

# SinterCast Tracking Technologies

## SinterCast Cast Tracker® – “More Measurements, More Control”

SinterCast Cast Tracker provides complete traceability of every casting; from core production through to pouring and shake-out, by linking the core history, moulding history, and the liquid metal history in a single database. With Cast Tracker, castings evolve from production batches to individual components with unique process histories. Cast Tracker provides Industry 4.0 traceability of the castings; prevents out-of-spec core packages from being poured; and enables engineers to determine and eliminate the root cause of metallurgical defects.

### Core Tracking

Cast Tracker begins by engraving a unique identification code into a Tracker Core. The Tracker Core is inserted into the core package at assembly to define the moment of inception and to apply the unique embossed identification code on each casting. Reading the embossed code on the casting provides complete traceability between the casting and every stage of the foundry process through the Cast Tracker database.



Figure 1: Tracker Core

### Core Package Labelling

For every Tracker Core, a corresponding 2D Matrix Label is printed and affixed to the core package. The Tracker Camera reads the label as the core package leaves the assembly area, and again when the cores are set into moulds. Registration at core setting identifies the unique code of each core package and determines the shelf storage time of the casting.

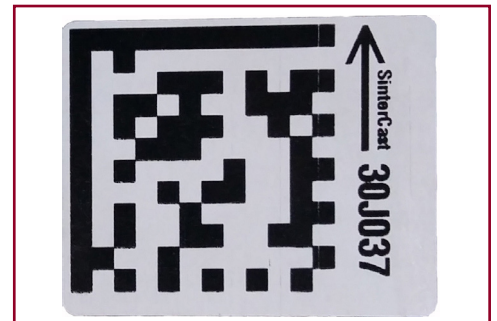


Figure 2: 2D Matrix Label

### Flask Tracking

The identification of each core package is linked to an RFID Tag affixed to the flask. The flask ID is read by an antenna at pouring to identify the flasks, and thus, the castings being poured from each ladle. The handshake between Cast Tracker and Ladle Tracker provide continuous traceability of the core and liquid metal histories, including the cast sequence within the ladle.



Figure 3: Label and Flask Tag

| SinterCast Cast Tracker Performance Summary   |  |
|---|--|
| Report Period: 1-May-19 to 31-May-19  |  |
| <b>Core Assembly Production</b>   |  |
| Core assemblies produced during the report period   | 9200 Core engraved/Labels created  |
|   | 9228 99.3% Core assemblies were verified in core shop  |
|   | 72 0.7% Core assemblies were unverified in core shop   |
| <b>Core Setting</b>   |  |
| Core assemblies observed at core setting (set in flasks)  | 9582 26 0.3% Were unverified in core shop  |
| Total core assemblies merged to flask   | 9570 99.3%   |
| Age of the core assemblies set  | 14.8 Ave. (hrs.) 118 Max. (hrs.) 428 Max. (hrs.)   |
| Age limit violations  | 6 < 45 hrs. 0.1% 0 > 245 Days (600 hrs.) 0.0%  |
| Time from mould merging to pouring  | 00:21 Ave. (hh:mm) 00:15 Min. (hh:mm) 00:40 Max. (hh:mm)   |
| Time limit violations   | Set limit: 00:45 (hh:mm) 0 Tracked cores in mould beyond set limit 0.0% of tracked cores                 |
| Number of flask turns   | 32   |
| Number of flasks detected:  | 100  |
| Number of flasks making all turns:  | 95 -5  |
|   | Under-reporting flasks: 5  |
|   | Non-reporting flasks: 5  |
| <b>Mould Pouring (Ladle Merging)</b>  |  |
| Number of ladles completing ladle/correction  | 832  |
| Number of ladles never arriving to pouring  | 16 1.9% (Failed Pour Temp check or other operator rejection)   |
| Total number of moulds poured   | 4780   |
| Moulds missing one Core ID  | 5 0.1% of total moulds poured  |
| Moulds missing both Core ID   | 2 0.0% of total moulds poured  |
| Total number moulds with missing Core ID  | 7 0.1% of total moulds poured and 9 Missing Core ID's (Castings) 0.2%                                    |
| Number of ladles arriving to pouring  | 816 98.1%  |
| Number of under poured ladles (shown below):  | 74 8.2%  |
| Number of ladles pouring only 5 moulds  | 50 6.1%  |
| Number of ladles pouring only 4 moulds  | 20 2.5%  |
| Number of ladles pouring only 3 moulds  | 3 0.4%   |
| Number of ladles pouring only 2 moulds  | 0 0.0%   |
| Number of ladles pouring only 1 mould   | 1 0.1%   |
| Number of ladles pouring no (zero) moulds   | 0 0.0%   |
| Totals  | 74 59 79.7% 12 16.2% 3 4.1% Other*   |
| * (Line stop, lunch break, end of campaign, mould not available, pouring signal, RFID Tag not read) |  |
| Number of moulds not poured from ladles arriving at pouring   | 104 2.1% = 208 Unreported Castings (2 Castings/mould)  |
| Number of moulds with only one valid core and no assigned Melt ID                                   | 8  |
| Number of moulds with valid cores in both positions and no assigned Melt ID                         | 4  |
| Number of moulds with valid cores at pouring (the flask/pouring signal)                             | 12 85 Castings with Incomplete traceability 0.2%   |
| <b>Shakeout Timing</b>  |  |
| Average time to shakeout  | 2:08   |
| Minimum shakeout time (hh:mm)   | 0:12   |
| Maximum shakeout time (hh:mm)   | 12:34  |
| Number of poured moulds not tracked at shakeout   | 0 0.0%   |
| <b>Overall</b>  |  |
| Potential number of castings poured from connected ladles (System 3000 database)                    | 9984   |
| Potential number of castings poured from ladles entering pouring (System 3000 database)             | 9792 -192 -1.9%  |
| Number of castings poured (Cast Tracker database)   | 9588 -208 -2.1%  |
| Number of castings fully tracked (Cast Tracker database)  | 9551 -33 -0.3%   |
| Percentage of castings fully tracked  | 99.7% (based only on Cast Tracker data) 99.9% (est. possible based on Cast Tracker + Ladle Tracker data) |

Figure 4: Cast Tracker Summary Report

### Result Reporting

All Cast Tracker and Ladle Tracker results – from inception to shakeout and from melting to pouring – are compiled into a single database for traceability, process optimisation, and metallurgical troubleshooting. The database can also include results from microstructure and chemistry analyses. The results are summarised in Performance Summary Reports that can be generated on demand. All data are saved in a central database that can be fully accessed by the foundry engineers.

## Cast Tracker Benefits:

- Traceability begins at core assembly (inception event)
- Quantitative measurement and control of core storage time
- Handshake with Ladle Tracker at pouring (birth event) links core history with liquid metal history
- Automatically prevent out-of-spec, or unidentified, core packages from being poured
- Comprehensive database for root-cause defect identification, including cast sequence within the ladle
- Elimination of manual data entry
- Eliminate manual data recording and paper records
- Multiple data sources organised in a single process database
- Industry 4.0 traceability to define process efficiency improvements, to prevent the production of out-of-spec castings, and to determine the root cause of metallurgical defects
- Real-time monitoring of the entire casting process on any internet device
- Incorporate microstructure, visual inspection, and NDT results into the Cast Tracker database

## Cast Tracker Hardware/Software:

- Comprised of individual hardware modules that can be custom configured and scaled to suit the layout, process flow, and production volume of any metalcasting facility. SinterCast can also supply the Tracker Core engraver
- Optional RFID Flask Tag configurations to suit a variety of flask configurations
- Configurable software provides engineers, production personnel, and management with real-time monitoring of the process with customised reporting options



*Tracker Computing Module*



*Tracker Antenna Set*



*Tracker Label Printer Module*



*RFID Ladle Tag Holder Set*



*Tracker Reader Module*



*Tracker Optical Camera Module*