by option.

2 Automatic imaging

● Optical analogue type

Imaging corresponds to magnification of 100x

● Digital image storage

Images can be stored.

● Automatic nodularity determination

Ten views are automatically measured, where images can be selected if so desired. Determination is done without depending on the selection, and the fair and reliable result is expected without a need of worrying about personal bias.

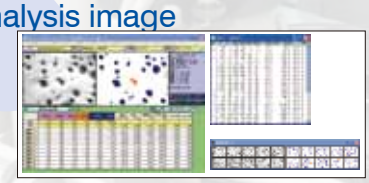
3 Automatic analysis

SG-Analyzer

● Digital data storage

The analysis data can be stored.

analysis image



● The analysis data can be stored.

The averaged value from 10 views is displayed. A precise value is obtained, because analysis is made irrespective of the selection of views.
Because of the automatic system, operation time and results are person-independent.

Specification

Functions and main specification

●Conditions of usage

(1) Environment of usage: place in room
surrounding temperature 10 ~40℃
(2) Frequency of usage: about 100 times a day

●Test piece

(1) Shape: cylindrical (polished edge is rounded off)
diameter 20 mm
length 50~5 mm
(2) Material: cast iron

●Measurement

(1) Method: Image analysis
(2) Procedure: Based on revised JIS (G5502-2001)
(3) Time: 5 to 6 minutes for one piece

Specification of the apparatus

●Test piece handling

(1) Horizontal move (left-right) (X-axis)
Driving Robo-cylinder (ball/screw driven by pulse motor)
Ball screw diameter 10mm
Moving speed 230 mm/s at maximum
Stroke 800 mm
Motor pulse motor (absolute)
(2) Vertical move (Z-axis)
Driving: Air cylinder with a guide
Stroke: 60 mm
Cylinder diameter: 16 mm
(3) Chucking
Chuck type: Air chuck with three claws
Chuck claw stroke: 16 mm in diameter
Chucking claw: for a test piece of 20 mm diameter
Chucking force: 58 N (5.9kg) by air pressure of 0.4 MPa
Chucking on 30 points

●Polisher

(1) Polishing method: Dry wheel polishing
(2) Polishing wheels

step	polishing	wheel type
1st	rough grinding	rough grinding stone
2nd	rough finishing	rough finishing stone
3rd	medium finishing	medium finishing stone
4th	fine finishing	fine finishing stone
5th	finishing	finishing disc
6th	wiping off	wiping disc

wheel diameter: 100 mm
attaching/detaching: one-touch action with a center cap
(3) Polish transfer speed: 50 mm/s at maximum
(4) Polishing pressure: 80 N (8.1kg with air pressure of 0.4MPa) at maximum
(5) Pressure application: vertical cylinder
(6) Pressure control: Electro-air regulator
(7) Motor: 1.5 kW
(8) Driving system: Flat gear (m=1) for different speed at different steps

●Cover and safety measures

(1) Cover system: Full closing cover
Upper part of the front cover can be opened.
A vinyl door at right side for inserting test pieces
(2) Maintenance: Wheel change through the front door and polish box door
Test pieces inserted through a vinyl door at right side
Dust collection through the front door of the control panel
Electrical power through the front door
(3) Noise suppression: Noise sources are enclosed inside the unit to keep the noise level below 85 db.
(4) Safety measures: Automatic shut down of the instrument for incomplete closing of upper cover and test piece door.

●Analysis

(1) Method of analysis: Image analysis of images obtained with a CCD camera
(2) Number of areas for one test piece: ten areas
(3) Positioning of measurement area: X-Y positioning
X-axis (left-right): Test piece held with a chuck and moved.
Y-axis(front-back): Camera moved as adjusted with a screw
2 mm on a test piece of 20 mm in diameter

●Control

(1) Control board: Installed in the unit.
(2) Operation panel: Installed in the upper part of the control boar
(3) Displayed items: (a) Rotation of the polisher
(b) Time of polishing
(c) Polishing speed
(d) Polishing pressure
(4) Controlling system: Sequencer

●Dust collection

(1) Location: Installed inside the unit.
(2) Collection system: Formed cassette filter
(3) Capacity: Air flow 4.0 m^3/min
Static pressure 125 mmH_2O
(4) Motor: 200W
(5) Intake diameter: 70 mm
(6) Collector duct diameter: 75 mm
(7) Dust bucket capacity: 2.0 liter
(8) Operation: Simultaneous with the polisher.

●Others

(1) Dimension of the apparatus: 1200mm(W)×600mm(D)×1350mm(H)
(2) Weight of the main unit: 400 kg

●Utility and others

(1) Power source: Supply: AC3phase 200/220V 50/60 Hz
Used electricity Power: AC3phase 200/220V 50/60 Hz
AC single phase 100V 50/60 Hz
Control AC single phase 100V 50/60 Hz
Electromagnetic circuit for air valve DC24V
Total electrical capacity 6kVA
(2) Compressed air: Dry air of 0.4MPa(4 kg/cm^2) or above.
(3) Air flow volume: 75 liter/min or above
(4) Paint: 5GY8.5/0.5

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