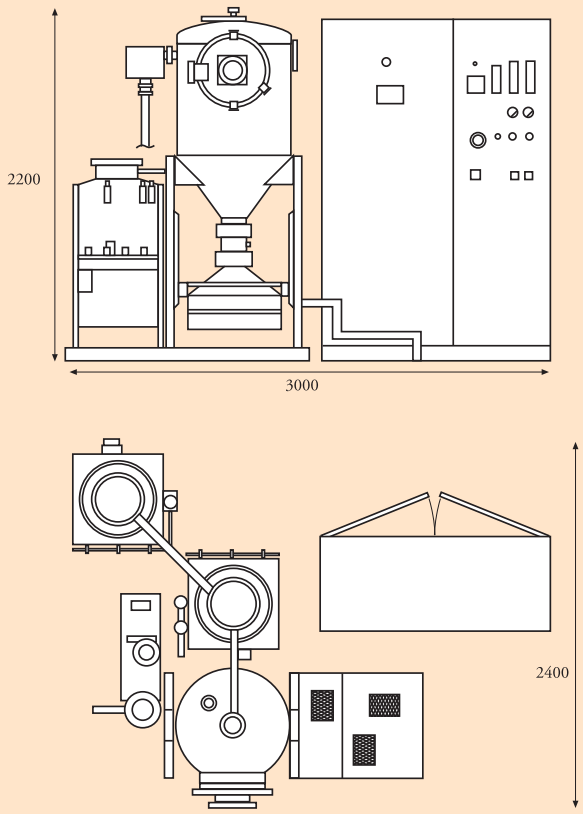
WINTER 1998

ATOMISING NEWS

ON LINE

Computer Controlled Ultrasonic Atomiser Commissioned



Following receipt of an order in February for a second ultrasonic atomiser from our first N American customer, the unit was commissioned in August in our works in Sheffield. The unit incorporated many detailed design improvements arising from a year's operating experience of the first unit. Designed to facilitate continuous 24 hour production at rates of 400-500kg/day, most control functions were taken over from individual panel mounted controls by a PC/PLC based control system. This allows automatic sequencing of many routine operations such as vacuum purging, metal transfer, shut-down etc. ASL is probably not the first company to find problems with software selection, but several weeks strenuous efforts resulted in very satisfactory operational trials in the presence of customer's technical staff. The major simplification of the operator's tasks provided by computer control has lead to a decision to standardise on this control method in future plants.

EVENTS

ASL to Attend Hagen Expertenkreis Meeting

Every year the German Gemeinschaftsausschuss Pulvermetallurgie holds a meeting in Hagen. This year on the 19th and 20th November, the subject is "Innovative Products through New Powders" and ASL will be sending John Dunkley to exhibit and to contribute to the discussions of the Expertenkreis Metallpulvererzeugung on atomisation. He will be reporting on the development of the water bench (see page 31).

SERVICES

Indian Iron Powder Project

India is an expanding market for iron powder and local entrepreneurs in Calcutta, M/s Ferroprojects Ltd will enter it in 1999 with a plant engineered and built by local engineers using advice and designs from ASL. The project has a planned capacity of 4,700t/yr and will use the ASL concept of induction melting and water atomisation to produce high compressibility iron powder to internationally recognised standards.

CONTENTS

Zinc Powder

It is not widely appreciated that zinc powder is probably produced in a larger volume than any other metal except iron. One reason for this is that only a fraction of the zinc powder produced is bought or sold; the bulk is produced inside electrolytic zinc refineries and used in the purification stage of the process to precipitate such metals as Cu, Co, & Sb from the zinc sulphate solution before electrowinning. The consumption of zinc within the refinery ranges from as little as 3% to as much as 8% of the smelt output. As electrolytic zinc production is around 5Mt/yr, this means that zinc powder consumption is probably around 250,000t/yr.

The specifications of the powder used in this process are very diverse, reflecting differences in ore chemistry and process design. Some plants like to use very coarse powder, in some cases as large as a median size of 100-150 microns. Others like a far finer powder, down to median sizes of 15-20 microns. Most plants still use a rather primitive asymmetric free-fall design where the metal falls vertically onto a horizontal airjet. This is blowing into a large chamber, typically as big as 3m wide, 4-5 high and 10m long. The noise from the open air jet is very severe and energy consumption in the compressor can be hundreds of horsepower. To cope with the demands of a large smelter (modern units range from 100kt-400kt/yr) it is necessary to use multiple small streams of zinc, which increases blockage problems.

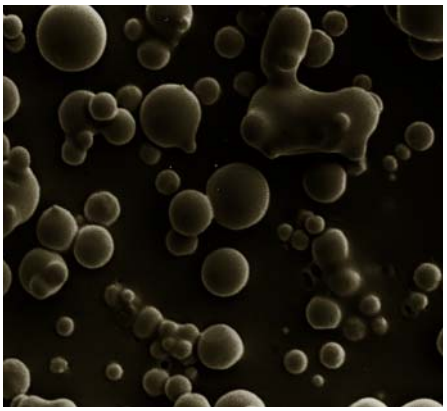
ASL has become involved in two methods to improve this old design. Firstly we supplied to CEZ and later to Cominco in Canada, water atomisers which allowed the production of a coarse, but very high surface area powder. This powder was pumped to the purification circuit and dispensed fully automatically to the tanks, eliminating laborious handling of dry powder. The atomiser has one 10mm stream to make 3.5t/hour, and runs for days without any attention. Energy consumption by the HP water pump is only about 10kWhr/t of powder, a reduction of at least 90% compared to the previously operated air atomiser at CEZ. The atomiser has a footprint of about 1m square, compared with the old air atomiser which occupied at least 70 sq.m.

A second option is currently being explored, where fine dry powder is required, and that is to replace the free-fall jet with a closed jet. This should enable a reduction of particle size of about 50-70% using the same airflow and energy consumption. It should also allow operation with larger metal flowrates per nozzle. ASL has produced zinc powder as fine as 18 micron median particle size, and is confident that there are many zinc producers who could benefit from this technology, without major changes to the rest of their plants.

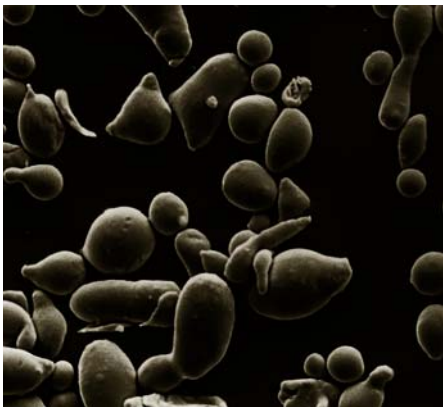
A more visible and recently developed market for zinc powder is the alkaline manganese battery for consumer use. Consumption for this application is probably approaching 100,000t/yr world-wide. These batteries use zinc in the form of a coarse powder, typically between 100 and 500 microns in particle size. Extremely high purity is necessary to avoid corrosion in the battery, and recent developments in the field have led to the use of microalloying at ppm levels of various elements. At first, the market was supplied by the same technology used by large zinc smelters. Although yields of the required size range were poor, ranging from 60-80%, all off-size material could be consumed in the purification circuit. Now that micro-alloying is demanded, sometimes with elements prohibited in the purification circuit, there is pressure for a much higher yield. This can be achieved by centrifugal atomisation. A spinning cup operating at less than 10,000 rpm can produce a yield of 98% in specification. Already used by some producers, it is expected that this will become the preferred technology in the future.

The paint industry consumes the oldest form of zinc powder - "zinc dust". This has been used for many years as the basis of zinc rich paints which give excellent corrosion protection to steel. This market consumes about 100-150,000t/yr of powder. The classical method of producing zinc dust, which has a typical particle size range of 2-10 microns, is by vaporisation and condensation of zinc metal. This demands an energy consumption of 1000kWhr/t to vaporise the metal, compared to only 100kWhr/t to melt it. One major producer has switched to atomisation and ASL's work shows that, using high efficiency designs, such as the GE nonaxisymmetric nozzle, it may be possible to produce a high yield of zinc dust grades by atomisation. Energy consumption should be reduced and unit productivity enhanced. However, viability depends on local material and energy costs, as much zinc dust is made from secondary zinc (drosses etc) which sell at a discount to slab zinc.

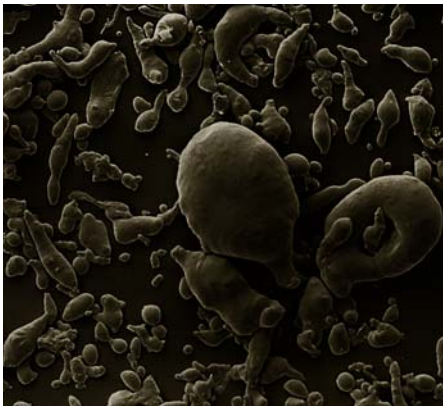
ASL has experience of atomising zinc with air, water, gas, oil, and centrifugally. We are thus uniquely qualified to advise on any requirement.



Vaporised Zinc Dust 8µm



Air Atomised Fines 8µm



Air Atomiseds 20µm

Water Atomiseds 20µm

New Research Initiative in Water Atomisation

The metal powder industry, principally because of the large number of small companies within it, has experienced difficulties in funding R&D, with the result that there is a lack of fundamental understanding of the water atomisation process. Recent years have seen only a limited amount of work published on atomisation of metals and alloys. The larger part concerns gas atomisation while, in the industrial arena, the majority of metallic powders are produced by water atomisation. As a result, the full potential offered by water atomisation is not, in many cases, being realised in commercial operations. Fundamental research aimed at optimisation of the process for diffferent alloys would, however, pay dividends by reducing powder production costs, leading to faster growth of the powder market and higher profits for powder producers.

ASL has been involved in many water atomisation projects ranging from 1 kg to 80 tonne capacity, and is in a unique position to assist the industry. Because of the size and expense of an effective research programme, ASL is now negotiating with The University of Sheffield to form a multi-disciplinary research group which would combine the relevant resources of its Engineering Materials, Mechanical Engineering and Chemical & Process Engineering Departments with ASL's specialists.

It is planned that a special atomiser, designed for research work on water or liquid hydrocarbon atomisation, will be installed in The University of Sheffield's Engineering Materials Department and a programme of test work conducted, with associated theoretical modelling and powder characterisation studies being undertaken in association with the other Departments. The unit will be capable of operating at water pressures of up to 250 bar and of processing metals melting at up to 1600C.

ASL need your assistance in determining the topics to be investigated. The possibilities listed below spring to mind but your suggestions will be gratefully received. In all cases, there is the option to study alloy microstructures and their optimisation, in addition to the effects of various process parameters on powder particle size distributions and shapes.

ASL will have access to the atomiser in the University laboratory for its own staff, and will be able to offer to carry out special melts or small test programmes for individual clients.

Suggested Topic for Proposed Research Programme

- Effects of atomising pressure on particle characteristics, (size, shape and microstructure)
- Effects of water/metal ratio on particle characteristics
- Effects of melt superheat on particle characteristics
- Effects of water jet configuration on particle characteristics
- Effects of alloy composition on the oxygen content and characteristics of the powder
- Effects of atomising water temperature on particle characteristics.
- Effects of water additives (varying surface tension, viscosity) on particle size and shape
- Effects of water additives (e.g. methanol) on particle oxidation and shape
- Use of hydrocarbons to atomise.

Bespoke Gas Nozzle Development Service Available

As reported in our last edition, we have continued to invest in upgrading our water bench system for testing close coupled gas atomisation nozzles. We have now installed improved instrumentation and a compressor system to reduce the necessity to handle bottles of compressed gas. A number of projects are now in hand where we can take the pressure and flow characteristics of a client's gas or air system and design a nozzle to suit them and achieve optimum performance. In addition to customers making nickel and cobalt based hard facing powders, we have worked on brazing powders and on the air atomisation of aluminium and zinc powders. We often find that we can either greatly increase yields or reduce air/gas consumption, and sometimes can do both. If you have an old gas or air atomisation system, why not call us to discuss its performance and whether we could improve it?

North American Developments

ASL is glad to announce that it has signed a representation agreement with Dr Cheng Li, based in Vancouver, to work with us in the N American market. Dr Li has a PhD from Sheffield Hallam University (England) in metallurgy and has worked with ASL for 2 years both in the UK and in China, where he commissioned a water atomising plant.

Dr Li can be contacted on tel (604) 298 8514 fax (604) 298 8587 e-mail cccli@hotmail.com

John Dunkley attended the Las Vegas PM2TEC98 conference where the agreement with Dr Li was signed. He had a number of very promising meetings, some of which have already led to business, and introduced Dr Li to a number of old friends in the PM industry. We are confident that our American and Canadian clients and contacts will find Dr Li most helpful.

TECHNOLOGY

Advice Needed

After six successful years in business, ASL is able to consider how best to invest in improving atomisation technology. One option is to increase the size of our R&D facilities by adding an inert gas atomiser and water atomiser to allow both new development work and the production of samples for clients. To cover the sizeable costs of such a facility, if it is to be of industrially relevant size, one option is to sell small commercial quantities of special powders which are difficult to purchase from larger scale powder producers.

We would thus much appreciate hearing from powder users, or from powder makers or distributors, about powder grades needed in small lots or special qualities. This would greatly assist us in selecting the correct size and type of atomisers to install.

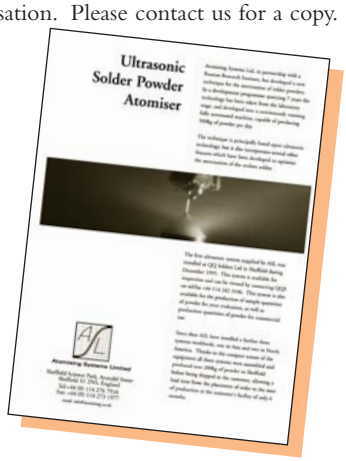
Oxide Atomising Project in Hand

ASL has a lot of experience of atomising metals, but non-metals are also candidates for atomisation. Phoenix Environmental Ltd of the USA is the developer of a new process for the treatment of wastes from the steel industries. Furnace dusts and grinding swarf, both major disposal problems being contaminated with lead and zinc or oil respectively, are charged into a furnace heated by oxidation with oxygen lances. The temperature rises to over 1600C which volatilises the lead and zinc to be recovered in a bag-house, leaving molten magnetite. This flows continuously from the furnace and will be atomised by air jets to a spherical powder for use in a number of industrial applications. The first plant is to be built at the Canton Ohio works of the Timken corporation and is planned to start up in mid 1999. This promises to be a challenging assignment for ASL and we look forward to taking part in this exciting new development. Anyone needing information from PEL should e-mail them at fe3o4@worldnet.att.net.

LITERATURE

Leaflet on Ultrasonic Solder Atomiser Available

A four page full colour leaflet is available describing our capabilities in electronic solder atomisation. Please contact us for a copy.



EVENTS

Granada PM98 World Congress

By the time you read this, the 1998 world congress on PM will have taken place in the historic city of Granada in Spain on the 18th-22nd October 1998. ASL are participating in the large trade exhibition and we look forward to meeting many of our readers on stand 129 during the show. The huge number of papers on powder production (about 60) of which about half are on atomising, promise a feast of information and we shall bring you a review of as many as we can fit into this newsletter in our next edition.

ASL Joins the www (World-Wide-Web)

As a service to the world-wide metal powder community, ASL has created a website devoted to atomisation at www.atomising.co.uk. Here you can find information about the different atomisation techniques that we offer, data sheets on applications and equipment, and back-numbers of this newsletter. We hope to build on this basis to create a real technical resource.

New E-mail Connections

It is now possible to e-mail directly to each of our computers in the office. We are all **@atomising.co.uk.**

General information is a info@ and other staff are:-

Brett Telford	**Research**	**bt@**
Paul Rose	**Sales**	**pr@**
Roger Walker	**Engineering**	**rw@**
Craig Winfield	**Engineering**	**cw@**
Sandra Foster	**Administration**	**sf@**
John Dunkley	**Director**	**jjd@**

We hope that you will find this arrangement a cheap, fast and convenient method to get in touch with us.

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