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Global Vacuum Inert Gas Atomization Equipment Market Research Report 2024(Status and Outlook)

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Abstracts

Report Overview:

Vacuum induction melting and inert gas atomization is the leading process for production of a variety of high-performance metal powders and essential for quality manufacturing of Ni-based super-alloys as well as Fe-, Co-, Cr-based and other special alloy powders. In the VIGA system, a vacuum induction melting unit is integrated with an inert gas atomization unit. The starting materials are melted using electromagnetic induction which couples electrical power into the crucible/material under vacuum or in an inert gas atmosphere. Once the desired melt homogeneity and chemical composition have been achieved, the material is poured into a tundish by crucible tilting. The fine metal stream flowing from the tundish orifice into the atomization nozzle system is subject to a high-pressure, inert-gas jet and then atomized. The combination of molten metal and gas jet creates a spray of micro-droplets that solidifies in the atomization tower and forms fine powder with spherical shape.

VIGA is where the melting and pouring of the alloy prior to atomisation is carried out in a vacuum chamber, to allow the production of the most oxidation-sensitive and reactive alloys, especially Fe-, Ni- and Co-based alloys containing Al, titanium and rare earths. This includes ‘superalloys’ such as IN718, maraging steels and M-Cr-Al-Y alloys. This technique was developed from the 1950s and 1960s when there was a push to explore the potential benefits of rapid solidification (RS) to allow the production of more highly alloyed superalloys for aerospace and defence applications. This proved to be a very challenging field of application but, after several decades of development, is now absorbing many thousands of tonnes per year of VIGA-produced superalloy powders. This intensive development has meant that the technology lends itself well to producing powders for HIP, MIM and AM. Oxygen contents in the 50–200 ppm range are

achievable. Particle shape is, again, spherical with mis-shapes. Particle sizes are as for IGA.

By 1940, air atomisation was a well-established process for the production of zinc, aluminium, and probably also copper/brass/bronze powders. During World War Two, German engineers applied it to pig iron for iron powder production using the RZ process (Roheisen Zunder-Verfahren or 'pig iron ignition process'). In the 1950s, W D Jones in the UK worked on inert gas atomisation as well as water atomisation and, by the 1960s, plants were being built for thermal spray alloy powder production of the NiCrBSi self-fluxing type. The development of Powder Metallurgy of high alloys and the concept of Rapid Solidification (RS) for refinement of microstructures led to the construction in Sweden of inert gas atomisers for tool steels, which went commercial on a 1–2 t scale in the 1970s. At the same time, the US government invested heavily in R&D on RS superalloys for aerospace and the first Vacuum Inert Gas Atomiser (VIGA) units were constructed with 100–300 kg capacity.

Since then, the use of inert gas atomisation (IGA) with air melting, as well as VIGA, has become widespread in use for thermal spray powders, PM superalloys, AM powders, and MIM powders. VIGA production of superalloy powders in the US alone now amounts to something in the order of 10–20 kt/year.

Inert gas atomisation is the method of choice for more demanding applications, such as MIM, AM, HIP, HVOF, brazing pastes, etc. Nitrogen is the most economic option, but argon is also used on reactive alloys like superalloys and titanium. Helium is used mostly in the production of aluminium and magnesium powders, but there is currently a huge incentive to switch to argon due to the unstable supply and high cost of helium. Total installed capacity of IGA and VIGA probably approaches 100 kt/ year, with large numbers of plants in different countries and industries. They range from tiny plants for a few kgs of precious metal brazing alloy to 3 t/h continuous plants for tool steel production. The fact that they are mostly processing relatively valuable metals and alloys (high value-added, large margin applications) makes small, local, plants economically feasible as opposed to iron powder plants, where low cost and economy of scale is imperative.

The Global Vacuum Inert Gas Atomization Equipment Market Size was estimated at USD 78.16 million in 2023 and is projected to reach USD 171.56 million by 2029, exhibiting a CAGR of 14.00% during the forecast period.

This report provides a deep insight into the global Vacuum Inert Gas Atomization

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Equipment market covering all its essential aspects. This ranges from a macro overview of the market to micro details of the market size, competitive landscape, development trend, niche market, key market drivers and challenges, SWOT analysis, Porter's five forces analysis, value chain analysis, etc.

The analysis helps the reader to shape the competition within the industries and strategies for the competitive environment to enhance the potential profit. Furthermore, it provides a simple framework for evaluating and accessing the position of the business organization. The report structure also focuses on the competitive landscape of the Global Vacuum Inert Gas Atomization Equipment Market, this report introduces in detail the market share, market performance, product situation, operation situation, etc. of the main players, which helps the readers in the industry to identify the main competitors and deeply understand the competition pattern of the market.

In a word, this report is a must-read for industry players, investors, researchers, consultants, business strategists, and all those who have any kind of stake or are planning to foray into the Vacuum Inert Gas Atomization Equipment market in any manner.

Global Vacuum Inert Gas Atomization Equipment Market: Market Segmentation Analysis

The research report includes specific segments by region (country), manufacturers, Type, and Application. Market segmentation creates subsets of a market based on product type, end-user or application, Geographic, and other factors. By understanding the market segments, the decision-maker can leverage this targeting in the product, sales, and marketing strategies. Market segments can power your product development cycles by informing how you create product offerings for different segments.

Key Company

ALD

Consarc

PSI

SMS Group

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Arcast

Topcast

Avimetal

VMP

ACME

Zhuzhou ShuangLing

Hunan Skyline

Zhuzhou Hanhe

Market Segmentation (by Type)

Small VIGA Systems (

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