



Measurement & Analytics | Measurement made easy

Prefil®-Footer printer

Pressure filtration melt cleanliness analyzer

A quick and thorough inclusion control solution

Pressure filtration melt cleanliness analyzer

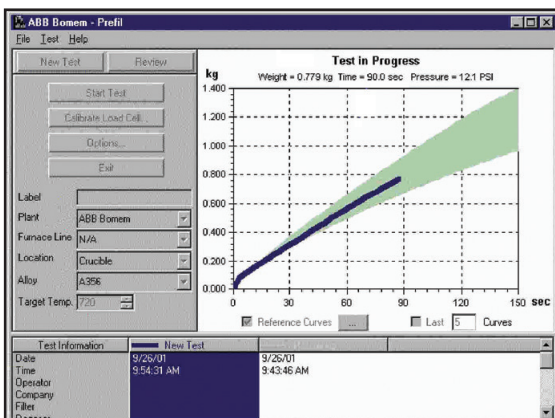
A quick and thorough inclusion control solution



Today's global economy and competition have compelled aluminum producers and aluminum foundries to produce the highest quality aluminum and shape castings. Process expertise is essential to ensure world class quality. On-line process monitoring enables the management of melt quality at all stages of the manufacturing process

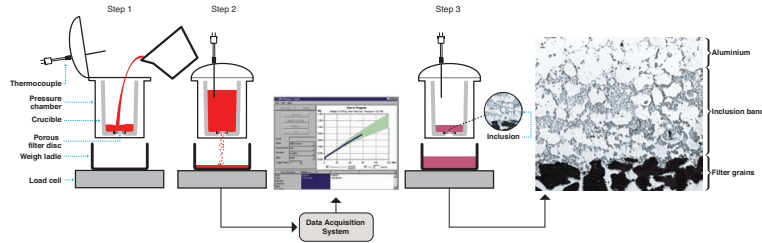
- On-line inclusion measurement
- Process Control and Process Optimization
- Residue for metallographic analysis
- Low cost per measurement with reusable crucibles

Prefil® is the only inclusion analyzer that provides an immediate result and, at the same time, a sample for further metallographic analysis. These two qualities make the Prefil®-Footprinter a powerful solution for performing process control on a day-to-day basis, and/or on a more in-depth audit basis for process optimization. The Prefil®-Footprinter is simple to use and designed to survive the foundry floor. Its rugged construction is based on an open architecture that will give you access to improvements and upgrades over the long life expectancy of the instrument. The instrument is well engineered for process optimization and routine measurement by shop floor personnel.



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Prefil®-Footprinter Operation Principle

The flow-rate of molten metal through a micro filter at constant temperature and pressure is monitored and used to plot a graph of weight filtered vs. time. Inclusions in the metal, such as oxide films and small particles, quickly build up on the filter surface during a test, reducing the flow-rate through the filter. The slope and overall shape of the weight filtered vs. time curve indicates the level of inclusions present in the metal. Regular Prefil® testing and reference to a suitable production 'window' allows the metal quality to be monitored and remedial action to be taken if quality drops. In addition to the filtration curve, metallographic analysis of the residue that is retained on the filter after a Prefil® test allows identification and quantification of the types of inclusions present in the metal sample.

Once the inclusion profile of a product line has been characterized it is easier to select the most appropriate monitoring and control procedures for maintaining consistency. A Prefil® test is easily performed in three steps as shown below.

Step 1:

A reusable crucible, with a filter previously installed in the bottom, is first pre-heated and installed in a pressure chamber. The operator then takes a sample of liquid metal with a ladle, pours it into the crucible and closes the lid.

Step 2:

When the metal temperature drops down to the specified target value for the test, the system applies a constant pressure in the chamber, forcing the metal to flow through the porous filter disc. A load cell connected to a computer records the weight of filtered metal as a function of time. The filtration curve is displayed in real time on the computer screen.

Step 3:

The test is completed in less than 3 minutes and the pressure chamber is automatically de-pressurized. The test result is saved with relevant information and used to easily generate a comprehensive report. The metal residue is identified and kept for future metallographic analysis.

Prefil FootPrints®

The real power of Prefil® is only realized when the Prefil® curve for a particular molten metal sample, obtained on-line, is compared to a pre-established "window" (or "Footprint") for an appropriate level of quality.

Prefil FootPrints® are regions of the Prefil plot that define where 66.6% of all the industrial data lie. They are extracted from a database of over 10000 Prefil® curves and can be determined for an alloy family, a specific alloy type, process stage or a particular product. They are therefore a very good way to benchmark and audit a process or product line.

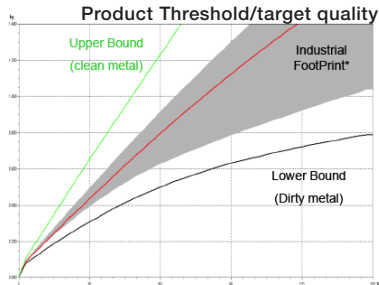
Since molten metal quality often changes as it flows through the metal and delivery systems, Footprints® maybe required for samples taken at different stages during the casting process. Prefil FootPrints® are used when evaluating Prefil® curves for samples taken from the final stage of the process, immediately prior to casting e.g. DC head launder, dip well, pouring spout, etc. If plant data does not lie inside the Footprint then it is not in the world class league.



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Prefil® Characteristics and the Industrial FootPrint

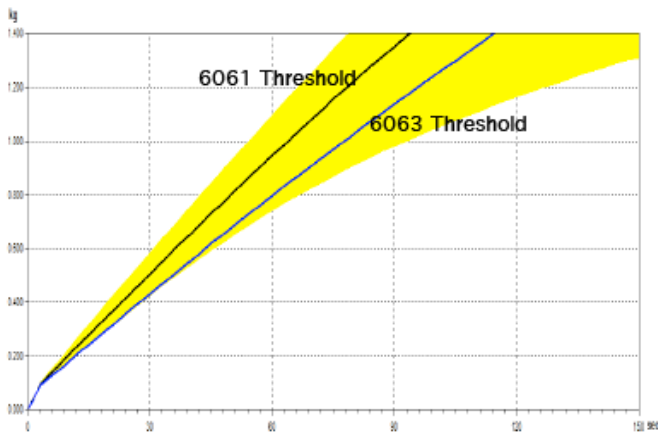


* The Industrial FootPrint is the metal quality range defined by the average of all the data for a particular alloy or product in the N-Tec database (+/-) one standard deviation. This means that 66% of all industrial data lies inside the shaded area

A356 Premium Automotive Casting Alloy

- Prefil® is the ideal tool for monitoring and optimizing both manual and rotary fluxing practices.
- Prefil® can tell you if your fluxing practice is efficient and how to optimize residence time.
- Prefil® can also tell you:
 - The molten metal quality from melting and holding furnaces and at any point during the process
 - The levels of residual (possibly ineffective) grain refiner particles
 - The effect of metallurgical additions, such as eutectic modifiers and grain refiners, on metal quality

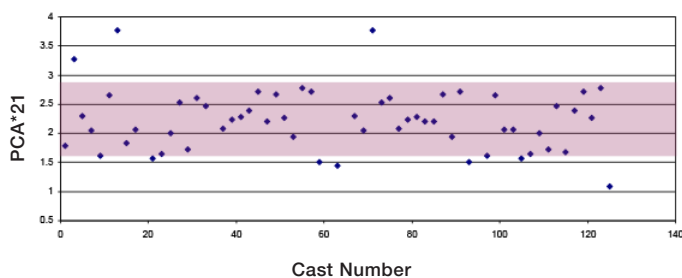
6xxx FootPrint



AA60XX General Quality Extrusions – Grain Refined

- Prefil® is used to optimize in-line metal treatment systems such as rotary degassers and filters.
- Prefil® can be used to correlate molten metal quality with parameters such as extrusion die life (number of billets per die), knowledge that is critical to process cost modeling.
- Prefil® is sensitive to grain refiner particulate (TiB_2 , TiC) and can highlight deviations in standard practice when they arise.

PREFIL Metrics Control Chart (FootPrint Shaded)



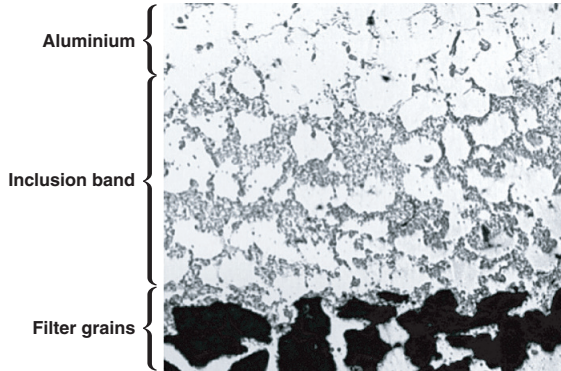
Prefil Metrics®

- A feature is available in the Prefil® software called Prefil Metrics®. This add-on automatically calculates two new parameters from the Prefil® curve:
 - The primary slope of the curve
 - The area under the curve.
- These metrics can be plotted separately on a control chart or grouped to correlate with metallographic measurements of oxide film and total inclusion content (PoDFA values).

© PREFIL Metrics and FootPrinting are trademarks belonging to N-Tec.

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In-depth Metallographic Analysis for Inclusion Types and Concentration

In addition to the filtration curve, metallographic analysis of the Prefil® residue allows identification and quantification of the types of inclusions present in the metal sample. The build-up of inclusions at the filter surface during a Prefil® test creates an inclusion band, which can be quantitatively analyzed using optical microscopy. By today's standard, it is widely acknowledged that a filtration technique* can identify and quantify inclusions.

* PoDFA is a well-known technology using the filtration technique. The PoDFA technology is the property of Rio Tinto Alcan and is available under license from ABB.



ABB metallographic analysis service

ABB has a metallographic analysis laboratory highly specialized in inclusion identification and counting. We do a large number of analyses every year for our customers all over the world.

Simply identify and mail your Prefil® samples to ABB. You will receive a report with key residue pictures and a breakdown of each inclusion type expressed in mm²/kg of aluminum. All information is strictly confidential and reports are produced in less than two weeks. There is no license fee; you pay on a per-sample basis.



Reusable crucibles and filters

The reusable crucible is designed to better respond to the needs of foundries and cast houses by decreasing operational costs. Prefil® users truly benefit from this innovative approach because it reduces risk of damage during handling and shipping (robust design).

The patented reusable crucible can last for approximately 100 samples. Prior to each test, a ready-to-use filter is easily installed in the crucible in a matter of seconds. Thanks to this leading-edge design, the filter detachment problem has been almost eliminated as the filter is literally cast into the aluminum.



Reusable crucible trolley for safe cooling and easy saw carrying



Metal sample holder for safe aluminum residue cutting on a band saw

Filter On Ceramic Disk:

We now offer filters mounted on ceramic disk. They can reduce preheating time of 10 minutes and the use of an expendable material as gasket greatly reduces the risk of leak when pouring molten metal in the crucible.

Accessories

Prefil®, Footprinter® and World Class Windows™ are trademarks of N-Tec Limited. N-Tec Patent nos. GB 230 070 49B. GB 230 68 96 CAN 2237355, 2237320 Reusable Crucible RTA patent no 7,472,613

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Measurements

Mass

- 0 to 6 kg \pm 0.02 kg (0 to 13.2 lb.)
- Mass above 9 kg (20 lb.) can damage the load cell

Reproducibility

- Overall margin on the Prefil® Footprinter curve is \pm 9% at a level of confidence of 95% (two sigma) at any time during the filtration

Software

Operating system

- Windows XP, Windows 2000, Windows NT version 4.0 Service Pack 5 or later, Windows ME, Windows 98, (with Internet Explorer 5.0 or later)

Hardware

Thermocouple

- Type K, ungrounded

Supplies

Compressed Air

- Inlet port: 4 to 8 bar (58 to 116 PSIG)
- Maximum pressure: 10 bar (145 PSIG)
- Air Consumption: 566L/min (20 SCFM) maximum, at 6.9 bar (100 PSIG), inlet pressure and the cooling valve fully opened.
- Purity: Dry and Clean (filtered to 40 microns)
- Maximum air temperature: 40°C (104°F)

Electrical

- Rated voltage: 100 – 240 VAC
- Rated input current: 10 – 5 A
- Frequency: 50/60 Hz

Environmental

- Operating temperature range 0 to 50°C (32 to 122°F) ambient
- Operating humidity range Up to 95% non-condensing at Ambient temperature = 40°C (104°F)
- Up to 85% non-condensing at Ambient temperature = 50°C (122°F)

Physical

- Overall Dimensions (H x W x D) 56.0 cm x 71.0 cm x 112.5 cm (22 in. x 28 in. x 44.3 in.)
- Weight 103 kg (227 lb.)



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Reusable crucible and Prefil® filter

General

Crucible heating time on the crucible heater

- Typically 30 minutes

Important: Typical times are based on crucible and heater at normal room temperature, no forced convection around the equipment and the use of an insulation blanket over the crucible.

Crucible lifetime

Up to 100 tests when following the proper preparation and manipulation procedure described in the User's Guide

Crucible protective coating

Needs to be redone every 15 to 20 tests

Important: Crucible lifetime is dependent on the protective coating. Carefully follow the procedure described in the User's Guide.

Physical

Crucible

Overall dimensions

- OD: 13.3 cm (5-1/4 in.)
- Height: 20.3 cm (8 in.)

Weight 3 lb (1.36 kg)

Materials

- Outer shell: Carbon steel Aluminum and silica
- Inner shell: Stainless steel
- Insulation: Synthetic Vitreous
- Fiber (SVF) blanket

Packaging information

- 3 crucibles per box 24 filters per box

Environmental

Storage temperature range -10°C to 75°C (14°F to 167°F)

- Storage humidity range Up to 60% (non condensing)

Crucible Heater

Heating time

0 to 6 hours (adjustable timer)

Electrical requirements

- Rated input voltage 100-120 / 220-240 VAC (factory set)
- Rated input frequency 50 / 60 Hz
- Earth leakage Less than 50mA
- Rated input current 4A at 230 VAC, 7A at 115 VAC
- Fuse type T4A/250V at 230 VAC, T7A/250V at 110 VAC

Environmental

- Operating temperature 10°C to 50°C (50°F to 122°F)
- Storage temperature 10°C to 75°C (14°F to 167°F)
- Operating humidity Up to 90% (non condensing)
- Storage humidity Up to 60% (non condensing)

Physical

- Overall Dimensions (H x W x D) 35 cm x 29 cm x 21 cm (13-1/2 in. x 11-1/2 in. x 8-1/4 in.)
- Weight 5.6 kg (12 lb.)



PoDFA reusable crucible and filter



Crucible Heater

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Service