

Magnetic Fluids

For Audio Applications





SAMWHA *Since 1956* CAPACITOR GROUP



The Samwha Capacitor Group has steadily grown with the world's electronics industry for the past half-century. The four affiliates specialized in electronic components are Samwha Capacitor, Samwha Electric, [Samwha Electronics](#), and Samwha Tecom with the combined sales forecast of \$409 million in 2003.

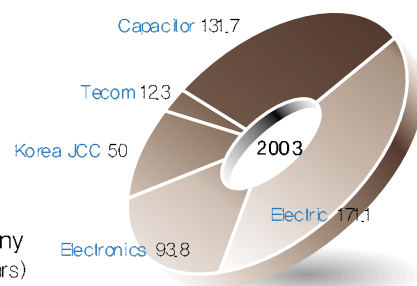
The Group now employs over 4,500 worldwide. Our global reach has been successfully pursued with the goals for cost-effective operations. Upon the completion of ERP system and Six Sigma, Samwha continues its business endeavor to better serve its

global customers. We newly established sales subsidiaries in Germany and Hong Kong in 2002 to better assist the growing customer bases in the regions.

As a well-established supplier of electronic parts in Korea, the Samwha Capacitor Group will continue to grow creating more values for customers in the world markets. We prioritize your satisfaction for the goals in your realm of business.



Sales Forecast by Company
(Unit:Mill,US Dollars)



SAMWHA *Since 1976* ELECTRONICS



Samwha Electronics is the global leader in ferrite technology. Mass-production capacity combined with the thorough quality assurance program ensures reliable supply to Samwha's end users and distributors worldwide. Headquartered in Seoul, Korea, the company has production bases in Korea, China, and Thailand with the sales subsidiaries in Germany, China, Hong Kong, and the USA.

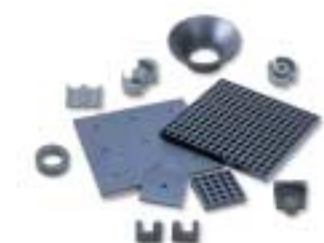
Our customized R&D system enables ongoing joint development with global players in the various fields of electronics. We are leveraging our expertise in ferrite technology to succeed

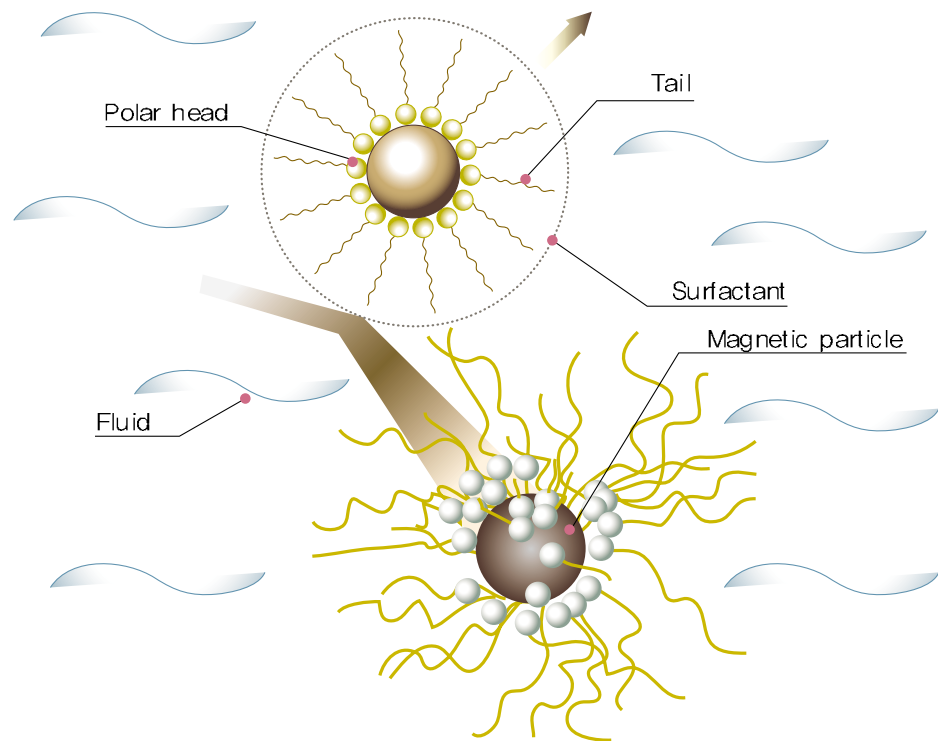
in magnetic fluids by applying our high standards for quality and customer services.

Innovations from Samwha R&D teams build the basis for our magnetic fluids specifically designed for various audio applications, representing a unique competitive advantage for you.

We are focused on helping you achieve the performance advantages in your speaker systems with:

[More services](#)
[More reliability](#)
[Less cost](#)
[Less time](#)





Composition of a Magnetic Fluid

Magnetic Fluids



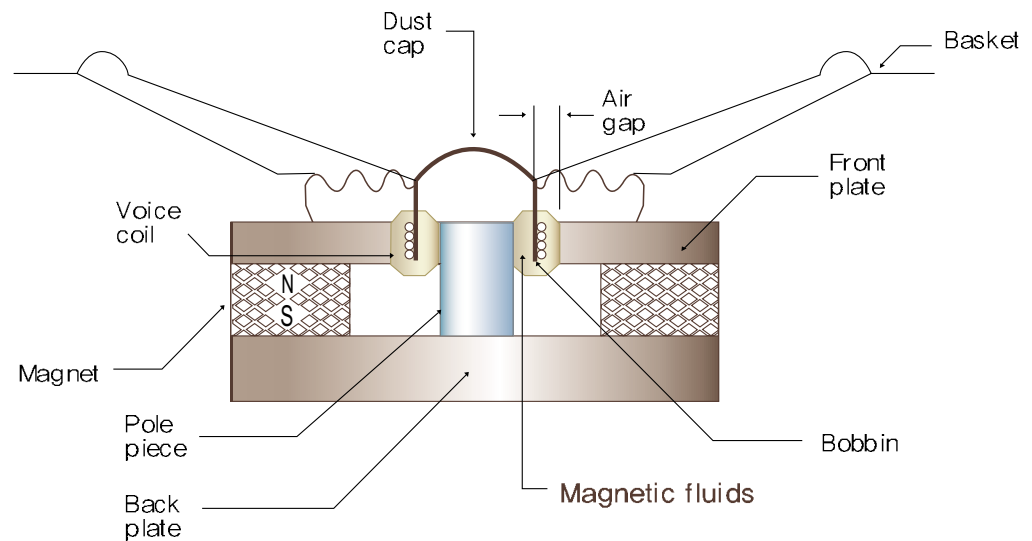
Magnetic fluids are colloidal suspension of surfactant-coated magnetic materials in a liquid medium where the sizes of the particles are of several nanometers. Typically known as an example of functional fluid in the magnetic field, magnetic fluids, to simply put, are liquids that have magnetic properties.

Magnetic fluids are attracted to the magnet and flow toward a magnet when brought near. In other words, the magnetic fluid can provide the restoring forces in the form of magnetic attraction. The strength of the magnetic field and the magnetization of the fluid affect the magnetic forces that hold the fluid in place.

This means that the retention forces of the fluid can be adjusted by controlling the saturation magnetization of the fluid and the strength of the external field.

More controls are possible to synthesize different types of magnetic fluids that provide optimum combinations of magnetization and viscosity values needed for various requirements in designing devices. Applied either to solve mechanical or electromechanical problems of a device, a magnetic fluid can be a dynamic performance enhancer of the device.

Magnetic Fluids in the Magnet Strip



Audio Applications



Magnetic fluids are placed between the pole piece and the top plate of the loudspeaker magnet. The magnetic fluids help dissipate heat generated by the voice coil as a cooling agent that helps increase power handling and prevents compression effects even on high load.

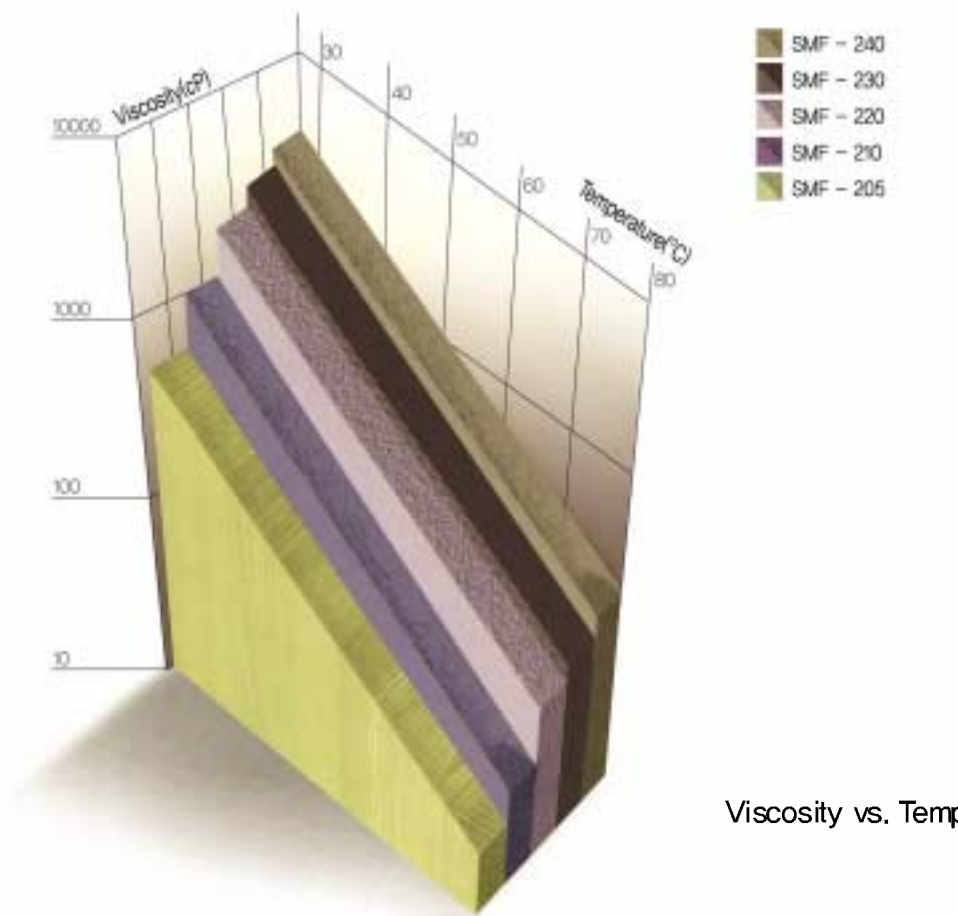
In a conventional loud speaker, the “spider” – typically a pleated fabric – acts like a spring to return the voice coil back to its starting position, centered within the magnet’s gap. The magnetic fluid technology further replaced the function of the typical spider in a bud speaker with the upgraded performance.

The magnetic fluids with the magnetic properties guide the voice coil to be centered within the gap. Particularly at high output levels, the greater precision of the magnetic fluids reduces distortion, known as compression effects, resulting in better acoustic performance of a speaker system.

In addition, the voice coils are more efficiently heat-sunk by the fluids instead of air, which also leads to greater linearity. With an increase of the heat transfer rate from the voice coil under long term, high-power use, magnetic fluids prevent corrosion from occurring in the magnetic strip. As a result, long-term reliability

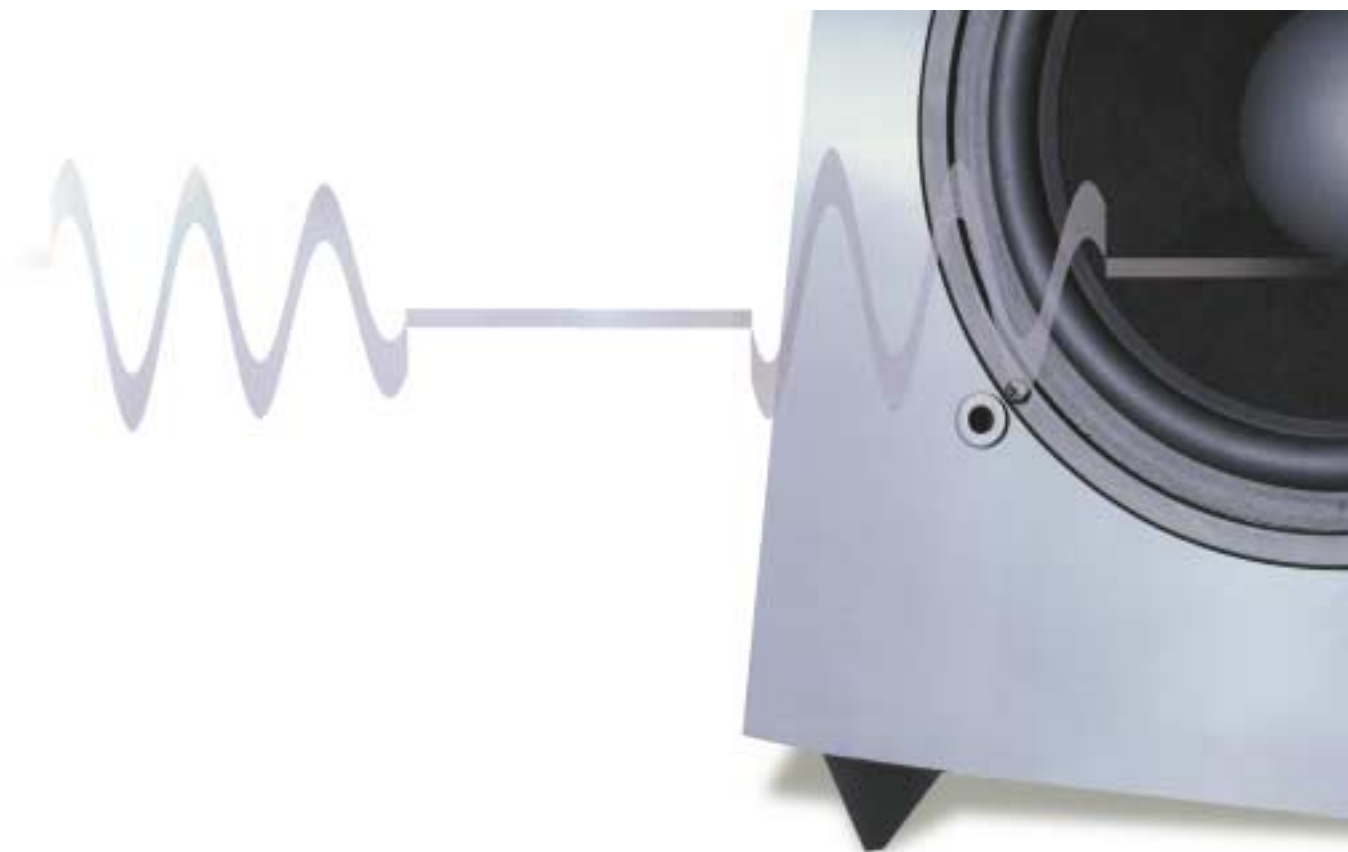
required for permanent installations is considerably enhanced.





Specifications

| | Description | Applications | Carrier Type | Fluid No. | Saturation Magnetization (at 10kOe) | Viscosity (at 27°C) |
|----------------|--|--|-----------------------|-----------|-------------------------------------|---------------------|
| SMF-100 Series | SMF-100 Series are mainly used for damping and heat sink in loudspeakers. The fluids can be exposed to temperature transients of up to 200°C, but to ensure longer life, operation above 120°C for extended periods should be minimized. | Tweeters, Midranges | Synthetic Hydrocarbon | SMF-105 | 100G | 500cP |
| | | | | SMF-110 | 100G | 1,000cP |
| | | | | SMF-120 | 100G | 2,000cP |
| | | | | SMF-130 | 100G | 3,000cP |
| | | | | SMF-140 | 100G | 4,000cP |
| SMF-200 Series | SMF-200 Series are mainly used for damping and heat sink in loudspeakers. The fluids can be exposed to temperature transients of up to 200°C, but to ensure longer life, operation above 120°C for extended periods should be minimized. | Tweeters, Midranges, Communication Speakers, Compression Drivers | Synthetic Hydrocarbon | SMF-205 | 200G | 500cP |
| | | | | SMF-210 | 200G | 1,000cP |
| | | | | SMF-220 | 200G | 2,000cP |
| | | | | SMF-230 | 200G | 3,000cP |
| | | | | SMF-240 | 200G | 4,000cP |



Performance

The Essence of the Finest Loudspeakers...

Advantages



Better Sound Quality

Magnetic fluids used as a medium for damping realize the higher mechanical resistance to the moving coil. Proportional to the viscosity of the fluid, this damping effect of magnetic fluids effectively improves the frequency response of a speaker resulting in better acoustic performance.

More Effective Thermal Power Handling

Stronger than the air in thermal conductivity, a magnetic fluid acts as a heat sink for the voice coil, which helps increase power handling by cooling the voice coil that now can handle

more electric currents. In addition, the lower operation temperature of the voice coil leads to a greater linearity of the speaker's output.

Less Noise and Distortion

Magnetic fluids work as a constant centering force for the voice coil at the time of the coil displacement. This prevents the unnecessary noise and rubbing between voice coil and peripheral materials. The centering force of the magnetic fluid on the voice coil also reduces harmonic distortion and any spectral contamination caused by shaky modes of the voice coil. Magnetic fluids in the magnet gap create a seal around the coil that

removes air modulation noise within the piston band in particular.

Lower Cost for Network Designs

Improved frequency responses by the use of magnetic fluids may minimize common problems in the crossover network. This reduces the needs for additional expensive peripheral devices in your network.



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