



THE SOUL OF AN EXPANDING ENTERPRISE

How do you avoid the clash of corporate cultures while expanding the reach of your organization – particularly through acquisition? By focusing on the single most important factor that keeps any commercial venture alive – customer satisfaction!

In the past two years Höganäs has, through acquisitions, dramatically increased business activities in the Americas, and is in the process of doing so in Europe as well. We've also expanded existing operations in Europe and Asia.

The right conditions

Our ambition is, naturally, to expand our business, so there is an underlying motivation for each of the expansion investments we've made. Quite simply, it is to ensure a high and uniform level of reliability, quality and service to all of our customers. Only then have we ensured a stable foundation for growth, in both the short and long terms.

Industry statistics show that powder metal consumption is on the rise in P/M, in thermal surfacing, in chemical, pharmaceutical and metallurgical applications, to name just a few areas. Vigorous ongoing commitment to R&D, combined with close collaboration between developers, producers and customers, creates the right conditions for growth.

This issue of Powder News captures a number of Höganäs activities over the past six months. Much of the news related here is about events in the Americas, but, if I were to choose a defining theme, I would say that it is "Truly global. Truly focused". We are fortunate to have in the Höganäs family a strong group of people committed to expanding the sphere of the metal powder industry.

Sincerely,

Claes Lindqvist



Together, we create opportunities

In March 2000, Pyron Corporation joined the Höganäs Group and became a part of North American Höganäs. Today, we can already see many ways to create new opportunities for both organizations, and for all the customers we serve.

At the PM2TEC Pyron celebrated its 60th anniversary and the prospects of a exciting future.

Pyron is America's oldest established producer of ferrous powders. From 1940, when it first introduced its unique hydrogen-reduced sponge iron powder, the company's enterprise has expanded to include sponge iron and atomized iron powders, molybdenum alloys and ferrophosphorus.

Pyron serves a well-established P/M customer base, where its select range of powders are used directly in the manufacture of pressed and sintered components, and as performance-enhancing additives to base powder mixes. Pyron serves several other markets

as well, ranging from friction applications to chemical/metallurgical- and electro-photographic applications. ▶

ALSO IN THIS ISSUE:

Coldstream and Eaton
Höganäs global TQA
PM²TEC
Stainless in North America
Powdrex – the newest Höganäs company

► Pyron is fully ISO 9002 certified, both at its production plant in Niagara Falls and at its dedicated mixing facilities in St. Marys, Pennsylvania.

A brief history

For those of our readers less familiar with Pyron, here is a short account of the company's 60 years of metal powder service to North American industry.

Its founders introduced their sponge iron process at a critical point in P/M's history, just as the winds of war were fanning the need for a dramatic increase in industrial output. Pyron began producing in 1940 at Niagara Falls, New York, where inexpensive electricity and hydrogen gas were both in abundant supply. Its production plants, now much expanded, are still located there today.

The Pyron process employed heat and a hydrogen atmosphere to reduce iron oxide. The resulting pure iron powder quickly gained acceptance with America's P/M producers, particularly the automotive industry, which backed a six-fold expansion of output by 1952. For nearly a half century, and through several further capacity addi-

tions, the company remained true to its hydrogen-reduced sponge iron process.

At the same time, it expanded its customer base to include several additional industries – in particular manufacturers of friction products. The Pyron process enables production of an extremely pure powder with low apparent density and high specific surface, ideal for cost-efficient manufacture of highly effective brake pads. Today, Pyron is the world's leading supplier of iron-based metal powders for the friction industry. In addition, special Pyron powder qualities such as their Molybdenum Alloys (PMA's) and Ferrophosphorus respectively provide strength- and ductility-enhancing features to P/M powder mixes.

In 1991, the company built a water atomization plant at Niagara Falls. The investment was optimally timed, as demand for Pyron 2068 quality has kept that facility operating at capacity ever since.

Inauguration in 1995 of a purpose-built mixing plant at St. Marys, PA, paved the way for the company's full ISO 9002 certification, which was achieved in December 1998. The state-of-the-art St. Marys facil-

ity provides blending capabilities for Pyron's own product range as well as customer-specific mixes and contract blending. Its high quality standards, quick turn-around and responsiveness to customer needs have earned St. Marys a position of respect with both large and small P/M producers.

Clear organizational synergy

Whilst there are several metal powder producers that are larger in size and output than Pyron, there are few, if any, who put as much effort into ensuring that their customers get exactly the product they need, when they need it.

Today, as part of the Höganäs Group, Pyron continues to offer the quality, flexibility and timely service that have built a strong and devoted customer base in America's vital P/M industry. At the same time Pyron complements the growing capabilities of North American Höganäs, and the two companies are meshing admirably in all areas, from R&D and Quality Assurance to production, logistics, marketing and customer support.

Coldstream takes hat trick at Eaton Suppliers' Day

Höganäs' Coldstream Division received triple plaudits at Eaton's annual Suppliers' Day Conference, held in Nice this past February. The awards were Supplier of the Year, Best Ideas, and Best Overall Performance for 1999.

Eaton's ECO Division (Engine Components Operations), is the world's foremost producer of automotive valves, with an annual turnover exceeding USD 1 billion. The division has production plants in nine different countries, and Coldstream serves them all.

Teamwork is a commitment

Close cooperation between a manufacturer and its suppliers is just as vital as an organization's internal harmony.



Pierre Boisot and Michael Bocksteigel receive the award from Domenico Bertolino, VP and GM of Eaton Engine Components Operations worldwide.

Eaton and Coldstream, who have collaborated closely for many years, are clear proof of this. Continuous improvement – in cost, quality and on-time delivery systems – have involved personnel from both organizations, and in the Technical, Commercial and Quality Assurance disciplines.

Michael Bocksteigel, Coldstream's Marketing Manager, formulates it like this:

“Eaton and we have a common interest – always striving for the Lowest Total Cost. We will continue to meet new challenges together, striving for further quality improvements and cost savings. This leads to the highest competitiveness and, in this respect, the business idea of Eaton and Coldstream/Höganäs are identical.”

Höganäs Total Quality around the world



Global Höganäs QS-9000 certification supports our core business concept: the Lowest Total Cost for the Customer.

The ambitious reach of QS-9000 means that quality must be certified all the way to the customer. Höganäs companies around the world are well on the way to meeting this goal.

In recent months, Höganäs sales companies in Taiwan, Spain and the UK have joined their colleagues in Germany and Korea, and upgraded their QA systems to achieve QS-9000 compliance. Our companies in France and Italy also aim to achieve compliance before the end of this year.

A QS-9000 quality matrix

Meeting the stringent requirements of QS-9000 and ISO 9000 certification is no simple procedure, but the guarantee of high and uniform quality and service is well worth the thousands of man hours which the Höganäs organization has devoted to establishing its framework for global compliance.

A QS-9000 certificate, as achieved by our units in Sweden and Belgium, predicates “value added production processes”, and this effectively excludes the activities of sales companies. However, QS-9000 also requires certified quality assurance all the way to the customer, which dictates inclusion of sales companies’ logistical and customer support capabilities.

This dilemma is effectively resolved by a Lloyds-issued “statement of compliance” confirming that the sales companies fulfill requirements and can thereby be included in the parent company’s certification.

Höganäs companies in China, North America, India and Brazil each stand for a

large production volume and are therefore pursuing independent QS-9000 certification.

At its core, global Höganäs QS-9000 certification supports our core business concept: the Lowest Total Cost for the Customer. Both imply the highest possible levels of quality, reliability and support to our markets in order that they, in turn, can enhance their product, service and profitability.

That is what we aim for.

Festivity and momentum in

NEW YORK

All participants agreed: the New York Hilton and Towers was an ideal venue for the 21st century's first PM²TEC. It included lively technical sessions and numerous interesting exhibitor stands – all spiced by the excellent culinary and entertainment opportunities which the Big Apple offers.

This year's event started on Tuesday, May 30th, with a welcoming party attended by over 500 delegates. During the following three days, visitors were treated to a technical program containing over 270 presentations from the international powder metallurgy community, and tempted by the offerings at nearly 90 different exhibitor stands.

Friday evening rounded off three intensive days, focusing what was probably North America's largest-ever concentration of P/M people at a gala showing of the hit musical/opera "Aida". This was preceded by theater dinners for some 250 people at Sardi's and Gallagher's (the famous steak restaurant). Broadway regulars and first-timers alike accounted the evening a great success!

From research to reality

As could be observed from both subject choice and audience response, this year's technical sessions underlined an important point: that it is now time to start reaping commercial advantage from the development successes made over the past few years.

Included amongst the many presentations were nearly a dozen given by staff from Höganäs, North American Höganäs and

Pyron. Höganäs topics reflected our broad involvement in P/M research and development, treating subjects ranging from sinter hardening to dimensional stability to soft magnetic composites.

Positive response

North American Höganäs and Pyron each had a stand at this year's show, and both registered a record number of visitors.

Sales staff from both companies made a point of alternating their time between the stands, underlining the spirit of the recent acquisition. Customer response was overwhelmingly positive.

In the spirit of this year's Olympics, North American Höganäs hosted the "Höganäs Games". The waiting lines for both events proved that the P/M competitive spirit is strong, regardless of the circumstance.

Winners received awards and their peers' acclaim at the evening hospitality festivities.

Pyron – celebrating 60 years

On Thursday evening, Pyron and North American Höganäs sponsored an event encompassing ceremony, good food, and festivities until the 'wee' hours – in celebration of Pyron's 60th year serving the P/M industry.

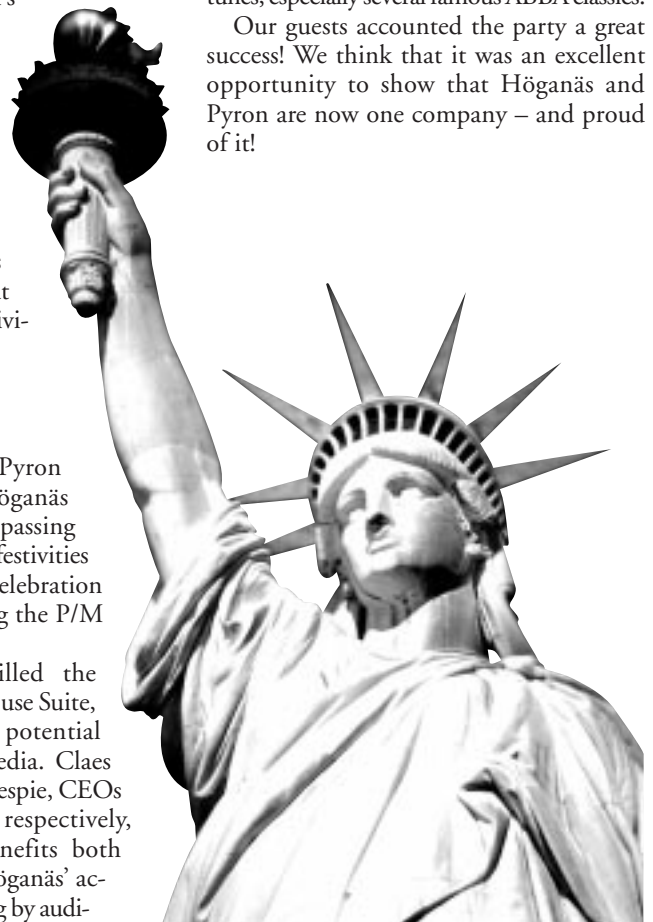
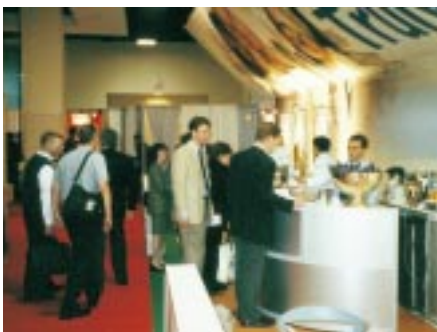
Nearly 300 guests filled the Hilton Towers East Penthouse Suite, representing current and potential customers as well as the media. Claes Lindquist and George Gillespie, CEOs of Höganäs and Pyron respectively, briefly described the benefits both companies derive from Höganäs' acquisition of Pyron. Judging by audi-

ence response, P/M producers also see benefits.

Ralf Carlström, Marketing Manager at North American Höganäs, presented prizes for the "Höganäs Games". Many participants wished they'd tried harder when the Secret Master Prize was handed out – an all-expenses-paid trip for two to Höganäs, Sweden.

To nourish the stomach as well as the soul, an extravagant 'New York' buffet was served. Spirited dancing followed, until the early hours of the morning, to the lyrical strains of a three-man band. The band's lady vocalist brought new life to a wide range of tunes, especially several famous ABBA classics.

Our guests accounted the party a great success! We think that it was an excellent opportunity to show that Höganäs and Pyron are now one company – and proud of it!



Three times as much P/M volume as today. It's a tantalizing number, and the world's largest auto manufacturers have clearly indicated that it is realistic – if quality and reliability requirements can be met.

Much of the development work necessary to achieve these standards has already been done. An overview of technical presentations from PM2TEC shows that momentum is growing to turn current research into reality.

Performance

Sinter hardening was a recurring topic, one for which production technology is advancing rapidly. It promises high structural integrity directly after sintering – even at low alloy levels. Belt furnaces with quick cooling capabilities ($\approx 3^\circ\text{C}/\text{sec}$) permit cooling rates up to 10 times faster than conventional furnaces.

Better alloying alternatives also improve performance, without noticeably increasing costs. Höganäs has championed this route with Astaloy™ CrM – a pre-alloy that also suits sinter hardening. A nitrogen atmosphere and good control over the process are required, but sintering can be carried out at 1120°C .

Microstructure was the focus of many presentations. Its importance is both proven and well documented. Today, mechanical performance can be accurately predicted if careful microstructural control is maintained.

Density

Both structural and fatigue strength can be directly related to density.

Several alternative routes were discussed in this year's presentations. Reduced lubricant levels, combined with high compacting pressures, were an alternative favored by several speakers. However, warm compaction and surface densification were undoubtedly the two hottest topics on the density agenda, reflected in presentations as well as at exhibitors' stands.

Uniformity

Many of P/M's advantages are based on



Tomorrow's P/M

technology sightings at PM2TEC 2000

— by Jan Tengzelius, Research Director, Höganäs Central Laboratories —

maintaining tight tolerances. Several presentations reflected this fact, and focus was particularly directed towards shoe filling technique and powder uniformity. Diffusion bonding and organic binders minimize segregation without adversely affecting flowability.

Stainless steel

The market introduction of stainless steel P/M exhaust flanges has catalyzed this material's commercial potential (see accompanying article). Several presentations focused on research that has been conducted in the areas of materials, techniques and production prerequisites.

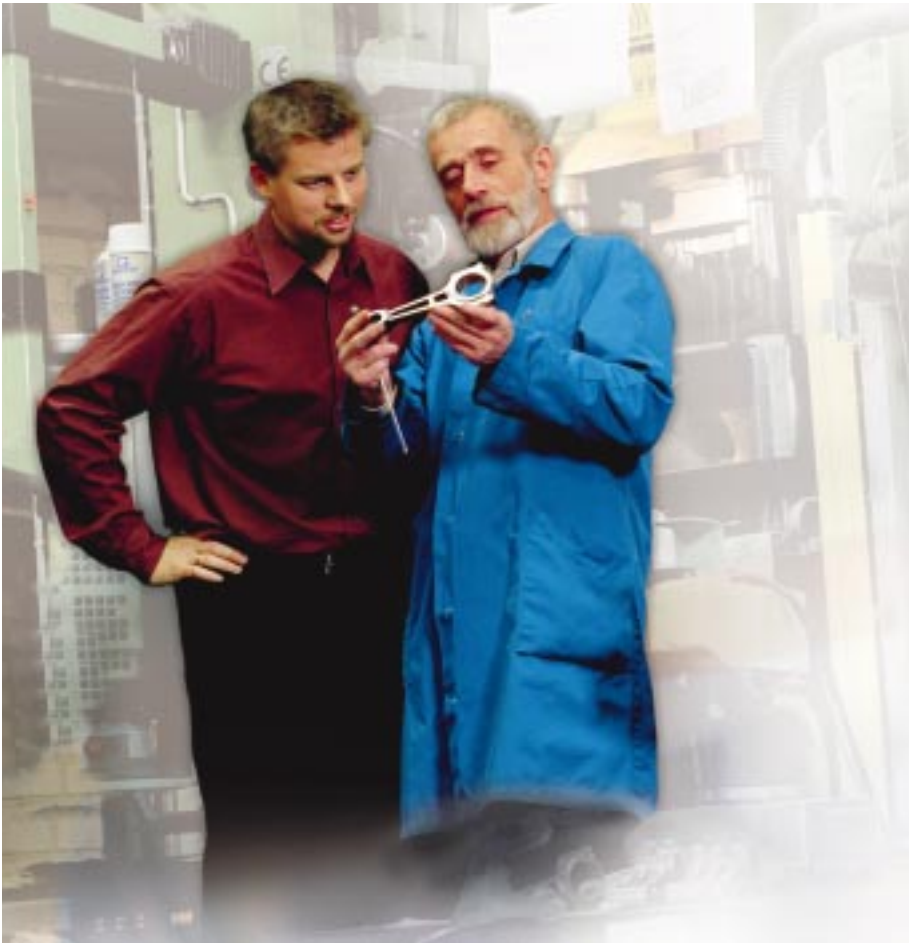
SMC

Soft magnetic composite materials and applications continue to command great interest in the P/M community, because of their parallel production technology and the enormous commercial potential of low-frequency SMC electric motors. Höganäs' own Patricia Jansson presented the latest

material developments and construction alternatives.

Visit www.hoganas.com to download the following papers:

- "Evaluation of sinter hardening of different P/M materials"; Ulf Engström
- "Mechanical properties of warm compacted Astaloy CrM"; Caroline Lindberg
- "Influence of density and microstructure on fatigue properties of warm compacted Fe-Ni-Cu-Mo steels"; Sven Bengtsson
- "Material for warm compacted heavy truck transmission parts", Paul Skoglund
- "Efficient bonding for dimensional stability"; Mats Larsson
- "Ferritic stainless steels for high temperature applications"; Anders Bergkvist
- "SMC materials – including present and future applications"; Patricia Jansson



A stainless start in North America

The demand for stainless steel P/M components grows in pace with the call for greater component durability and corrosion resistance.

To make the most of the situation, manufacturers should carefully gauge their supplier's P/M product and process know-how at the same time they consider deliver capabilities.

Growing steadily at around 10% per year, stainless steel powder is in no way an 'orphan' market – several large suppliers are currently active. Why, then, does North American Höganäs want to enter the fray?

The big little picture

The answer is simple. The market for stainless steel powder currently absorbs about 6,000 tons per year, and it has plenty of

room for expansion.

There are also ample resources within the Höganäs organization. We currently produce stainless steel powder in a purpose-built production line at the Coldstream plant at Höganäs Belgium.

Coldstream is an organization dedicated to supplying and supporting stainless steel powder customers. The stainless steel team is a tight-knit group, ready to provide all the

flexibility that comes with a small organization. At the same time, it can draw on Höganäs's comprehensive range of resources and support in R&D, production and logistics. The result is a unique combination of competence and focus.

Customer contact

Shared knowledge and experience is always beneficial. In the growing field of stainless P/M applications, it is even critical. Both manufacturers and their powder suppliers benefit by working together to optimize product and cost.

Olof Andersson is Marketing Manager at Höganäs Belgium. However, he can often be found on the other side of the Atlantic, helping North American Höganäs to serve the producers who are responsible for much of stainless P/M's dramatic growth. The collaboration is obviously bearing fruit – there are numerous development projects under way, as well as several components already in production.

Anders Bergkvist, in charge of stainless applications development at the Höganäs central lab, says "Many customers take advantage of our development resources, from powder properties and compositions to production processes. We can test the effects of different stainless steel powder compositions when varying the processing conditions, which helps our customers to get the desired product characteristics. We also work with long term development work in order to have suitable powders for new applications."

P/M competence gives focused results

North American Höganäs is uniquely suited to help manufacturers successfully increase demand for stainless steel P/M components.

Unlike current competitors in the stainless steel metal powder market, Höganäs focuses solely on the manufacture of metal powder. The lion's share of its production serves P/M applications, and the organization can focus unsurpassed technical competence on achieving the desired results, both in terms of metal powder and end product.

Product, price and support are key elements of the Höganäs promise "Lowest Total Cost for the Customer". This will be proven as North American Höganäs enters the market for stainless steel P/M powders.

Meet the newest member of the Höganäs Group

On 10 August, Höganäs AB acquired the business and assets of UK-based Powdrex Ltd., the world's largest producer of water atomized high speed steel powders. With its excellent reputation for technical ability and quality, Powdrex will be an important part of the fast growing Höganäs Coldstream Division.

Founded in 1972 as a result of a development project at Imperial College in London, Powdrex initially produced billets and bars from cold-pressed condition by full-density sintering.

The company soon found out that its primary production problems sprung from metal powder: there were simply no powders good enough to achieve the desired properties. Powdrex then took it upon itself to develop a unique production process which, unusually, includes a vacuum annealing stage. It produces fully prealloyed high-alloy powders with high green strength, relatively high compressibility, accurate carbon levels and consistently low oxygen content. The first patent on the process was achieved in 1973, and several further patents have ensued.

That process was the genesis of the com-

pany's mission today: to develop and produce high-speed steels of outstanding quality. To avoid the potential conflict of being both a producer and a consumer of powders, Powdrex elected to leave the sintering business entirely in 1978. The company believes that it was the first ferrous powder producer to achieve ISO 9000, which it obtained in 1990.

Spearhead in PM

Today, Powdrex employs around 40 people. It is located at Tonbridge, in the idyllic rural countryside of Kent, with easy access to metropolitan London.

The company's primary products are a range of water-atomized high-speed steel (HSS) powders, which are used in the manufacture of P/M components with exceptional wear resistance, compressive

strength and fatigue strength at high temperatures, or to improve hardness without heat treatment. Typical applications are valve seat inserts in gasoline- and diesel engines, pump parts, cams, rocker arm tips, power tool components and cutting tools.

The company has also recently developed and patented a new stainless wear resistant alloy for applications with high demands for combined corrosion and wear resistance.

A bright future together

"Powdrex views its acquisition by Höganäs very positively", says Dr. Stephen Flood, previously Managing Director of Powdrex Limited and now General Manager of Powdrex. "We are the market leader for our type of powders. We are growing steadily and have a strong technical track record."

He continues: "Powdrex is a strong business but it is small. Höganäs' greater resources and additional expertise, particularly in R&D, technical sales and production engineering, should enable us to develop more rapidly, expand into new markets and improve productivity. On the other hand, Powdrex's expertise in vacuum annealing, full density sintering and wear applications should create opportunities for other members of the Höganäs Group. The challenge is to exploit the synergy arising from the acquisition as effectively as possible to the commercial advantage of Höganäs and its customers".

Measuring atmosphere in sintering furnaces

— by Björn Lindqvist, Höganäs R&D —

Parallel to development of Astaloy CrM, an atmosphere measuring system has been created to ensure producers accurate sintering furnace control for the processing of oxygen-sensitive materials. The system has already showed significant benefits.

The suitcase-sized system is able to measure all types of N_2/H_2 atmospheres, with or without the addition of a hydrocarbon. It is not used in CO/CO_2 atmospheres such as endogas or exogas.

Production-scale measurements started in early 1999, with simultaneous sintering of Astaloy CrM in tested production furnaces enabling producers to optimize their

process. In particular, component producers working mainly with furnaces operating at $\leq 1150^\circ C$ have been able to gain valuable input for the processing of oxidation-sensitive iron-based materials such as Cr- and Mn-alloyed steels (which are expected to represent a significant percentage of the powders used in the future). In turn, the system has enabled Höganäs to better understand the possibilities and limitations in the sintering of Astaloy CrM.

Portable and easy to use

The measuring system consists of a small furnace, pre-set at $1120^\circ C$, equipped with an oxygen probe and an S-type thermocouple. It is connected to a computer via a data logger.

A CO sensor is also connected to the system.

The system can be used for open- and, in some cases, closed furnaces. Measurement in closed furnaces is possible provided the furnace body is equipped with outlets for the furnace atmosphere. When there are such gas outlets, there is no limit in upper temperature range of the sintering furnace.

The furnace atmosphere is sampled at selected positions, and partial pressure of oxygen is calculated – as an in-situ representation of the processing conditions in the furnace. In practice, oxygen partial pressure means reducing ability of the sintering atmosphere. By sampling at selected positions, an atmosphere profile can be estimated. This also opens possibilities to judge the quality of the conditions in the sintering furnace, such as detection of possible air and/or water leakage or state atmosphere flow disturbances.

Components producers interested in participating in the further development of the system are welcome to contact their nearest Höganäs representative.

POWDER PEOPLE

R&D is the primary theme of this issue's Powder People. Our strong global expansion calls for a parallel strengthening of technical development and support capabilities to the market.

In Sweden:



INGRID HAUER who recently completed her studies at the University of Lund this past June, joins Höganäs R&D as a development engineer in mechanical engineering, with a focus on materials.



MARIA RAMSTEDT will serve as a development engineer in surface chemistry at Höganäs R&D. She also completed her studies at the University of Lund this past June.



LINNÉA FORDÉN a recent graduate of the Swedish Royal Institute of Technology, Stockholm, joins Höganäs R&D's P/M materials section as a development engineer.



ZHOU YE has worked on several Höganäs development projects over the past few years, simultaneously pursuing studies at Stockholm University.

He now joins Höganäs R&D full time as

a development engineer, working particularly with hard magnetic materials.



MARIA GRASS joined us in February this year, after completing her studies at the Swedish Royal Institute of Technology. She is currently serving as a development

engineer in technical customer service for the P/M industry.

In Spain:

MARTA BAZAL

holds a degree in Business Administration from Salamanca University. Together with work experience in customer support and accounting, this training will help her to fulfill her position as Höganäs Ibérica's logistics and accounts manager.

UPCOMING EVENTS

In the remainder of this year, the Höganäs Group will be exhibiting at:

Friction

October 1-4
SAE Brake Colloquium
San Diego, California, USA
More info at: www.sae.org/calendar/bce00/index.htm



Carrier Cores

October 15-20
IS&T's 16th International Conference on Digital Printing Technologies
Vancouver, BC, Canada
More info at: www.imaging.org/conferences/nip16



P/M

November 12-16
World Congress on Powder Metallurgy
Kyoto, Japan
More info at: wwwsoc.nacsis.ac.jp/jspm/kokusai.html



New P/M school in Brazil



Students and staff from 5 countries made the P/M school a great success.

Höganäs Brasil held its first P/M school from June 13-16 this year. It was a truly international event, and response was so positive that another session is already being planned!

The four-day session took place at the company's production plant at Mogi Das Cruzes. As usual, it included an intensive and comprehensive program of lectures and

practical exercises. Twenty two 'students' from twelve different customers in Brazil and Argentina were served by a teaching group comprising Höganäs staff and engineers from Sweden, the USA and Brazil, as well as sales representatives for Brazil and Argentina.

The school also gave Höganäs Brasil an opportunity to showcase the plans which are now being carried out for a 7 MUSD plant extension, which will include an annealing furnace, a mixing station and a packing line. Scheduled to begin operation by mid-2001, the extension will increase plant capacity by about 150%.

Höganäs

THE DIFFERENCE IS KNOWLEDGE

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