

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.

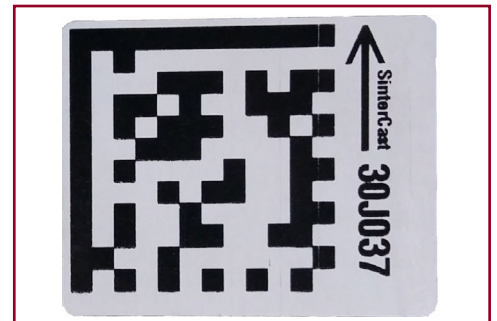


Figure 2: 2D Matrix Label

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	
Core Assembly Production	9200 Cores engraved/Labels created
Core assemblies produced during the report period	9928 93.3% Core assemblies were verified in core shop
	72 0.7% Core assemblies were unverified in core shop
Core Setting	
Core assemblies observed at core setting (set in flasks)	9982 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.) 118.0 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
Mould Pouring (Ladle Merging)	
Number of ladles comprising SinterCast 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% 40 Ladles TO 8 Ladles No lock 2 Other*
Number of ladles pouring only 4 moulds	20 2.5% 16 Ladles TO 3 Ladles No lock 1 Other*
Number of ladles pouring only 3 moulds	3 0.4% 2 Ladles TO 1 Ladles No lock 0 Other*
Number of ladles pouring only 2 moulds	0 0.0% 0 Ladles TO 0 Ladles No lock 0 Other*
Number of ladles pouring only 1 mould	1 0.1% 1 Ladles TO 0 Ladles No lock 0 Other*
Number of ladles pouring no (zero) moulds	0 0.0% 0 Ladles TO 0 Ladles No lock 0 Other*
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%
Shakeout Timing	
Average time to shakeout	2:08 Minimum shakeout time (hh:mm) 01:22 Maximum shakeout time (hh:mm) 12:34
Number of poured moulds not tracked at shakeout	0 0.0%
Overall	
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 -1.9%
Number of castings poured (Cast Tracker database)	9588 -2.6%
Number of castings fully tracked (Cast Tracker database)	9551 -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



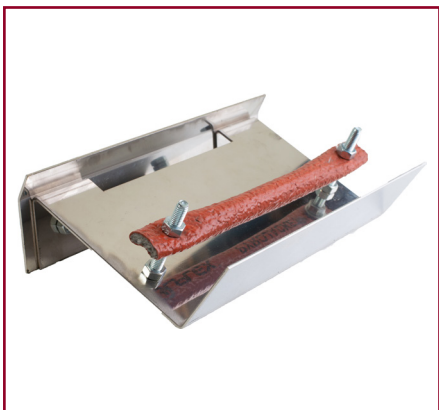
Tracker Computing Module



Tracker Antenna Set



Tracker Label Printer Module



RFID Ladle Tag Holder Set



Tracker Reader Module



Tracker Optical Camera Module