

NdFeB & Ferrite Design Comparisons

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The following examples represent differences in typical designs for a DC motor and loudspeaker when switching the magnets between NdFeB and Ferrite materials

DC Motor and Loudspeaker Magnet Comparisons

Ferrite:



Rare Earth:



Typical Ferrite Loudspeaker Design

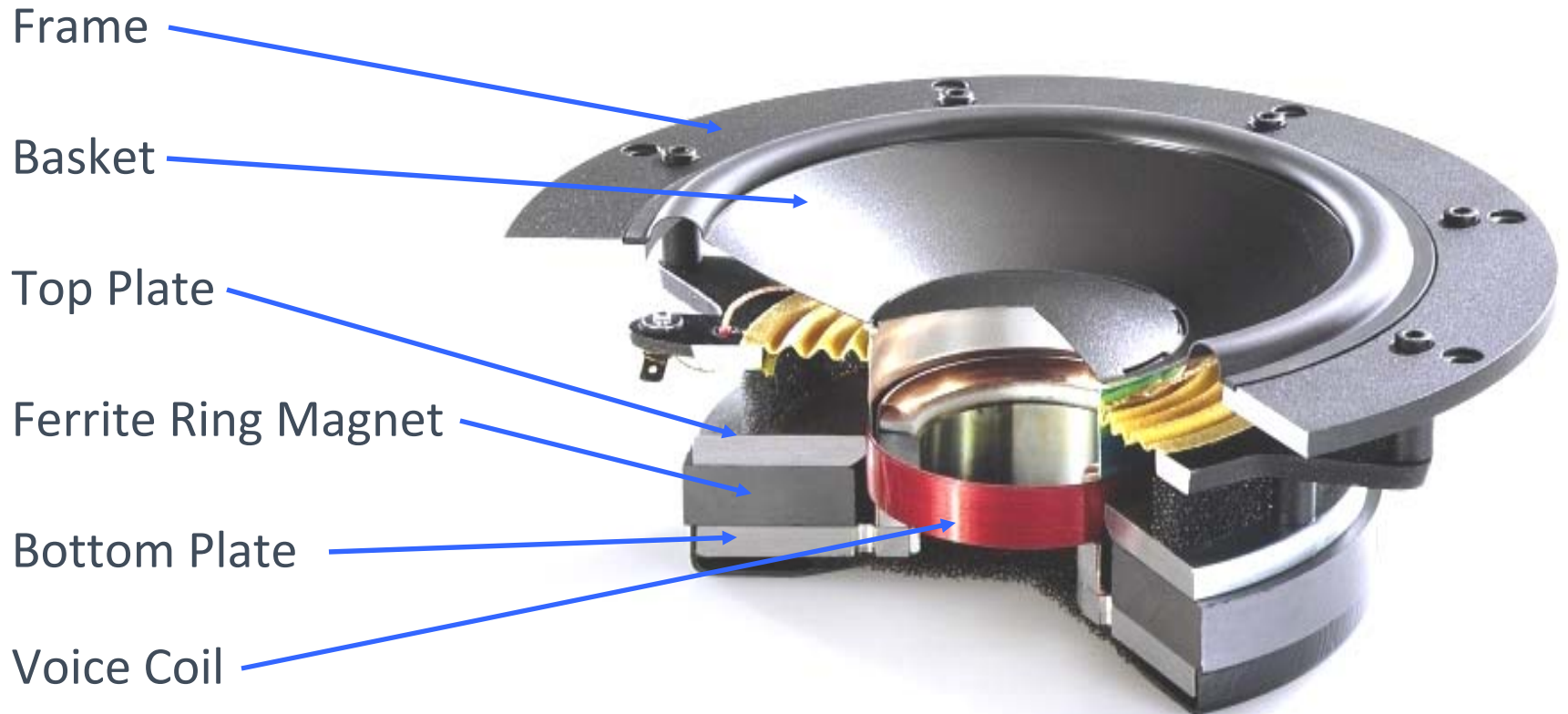
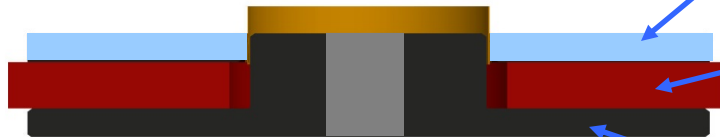
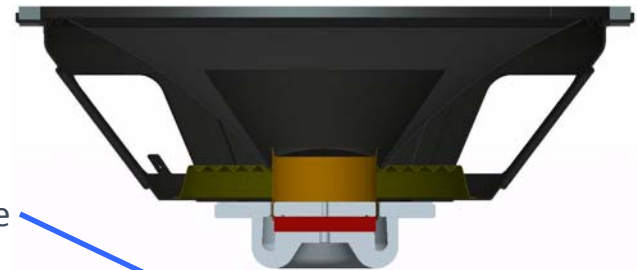
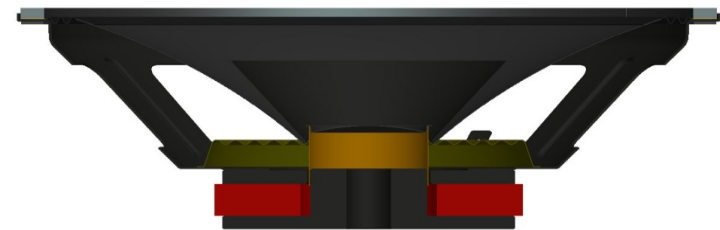


Photo Courtesy of Audiotechnology ApS Sweden

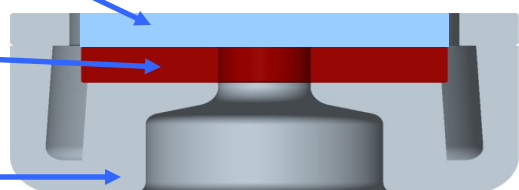
Ferrite and Neo Loudspeaker Comparisons



Top Plate

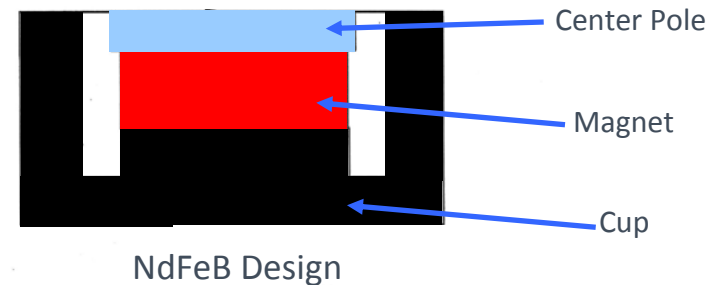
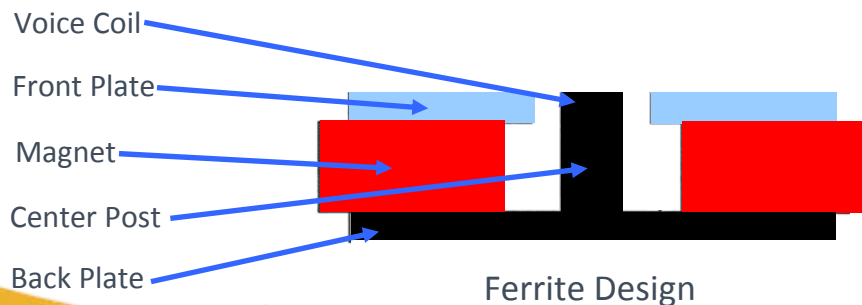
Magnet

Bottom Plate



Redesigning away from Neodymium Magnets

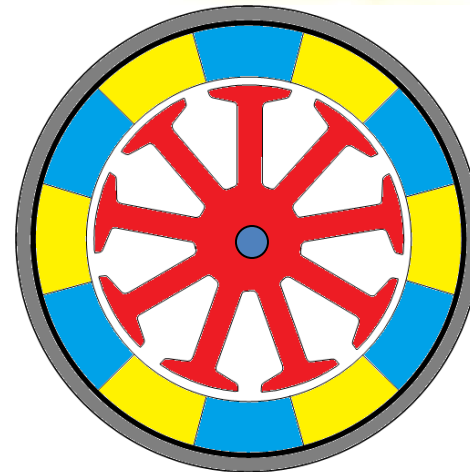
Automotive loudspeakers can certainly be converted back to old ferrite designs. However, loudspeakers used in door panels would be larger and weigh more. They would also require the door panels to be made wider, increasing the weight of the door and the cost of the steel used. Both would increase the cost of the car and decrease gas mileage due to the additional weight.



Design for a Standard One Inch Voice Coil Motor

	Hd @ BHmax	Bd @ BHmax	Magnet Length (in)	Magnet Area (in ²)	Magnet Volume (in ³)	Magnet Weight (lbs)	Weight Compared to Neo	Volume Compared to Neo
Ceramic 5	1,875	2,000	0.256	5.624	1.440	0.255	6.19	9.60
Alnico 5	550	10,000	0.873	1.125	0.982	0.259	6.29	6.55
SmCo 28	4,800	6,250	0.100	1.800	0.180	0.055	1.33	1.20
Neo N35	6,000	6,000	0.080	1.875	0.150	0.041	1.00	1.00
Bg =	10000	Gauss						
Lg =	0.04	inch						
r =	1.2							
Ag =	0.489	inch ²						
lc =	2.3							

Motor Design Comparison



Motor Design Comparison

	Neodymium	Ferrite	% change
Number of Poles	8	12	50%
Number of Stator Slots	6	9	50%
Stator Lamination OD	1.37	1.75	28%
Stator Lamination ID	0.792	1.4	77%
Motor Stack Length	2.25	3.5	56%
Magnet OD	0.75	1.36	81%
Magnet ID	0.55	0.86	56%
Total Magnet Weight	0.125	0.540	331%
Motor Volume (over lam)	3.317	8.418	154%