Weber Manufacturing Technologies Inc.

NICKEL VAPOR COATED GRAPHITE (VNCG)

Overview

Founded in 1962, Weber Manufacturing Technologies Inc. is a leading manufacturer of precision tooling for Automotive, Aerospace, and Home/Building Products.

Located in **Midland, Ontario**, Weber is a privately held Canadian company. Weber offers high quality tooling in steel, invar and aluminum, and precision CNC machined aluminum parts.

Over the last 15 years, Weber has developed nickel shell tooling using the Nickel Vapor Deposition (NVD) process. This process is also used for capturing fine surface detail, such as leather and wood grains, and authentically replicating them into hard tools. In 2011 Weber introduced VNCG, Vapour Nickel Coated Graphite using our nickel vapour deposition process to precision coat fine graphite powder.

200 employees, **135,000 sq. ft**. facility

On-site CAD Design capable (UGS, CATIA)

Certified ISO 9001:2008

Canadian Controlled Goods Program registered

Modern simultaneous **5-Axis CNC** machining centers

Full complement of CNC contour mills, gun-drills, vertical mills, and EDM machines

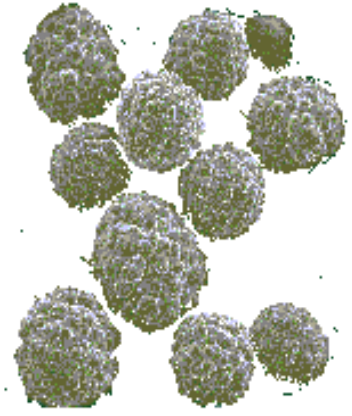
Company History

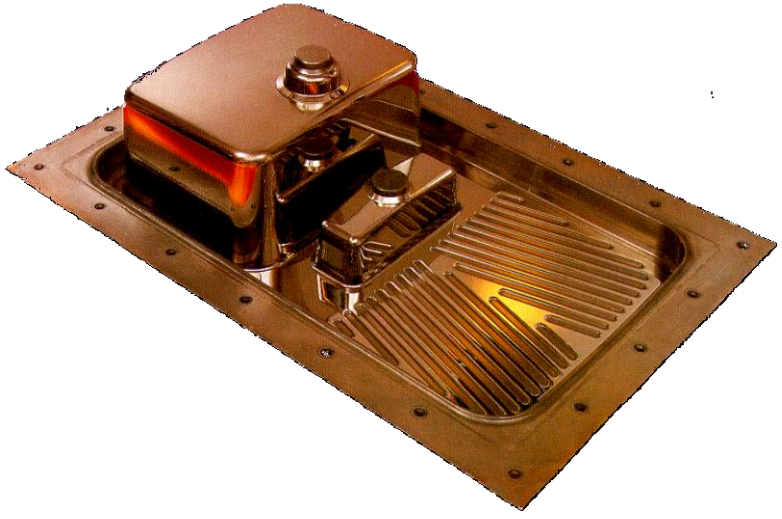
1962	Established Weber Manufacturing (Windsor) Limited
1967	Relocated to a new building in Midland, Ontario
	Established the Weber Tool & Mold Division
1989	Established the Nickel Tooling Technology (NTT) Division
1991	Sold our first Nickel Shell
1998	Built and tested NVD Pilot Plant
1999	Designed and Built Large Scale NVD Plant
2000	Commissioned the NVD Nickel Division
2001	Produced our first Nickel Shell in February
2004	Company purchased by American Capital Strategies and TMB Industries
2007	Company purchased by Zynik Capital Corporation
2009	Launched WeberGrain Technology and MasterGrain Doors
2011	Developed Nickel Coated Graphite (VNCG)

NICKEL VAPOR DEPOSITION

THE SUPERIOR ALTERNATIVE TO ELECTROFORMING

Chemical Vapour Deposition



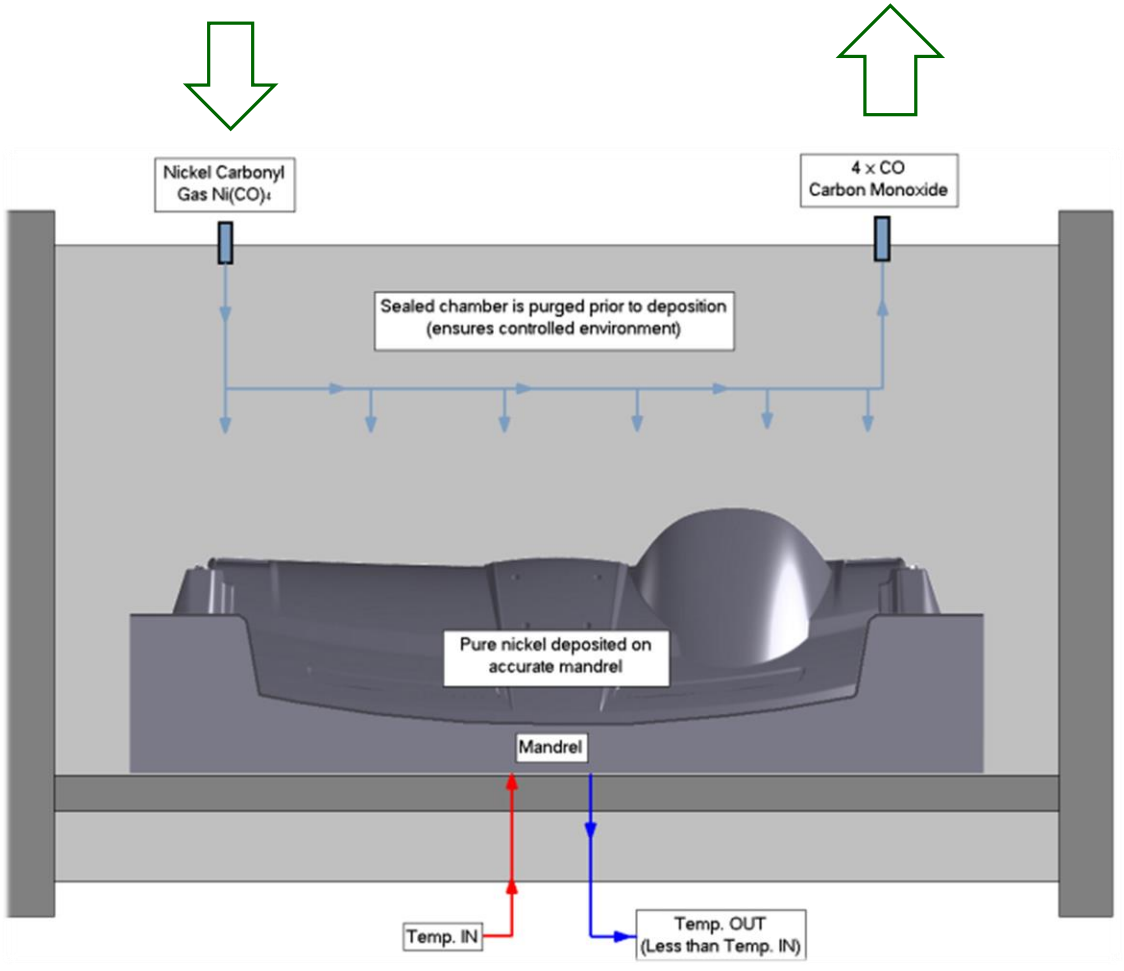


Nickel Powder

Solid Nickel Shape

NICKEL VAPOR DEPOSITION PROCESS

SEALED DEPOSITION CHAMBER



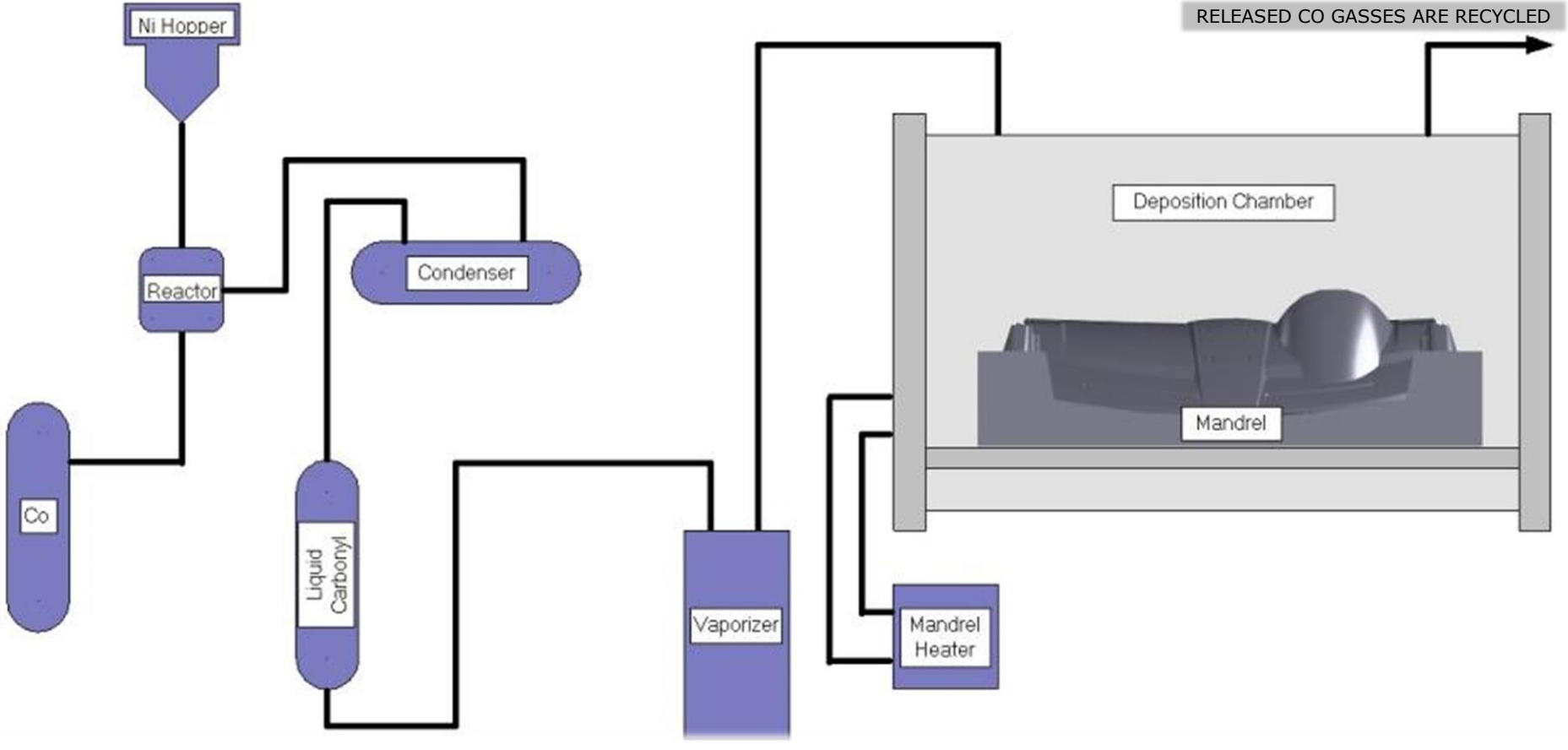
THE NICKEL CARBONYL GAS FLOWS OVER A RE-USABLE DEPOSITION MANDREL CREATING A UNIFORM THICKNESS NICKEL SHELL AT A GROWTH RATE OF .010" (0.25mm) PER HOUR REGARDLESS OF THE PART SIZE

NICKEL VAPOR DEPOSITION PROCESS

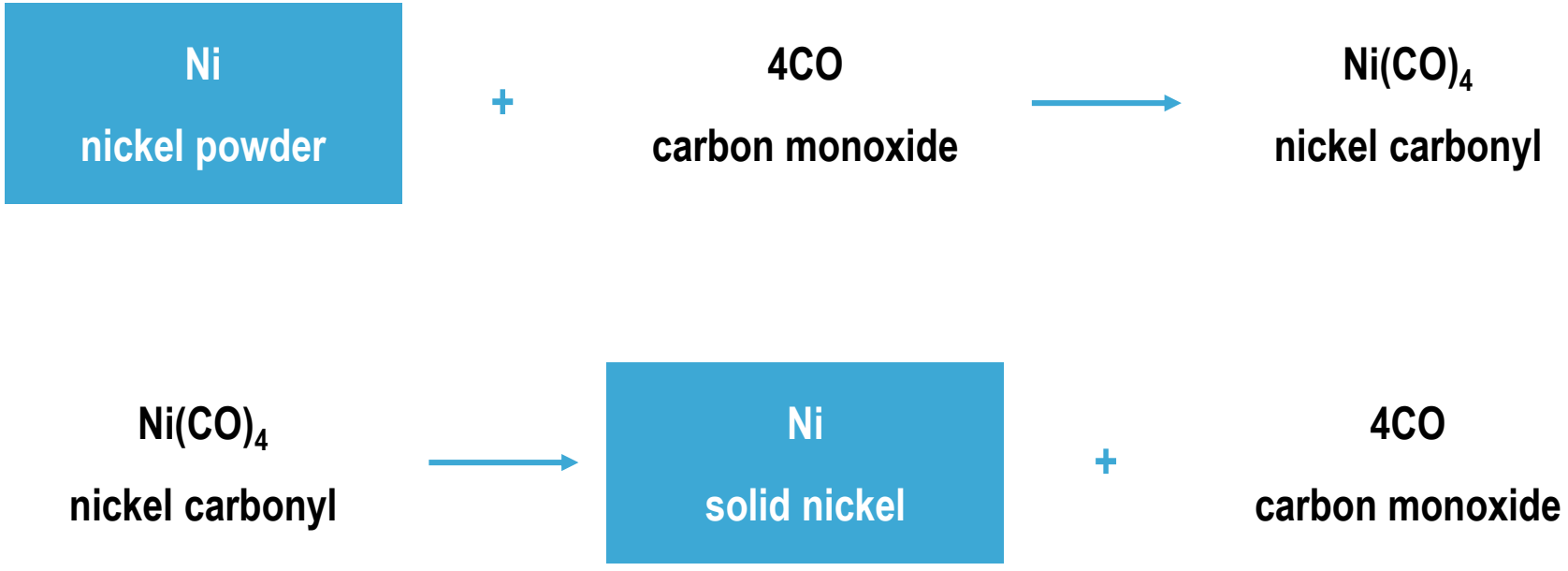
RE-USABLE DEPOSITION MANDREL IS PLACED INTO THE DEPOSITION CHAMBER AND HEATED TO APPROXIMATELY 350°F (175°C)

MULTIPLE NICKEL SHELLS ARE MADE SEQUENTIALLY FROM THE SAME DEPOSITION MANDREL

DEPOSITION MANDREL IS CLEANED, RE-ASSEMBLED, & RE-PREPARED PRIOR TO EACH USE

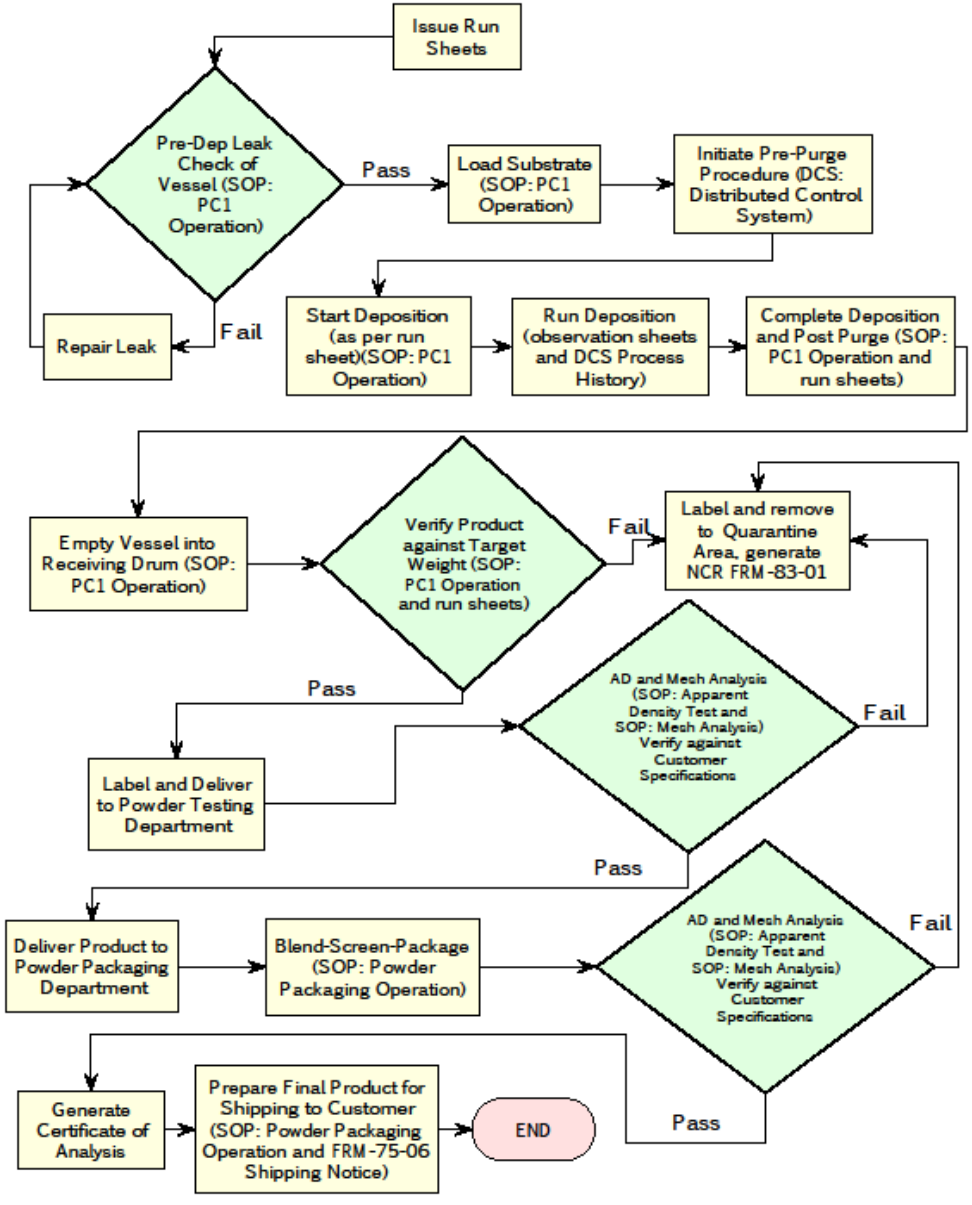


Chemistry

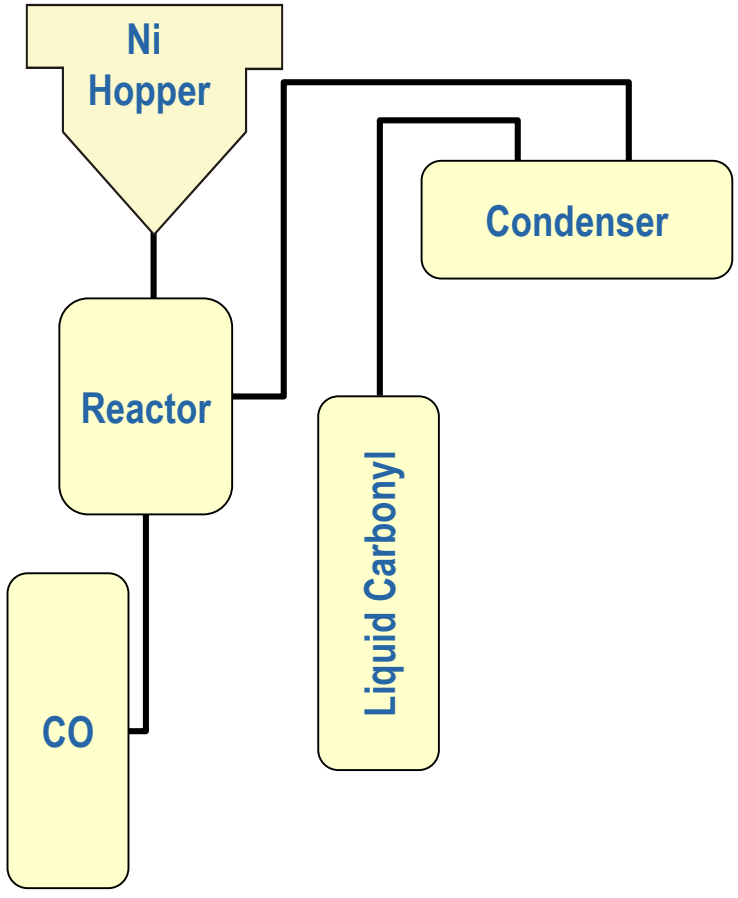

Ni
nickel powder
+
4CO
carbon monoxide
Ni(CO)4
nickel carbonyl
Ni(CO)4
nickel carbonyl
Ni
solid nickel
+
4CO
carbon monoxide

Weber Manufacturing Technologies Inc.

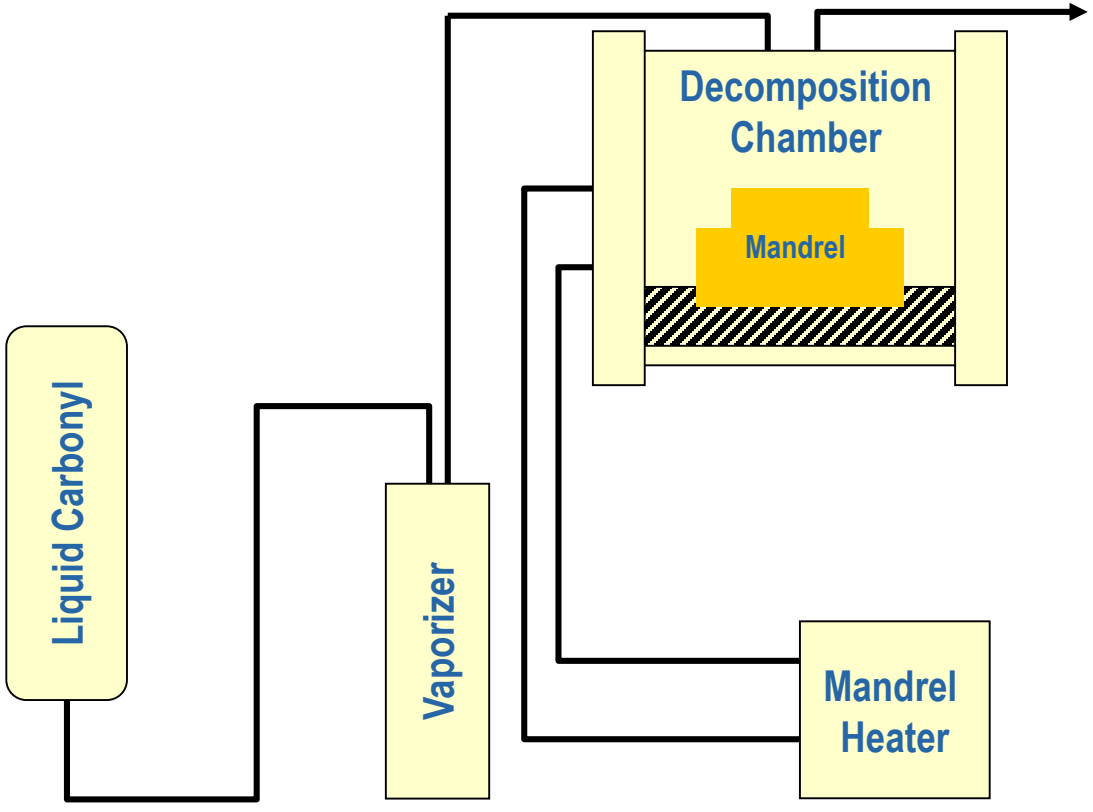
NVCG Powder Process Flow Diagram
Production/Testing/Packaging



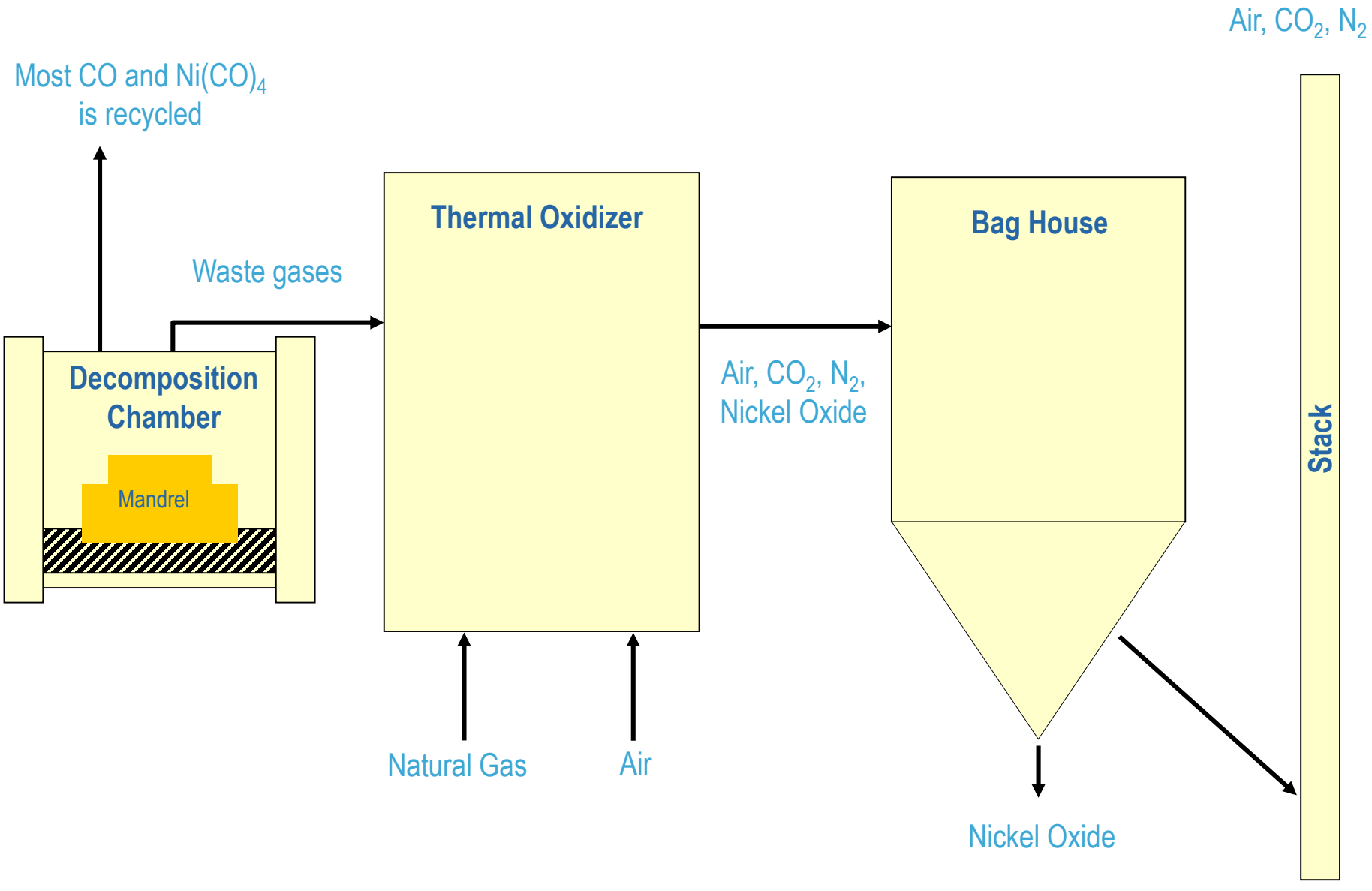
Carbonyl Generation



Carbonyl Evaporation & Nickel Deposition



Environmental Control System



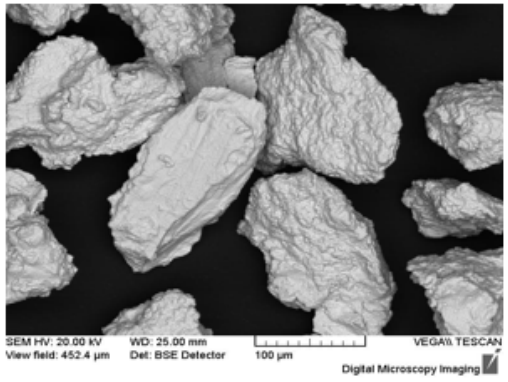
Product Sheet for Vapor Nickel Coated Graphite (VNCG085)

- D50 85microns
- 60%Wt. nickel coated graphite

CONDUCTIVE FILLER

VNCG 085 - Vapour Nickel Coated Graphite

Weber VNCG advanced powder is the only nickel coated graphite using Weber's proprietary Nickel Vapour Deposition (NVD) Technology. Atom by atom, each grain of graphite is encapsulated with 99.9% pure nickel, maximizing conductivity. The NVD process provides reliable and repeatable product.



Typical Analysis

Product	Nickel Content, wt%	Particle Size Distribution, µm			Tap Density, g/cc	Apparent Density, g/cc	Volume Resisitivty, mΩ-cm
		D10	D50	D90			
VNCG085	58-63	58	85	138	1.8	1.3 - 1.5	<15

- C of A with Particle Size Distribution, Apparent Density and Nickel Content provided with every batch
- Mastersizer 3000 for Particle Size Distribution
- Nominal screen analysis (RoTap) available
- Onsite testing equipment for Tap Density and Volume Resistivity
- R&D coating apparatus for custom product development (including alternative substrates) is available
- Ability to coat both spherical and non-spherical subtrates
- Standard packaging (MOQ): 55lbs/25kg pails
- Maximum crating: 18 pails/wooden pallet
- Volume Resistivity tested in silicone rubber

Product Sheet for Vapor Nickel Coated Graphite (VNCG050)

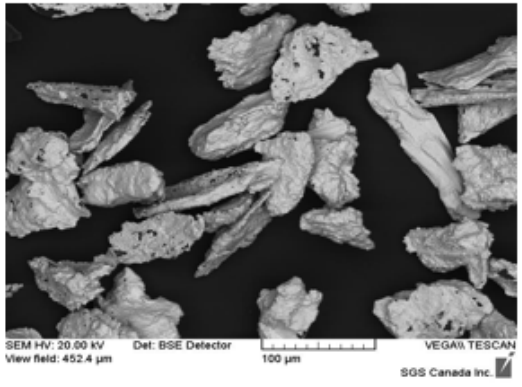
- D50 of 50 microns
- 60%Wt. nickel coated graphite
- Suited for FIP and applications requiring finer particle size without sacrificing Conductivity

CONDUCTIVE FILLER

VNCG 050 - Vapour Nickel Coated Graphite

Weber VNCG advanced powder is the only nickel coated graphite using Weber's proprietary Nickel Vapour Deposition (NVD) Technology. Atom by atom, each grain of graphite is encapsulated with 99.9% pure nickel, maximizing conductivity. The NVD process provides reliable and repeatable product.

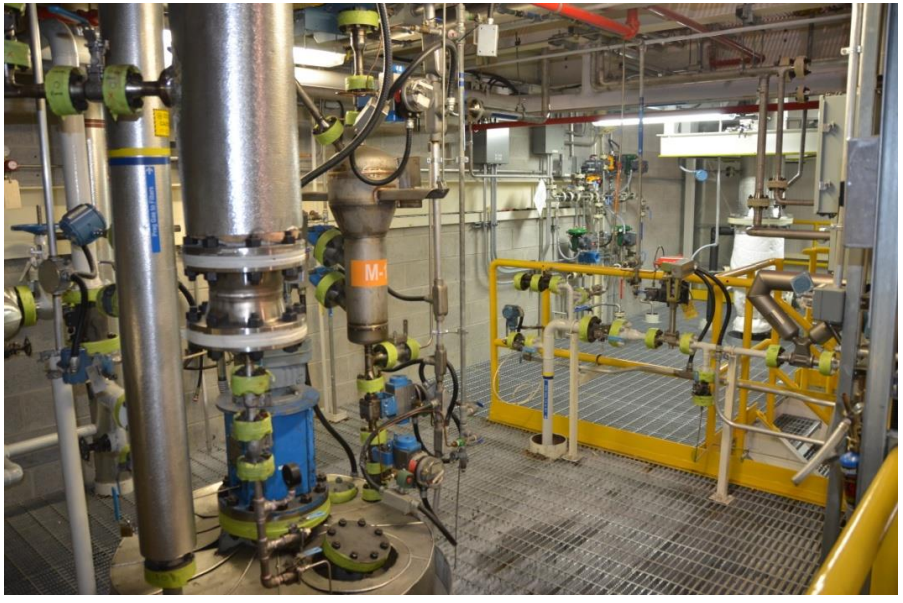
VNCG050 is suited for FIP and applications where smaller size filler particles are desirable without sacrificing conductivity or repeatability.

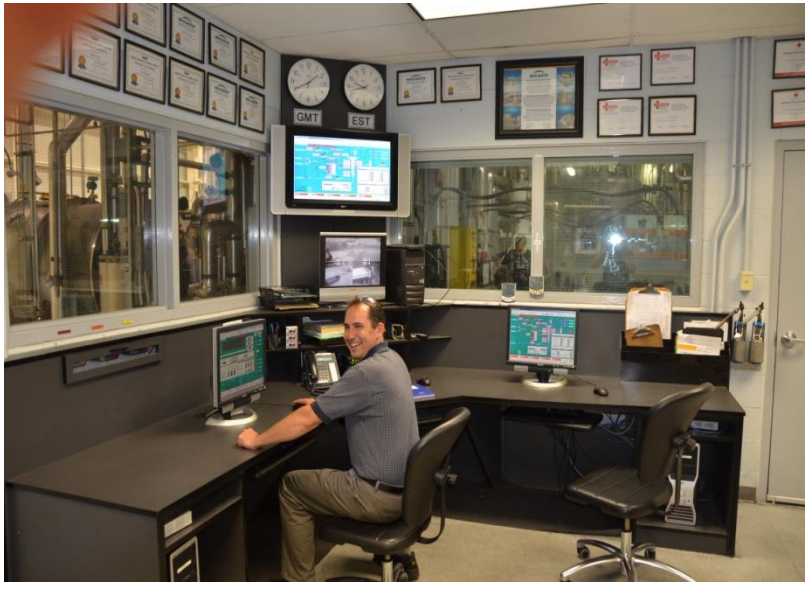


Typical Analysis

Product	Nickel Content, wt%	Particle Size Distribution, µm			Tap Density, g/cc	Apparent Density, g/cc	Volume Resisitivty, mΩ-cm
		D10	D50	D90			
VNCG050	57-63	35	50	80	1.8	1.2 - 1.5	<15

- C of A with Particle Size Distribution, Apparent Density and Nickel Content provided with every batch
- Mastersizer 3000 for Particle Size Distribution
- Nominal screen analysis (RoTap) available
- Onsite testing equipment for Tap Density and Volume Resistivity
- R&D coating apparatus for custom product development (including alternative substrates) is available
- Ability to coat both spherical and non-spherical subtrates
- Standard packaging (MOQ): 55lbs/25kg pails
- Maximum crating: 18 pails/wooden pallet
- Volume Resistivity tested in silicone rubber
- Typical applications include: Adhesives, Transfer Tapes, Conductive Elastomers and Sealants

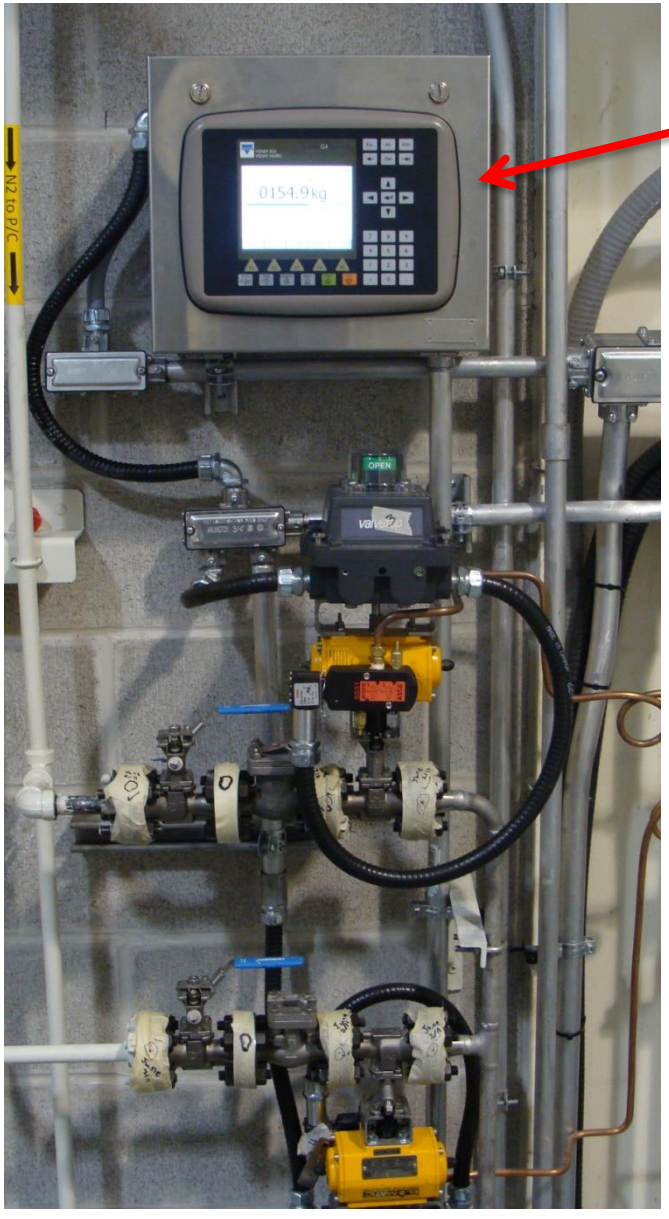




NVD Chambers, Process Piping and Control Room

R&D Chamber, Operating Floor and Control Room

Rear of Chambers, Process Piping



Inline integrated Scale to control mass of deposited nickel

WEBER

Hall Flowmeter for testing Apparent Density

Particle Distribution Analysis Testing Equipment

Typical Certificate of Analysis (C of A) supplied with each Lot

Certificate of Analysis

Created by: dsutherland
Last edited: 7/30/2013 11:49:23 AM

Company Details:

Provided By: Weber Manufacturing Technologies Inc.

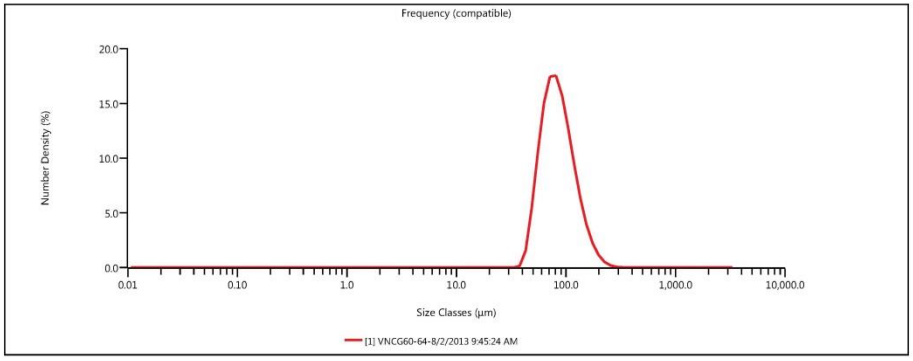
Address: 16566 Highway 12, PO Box 399, Midland, Ontario, Canada L4R 4L1

Measurement Details

Operator Name dsutherland
Sample Name VNCG60-64
Instrument Type Mastersizer3000
Instrument Serial No. MAL1081929
Measurement Date Time 8/2/2013 9:45:24 AM

Result

Dn 10 55.2 µm
Dn 50 81.6 µm
Dn 90 132 µm



Calculation

PASS - All results are within specification

Spec - Dx10: ≥45 - ≤65, Dx50: ≥75 - ≤95, Dx90: ≥115 - ≤145

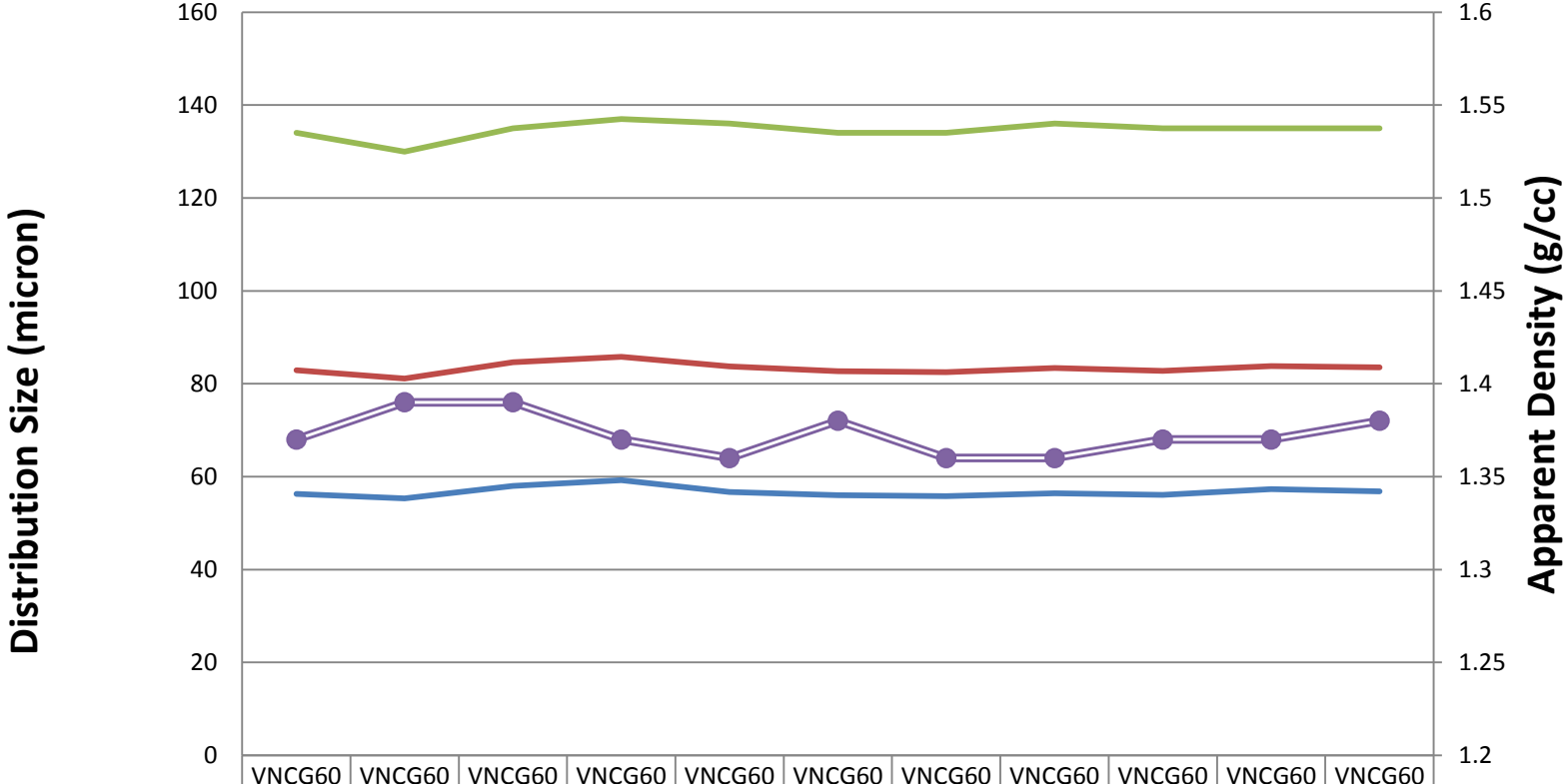
Additional Sample Details:

Nickel Content: 60%

Graphite Content: Balance

Software Version: 2.10
Malvern Instruments Ltd - www.malvern.com
Page 1 of 1

Product Consistency Analysis



	VNCG60-43	VNCG60-44	VNCG60-45	VNCG60-46	VNCG60-47	VNCG60-48	VNCG60-49	VNCG60-50	VNCG60-51	VNCG60-52	VNCG60-53
Dx 10	56.3	55.3	58	59.2	56.7	56	55.8	56.4	56.1	57.3	56.8
Dx 50	82.9	81.1	84.6	85.8	83.7	82.7	82.5	83.4	82.8	83.8	83.5
Dx 90	134	130	135	137	136	134	134	136	135	135	135
Apparent Density	1.37	1.39	1.39	1.37	1.36	1.38	1.36	1.36	1.37	1.37	1.38

VNCG 60 Ready to Ship

55lb/pail * 18pails/pallet = 990lbs/pallet

Customers from around the world choose Weber to take advantage of our:

1. **EXPERIENCE** - Over 45 years of manufacturing and mold-making experience for an international customer base.
2. **INNOVATION** – Design and manufacturing knowledge gained from experience in market applications ranging from Aerospace to Automotive to Consumer Products is continually and successfully applied to new developments.
3. **CAPACITY & CAPABILITY** – The worlds largest, fully integrated Nickel Vapour Deposition (NVD) and manufacturing facility can independently handle large orders reliably, efficiently and professionally.
4. **VAPOUR NICKEL COATED GRAPHITE (VNCG)** – A unique process for coating graphite powder with the highest purity nickel utilizing NVD to achieve high quality, high production delivered on-time to customer specifications.

HEAD OFFICE & MANUFACTURING

16566 Highway 12
P.O. Box 399
Midland, Ontario
L4R 4L1 CANADA

Tel **(705) 527-2930 [Main]**
Fax **(705) 526-3818**
Web Page **www.webermfg.ca**