Particle Core = Accucore Components

Revolutionary Pressed Electromagnetic Components

Applications

- Motor Stators and Rotors
- Ignition Cores
- Soft Magnetic Sintered Cores
- Solenoid Cores
- Choke and Inductor Cores
- Shunts
- Magnetic Bearnings
- Many Other Rotating and Static Components...

		Core Loss, W/lb		
Induction, kG	Applied Field, Oe	@ 60 Hz	@100 Hz	@ 400 Hz
1	1.91	0.06	0.11	0.48
2	2.93	0.19	0.31	1.48
3	3.92	0.35	0.60	2.82
4	5.03	0.55	0.94	4.45
5	6.25	0.79	1.35	6.39
6	7.70	1.05	1.80	8.55
7	9.41	1.34	2.30	11.02
8	11.42	1.66	2.86	13.83
9	13.91	2.01	3.47	16.94
10	17.05	2.38	4.10	20.18
11	21.07	2.78	4.80	24.00
12	26.40	3.19	5.54	27.84
13	33.76	3.62	6.28	31.82
14	44.28	4.05	7.06	35.91
15	59.83	4.52	7.89	40.96
16	82.45	4.93	8.64	45.21
17	113.50	5.31	9.36	49.84
17.5	135.00	5.50	9.71	

Table I - Magnetic properties of non-sintered Particle Core Components.

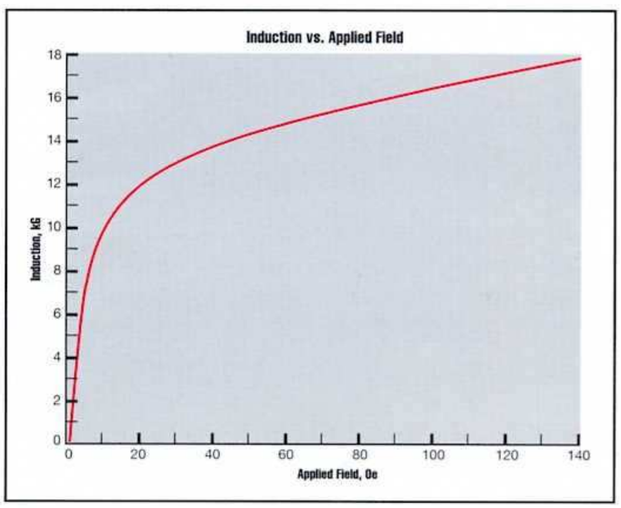


Figure 1 - The extremely high density of Particle Core Components results in saturation magnetization comparable to stacked lamination steel.

A New Alternative

A new, soft magnetic material that is better for use in electromagnetic components than traditional materials such as steel laminations, machined solid steel or pressed powder metal (see Table I).

Because the Particle Core Components we manfacture from this material perform over a wide frequency range, the pressed manufacturing techniques normally associated with only powdered metallurgy can be used commercially in components operating at power frequencies of 50 and 60 Hz up to 800 Hz and above.

Induction

The density of Particle Core Components is 7.55 to 7.70 g/cc, or up to 98% of the density of iron, which results in excellent ac and dc magnetic properties. Due to this superior density, the magnetic field required to obtain the high levels of inductance at which many devices operate is comparable to stacked lamination sheets and superior to Si Steel or pressed powder metal. (see Figure 1)

Core Loss

In real-world conditions, most electromagnetic components operate at induction levels and frequencies above the standard ASTM measurement baselines of 15 kG and 60 Hz.

As induction and frequency increase past these nominal baselines, the relative core loss of Particle Core Component is superior to traditional cores (see Firgure 2). For example, at 400 Hz, core loss is less than M-19 Non-Oriented Si Steel. This means that Particle Core Components consmue less energy, operate at lower temperatures and perform over a wide range of frequencies and inductions.

This exceptional performance is due to the low eddy current loss in relation to total core loss. Since eddy current loss increases with the square of frequency, it becomes a larger portion of the total loss as frequency rises. For comparasion, at 60 Hz and 15 kG, the eddy current component for Particle Core is only 5% of the total loss compared to 50% for steel laminations. This benefit becomes even more significant with non-sinusoidal voltages containing higher harmonics that result in higher eddy current losses.

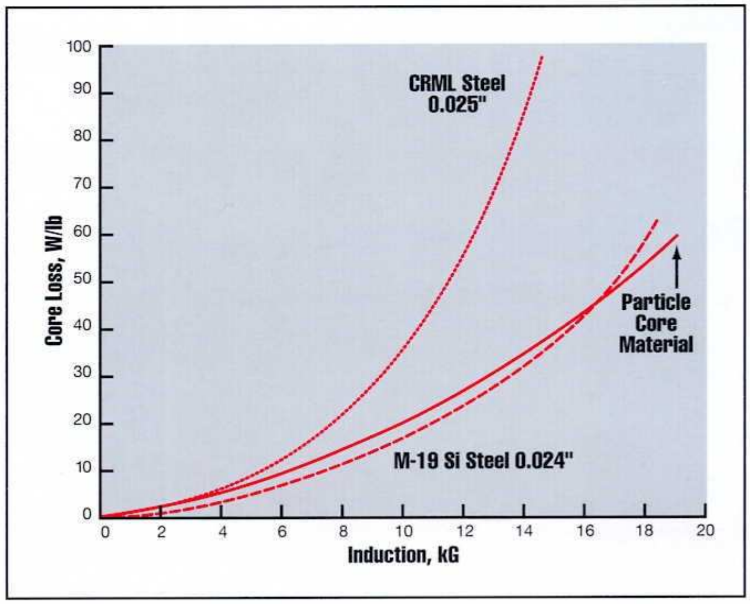


Figure 2 - The frequency related core loss of Patricle Core Components make them an excellent choice for variable speed devices.

Testing Conditions

All testing procedures followed ASTM procedures A343-82 and A697-74 standard test methcds for magnetic properties. Except where noted, all tests were run at 60Hz and data tests were run at 60 Hz and data reported at induction levels of 15 kG.

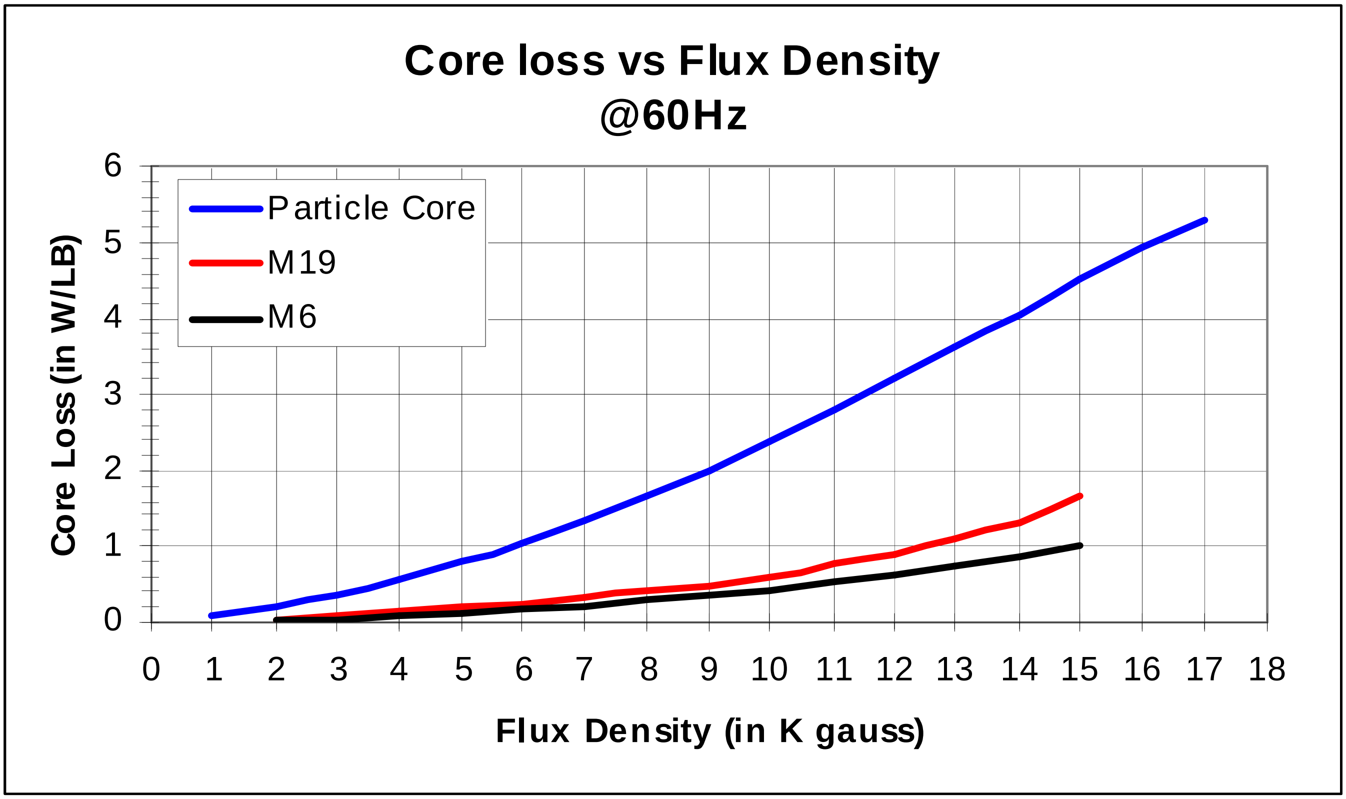
dc Properties

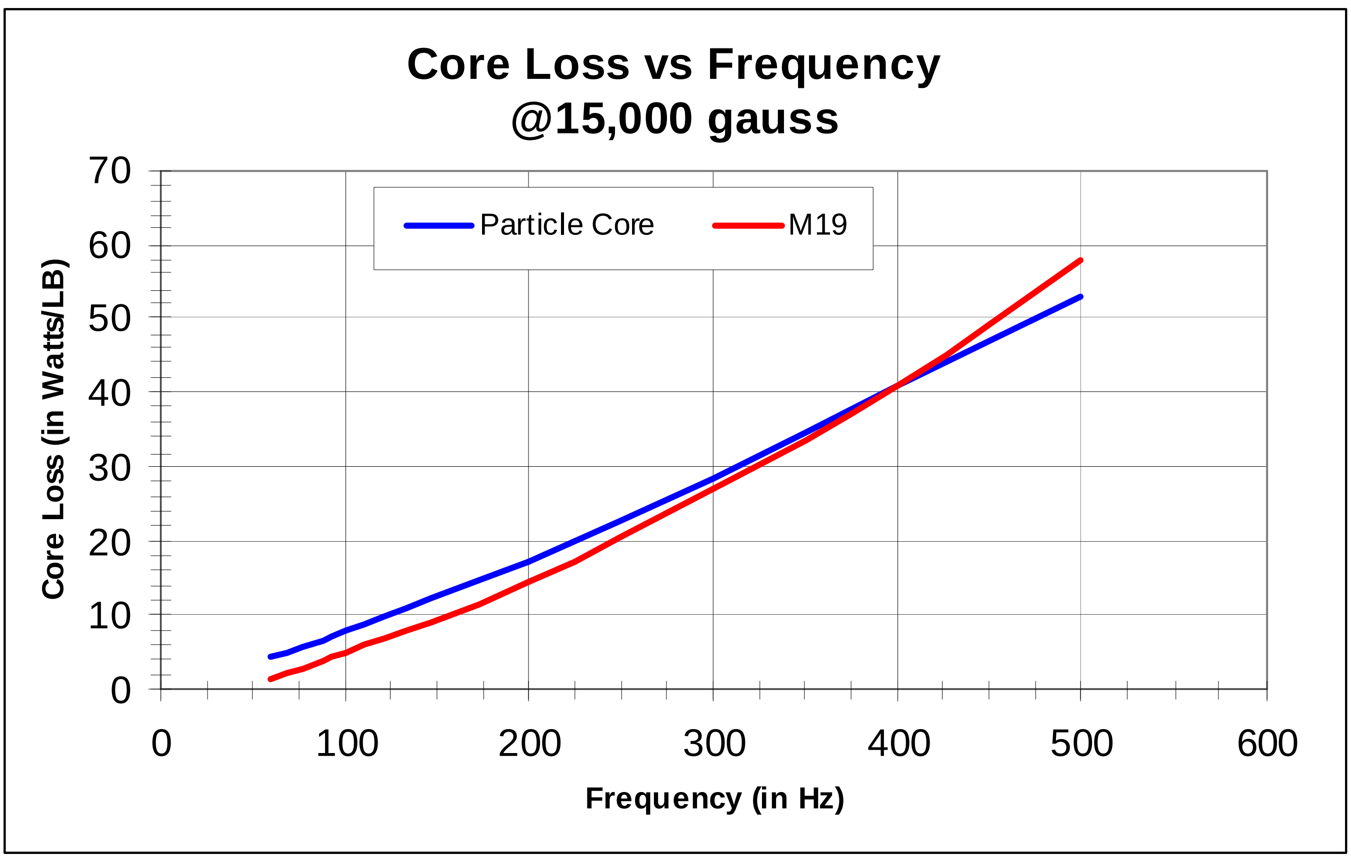
The magnetic performance of Particle Core Component makes it an excellent choice for dc applications. When sintered, Particle Core Components have higher saturation magnetization, higher permeability, and lower coercive force that typical powder metals. For example, the permeability of Particle Core Components is more than twice that of iron powder.

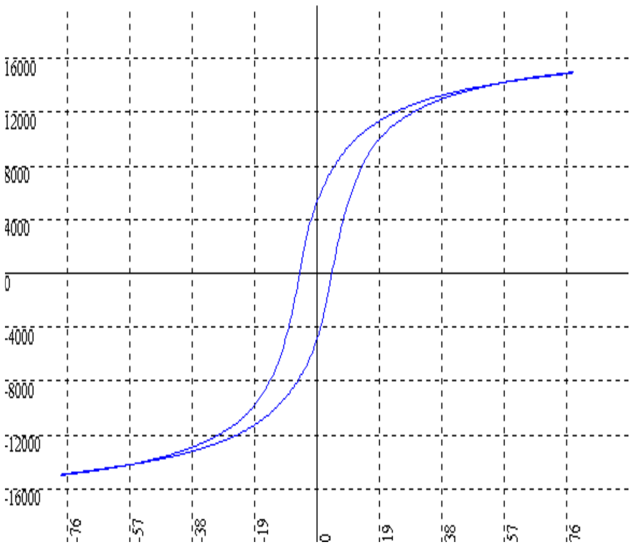
When compared to steel, the coercive force of Particle Core Component is equivalent to CRML and its induction at 100 Oe is identical (see Table II).

	Sintered Particle Core	Cold Rolled Sheet 24 gauge .025", .7%Si	Pure Iron Powder	0.45% P Iron Powder	Low Carbon Plate
B @ 15 Oe (kG)	14.2	14.8	12.4	12.2	15.2
B @ 100 Oe (kG)	17.5	17.5	14.5	14.3	18.2
Hc (Oe)	1.0	0.9	2.1	1.5	1.3
Max Perm.	7,000	5,000	2,660	3,200	3,500

Table II - Comparative magnetic properties of sintered Particle Core Components.


Core loss vs Flux Density
@60Hz
Core Loss (in W/LB)
Flux Density (in K gauss)
Particle Core
M19
M6
0
1
2
3
4
5
6
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18


Core Loss vs Frequency
@15,000 gauss
Core Loss (in Watts/LB)
Frequency (in Hz)
Particle Core
M19
0
10
20
30
40
50
60
70
0
100
200
300
400
500
600



Material	Particle Core
Density	7.77g/cc
Date	11/23/01
OD,ID,HT	1.06", 0.50", 0.26"
Np, Ns	16, 16
Freq	60Hz
Bs	14964 gauss
Br	5108 gauss
Hc	4.895 oersted
Hmax	77.84 oersted
Effective Prem	192

Particle Core	% Yield	Laminations	% Yield
Raw Material Slab of Steel	100%	Raw Material Slab of Steel	100%
Mill Chips	~98%	Roll into Sheet	~98%
Anneal Chips	~100%	Slit Sheet to Width	~98.5%
Coat Chips	~100%	Stamp Pieces	<97%
Lubricate Chips	~100%	Anneal Loose Laminations	~100%
Press cores	~100%	Assemble Laminations	~100%
Total Yield	~98%	Total Yield	<93.6%
Tooling Cost	~$5,000	Tooling Cost	>$40,000