

ASL Extends Special Metal Powder Facilities

Following ASL's move just over three years ago from Sheffield Science Park into an 850 sq.m. industrial unit, we have now expanded our range of atomising equipment to provide a very flexible service. In addition to the initially installed ultrasonic solder atomiser and a 150kg inert gas atomiser, there is now a 30kg 40kW melting furnace which can provide metal to three different systems.

One unit is a water atomiser suited to processing iron, nickel or cobalt alloy powders with a water pressure of up to 200bars. The second unit is designed for processing silver and other non-ferrous or precious alloy powders and is capable of water atomising at up to 250bars. When fitted with a special head assembly, it becomes a compact wet-collect gas atomiser suited to processing silver and other non-ferrous metal powders.

This range of equipment is ideal for processing a very wide range of alloys in quantities from a few kilograms to a few tons in size ranges from 20 microns to 500 microns. As well as significant deliveries of powders for industrial use, several challenging R+D projects have been undertaken for clients with very unusual materials and/or powder property requirements. Such factors

as distribution width, purity, fineness, shape (ranging from spherical to highly irregular) can be varied over a wide range with the available equipment. Powders for brazing, dental amalgam production, diamond tools, special coatings, solder pastes, sintering additives and lubricants have already been supplied, in addition to some confidential applications.

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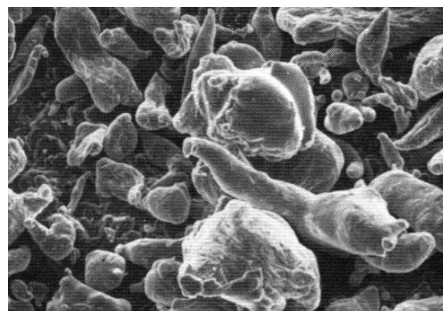


Effect of Oxygen on Inert Gas Atomisation

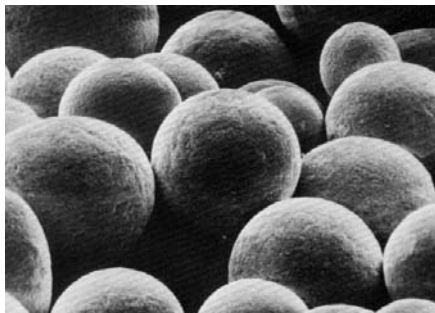
While nitrogen gas is used for many applications, air atomisation is much more widely applied for economic reasons, especially on products such as Pb, Sn, Zn, Al, and Cu alloys where particle oxidation is not critical, or is inhibited by stability of the oxide film (as in Zn, Al). It is an interesting question to examine the effects of applying designs developed for nitrogen gas to air atomisation.

ASL has recently carried out some trials on this and found a wide range of effects. Unfortunately, these are very chemistry-dependent and generalising about them can only be tentative. It will require much more data to understand the effects.

It is well known that air-atomised powders are generally more irregular than gas atomised powders, and this has been confirmed. However, the exact change in shape depends very much on the type of oxide film formed.



Aluminum powder air atomised SEM, 300X



Bronze powder (Cu90Sn10) air atomised SEM, 700X

When it is totally solid and strong at the melting point of the metal, as in the cases of Zn and Al, then a really irregular particle with convoluted surface is formed (see photo left). However, when the oxide is molten at, or near, the melting point of the metal, then the effect may be less marked, when measured in terms of apparent density, but still clear under the microscope, where elongated “sausage” and “tear-drop” particles are clearly seen. Where the oxide melts far below the metal, or is even a vapour (e.g. Cu-P) then sphericity is practically unaffected, as evidenced by the industrial production of spherical CuSn bronze for filters (see photo above).

An interesting problem, one quite unexpected, occurred when atomising a Cu – 30%Zn alloy for a pigment application. The alloy naturally has a golden colour, but the inert gas atomised powder was black. It is

possible that this is due to vapourisation of Zn during atomisation, followed by its condensation as super-fine particles. In an attempt to overcome this problem, atomisation with nitrogen was carried out with addition of air to the atomising chamber, but results were only a modest improvement in colour. We then organised a gas mixer to allow us to continuously inject air into our high pressure (up to 28 bars) nitrogen flow and raise oxygen contents to 1–3%. This was also ineffective. Perhaps the vapour pressure of Zn is so high that it still evaporates and depletes the local gas of oxygen enough to still condense to a black powder. This question deserves some electron microscopy.

More recently we have processed a very unusual alloy of Cu with 60%Zn. When processed with pure nitrogen, this material stuck together severely in the cyclone and would not flow freely from the system, despite being processed to an only moderately fine powder (median ca 50 microns). Additions of air to the atomiser vessel, in an attempt to oxidise the condensed Zn super-fines (actually pyrophoric when leaking from the system) were effective in reducing sticking problems, but led to darkening of the powder from its original near white colour.

Anomalous Ultra-low Density Inert Gas Atomised Powder

An instance where the “rules” were broken most spectacularly occurred when processing a Zn-Al alloy with inert gas (nitrogen) atomisation. Normally one would expect a powder bulk density of ~60% of solid, perhaps 3g/ml in this case. However on removing the powder collection pots, it was found that they were full to overflowing and the powder density was around 1g/ml. It had a most extraordinary “feel” like snow. It could be compressed into a snowball, undergoing a

compaction of as much as 2:1 ratio. Also if it was stirred with a rod, its density rapidly increased to at least double the loose fill value.

This behaviour, more characteristic of the kitchen and complex organic molecules than the foundry and metals, is intriguing. It may be due to the high vapour pressure of zinc, or perhaps some inverse segregation effect allowing ultra-clean zinc surface coatings that have sintered temporarily to each other, but

then break down, a bit like the linkages between thixotropic molecules. Unlike thixotropic materials, the effect, once destroyed by stirring, does not recur at room temperature.

It would be very interesting to hear reports of other unusual powder shapes occurring with specific alloys.

University of Madrid Orders an R&D Atomiser

The Universidad Carlos III de Madrid has ordered a highly flexible, R+D atomiser from ASL. The atomiser enables either gas or water to be the mode of atomisation and is particularly suited to R+D applications. However ASL have a number of industrial customers operating similar types of systems. The atomiser, to be commissioned in the 3rd quarter of 2004, will be used to further the university's research into powder metals.



COMPANY NEWS

Chinese Tin Producer Orders ASL Centrifugal Atomiser

The largest tin producer in China has chosen ASL as the supplier of their new centrifugal solder atomiser. The client is already a customer of ASL and the latest system has a much higher production rate, for electronic grade solder powders, than their existing system.

When this system is commissioned at the client's site, in the last quarter of 2004, the client will become the leading electronic grade solder powder producer in China.

TECHNOLOGY

Further Solder Powder Development

Further development of the Ultrasonic Atomiser has seen its output of solder powder rise to over 55kg/hr. This latest enhancement brings the output of the system to a level that exceeds many modest scale solder paste producers requirements.

If 55kg/hr is not enough to whet your appetite, you can always consider the 'next step' which is the centrifugal atomiser. A Chinese customer has taken this step (elsewhere in this issue) and is looking forward to a powder output of around 100kg/hr.

For further information about the above options please contact us.

COMPANY NEWS

Inco Europe Order Platinum Alloy Atomiser from ASL

As part of a major expansion and modernisation of their precious metals refinery at Acton, London, Inco Europe has placed an order with ASL for a water atomiser to process platinum bearing secondary alloys to render them reactive in their hydrometallurgical refining circuit. A high degree of flexibility is needed due to the variable size of batches coming into the plant and the wide range of compositions arising from scrap processing operations in many different places. The system can process melts of up to 350kgs of platinum group metals and is scheduled to be in operation in the second quarter of 2004.

COMPANY NEWS

ASL to Double in Size

Further expansions at ASL mean that we are having to spread out a little more. From June this year our building will be twice the size as we're going to take the unit next to our current one. This means that we will be doubling our size to 1680 sq.m (18000 sq. ft)

The special powder facilities coupled with our flexible R+D facility have allowed us to advance our powder production techniques into novel fields. More on this in the next newsletter. It is possibly an understatement to say we need a bit more room!





PM²TEC2004 Chicago USA

The Metal Powder Industries Federation will be holding their annual International conference on Powder Metallurgy and Particulate Materials in Chicago on the 13-17th June 2004.

The venue will be the Sheraton Chicago. Further information on this event may be found from:

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105 College Road East,
Princeton, New Jersey
08540-6692, USA
Tel: +1 609-452-7700
Fax: +1 609-987-8523
www.mpif.org

COMPANY

BATEMAN

ASL's Agent in Africa

A move to a different site means that ASL's agents for Africa now have new contact details. David Norval is still the man to speak to and he can be contacted on:

David Norval
Business Development Manager
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PM2004 Vienna Austria

This year sees the Powder Metallurgy World Congress and Exhibition being held in Vienna, Austria. PM2004 hosted by the EPMA is on the 17-21st of October 2004.

The venue will be the Austria Centre, Vienna. ASL will be present with a booth and a paper presentation on hot gas atomisation. We look forward to meeting many of our friends and clients there.

Further information on this event may be found from:

European Powder Metallurgy Association (EPMA)
Old Bank Buildings, Bellstone
Shrewsbury, SY1 1HU
United Kingdom
Tel: +44 (0) 1743 248899
Fax: +44 (0) 1743 362968
www.epma.com

PAST EVENT

Hagen Symposium 2003

In late November the DGM (Deutsche Gesellschaft für Metallkunde) hosts its Hagen Symposium meeting at Hagen near the Ruhr. Last November (2003) Paul Rose added his name to the list of over 210 attendees and added the ASL stand to a sizeable exhibition of 40 stands. The meeting is held entirely in the German language, and the programme is one of a small number of invited and very high quality papers, all preprinted in Volume 19 of PM Science and Practice entitled "Powder Metallurgy – Process and Processing". The Hagen Symposium is conference for the German speaking region and its high level of attendance is due to both the quality of the presentations and the highly professional organisers.

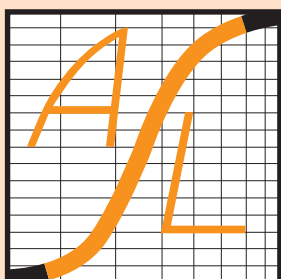
PEOPLE

New Employee



L-R Shaun Prescott, Paul Kerrigan and Martin Simpson.

Due to recent plant orders and the increased workload for our powder production/R+D facility Atomising Systems Ltd. is pleased to announce the appointment of Martin Simpson as a technician. Martin joins ASL with considerable powder metals experience having spent many years in the carbide powder department at LSM (London & Scandinavian Metallurgical Co. Ltd).



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