metals industry
TRENDS & EVENTS
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MIRDC's New Corporate Vision Highlights its 42nd Founding Anniversary

A week-long celebration was launched by the Metals Industry Research and Development Center (MIRDC) to commemorate its 42nd founding anniversary last 16-20 June 2008.

To kick-off the celebrations, technology presentations/symposium was arranged by the Center on 17 June 2008. The holding of free technical presentations/symposium also served as industry dialogue of sort since participants came from various metalworking companies and are mostly members of the Philippine Die and Mold Association (PDMA) and the Metalworking Industries Association of the Philippines (MIAP). Participants in the event raised their respective queries, concerns, and suggestions to effect changes in the metals and engineering (M&E) industry.

Executive director Rolando T. Viloria gives his inspirational talk during the MIRDC 42nd anniversary celebration

Dr. Feliciano H. Japitana presents his topic on manufacture of complex-shaped products through multi-axis machining

The main topics reported by the speakers include: Capability Building on Mechatronics Technology, Advanced Machinery Design and Testing presented by Engr. Amado R. Jabrica, Senior Science Research Specialist at the Design and Development Section, Research and Development Division (DDS-RDD); State of the Philippine Tool and Die Industry, a 2006 Study, with inputs from Mesdames Dolores D. Duque, Rosalinda M. Cruz, and Maria Elena G. Gurimbao, discussed by Engr. Eldina B. Pinca of the Information Technology and Promotion Section, Industry Assistance Division (ITPS-IAD); Low-Cost Rapid Tooling Through Investment Casting Technology by Engr. Almir R. Almirañez, Chief of the Metalcasting Technology Division (MCTD); and Manufacture of Complex-Shaped Products through Multi-Axis Machining by Dr. Feliciano H. Japitana, Chief of the Metalworking Technology Division (MWTD).

The succeeding days witnessed the hustle and bustle of the Center's celebrations. The anniversary's main event was held on 18 June 2008 wherein all the employees actively participated in the program, raffles, and enjoy without let up the activities prearranged specially for them.

Employees were likewise treated to seminars on livelihood opportunities to provide them alternative means to support their respective families. On 20 June 2008 MIRDC staff allotted time to make the Center spick and span by conducting a clean and green activity...a way of giving back something to the Center.

This year's anniversary theme "New Vision, Renewed Passion…" resonates the enthusiasm of the Center to align itself to the ever changing M&E environment. The new vision, i.e., an internationally recognized institution providing R&D, technology transfer,

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inside

From the Executive Director.....

The 2nd quarter of 2008 had been, as expected, one of the busiest months for MIRDC and the science department as a whole. This is because of the most talked about grand celebration of the department for its 50th founding anniversary with the theme "Making Science Work for You," in June 2008.

High-spirited events were prepared by the DOST to commemorate this milestone in its history. Different activities, from launching of the science department's mascot Tron, cultural events like the Ginintuang SinAg—a two-hour musicale arranged by Dean Ramon Acoymo of the UP College of Music, unveiling of DOST's coffee table book depicting its rich 50-year history, and conferment of 50 Men and Women of Science award were lined up for the said occasion.

In conjunction to the commemoration of DOST's 50th anniversary, the Philippines will also host the 2008 ASEAN Science and Technology Week (ASTW) celebration in July 2008. And as we organize and prepare to roll out the red carpet for the ASEAN member countries, i.e., Brunei Darussalam; Myanmar; Cambodia; Indonesia; Singapore; LAO PDR; Thailand; Malaysia; and Vietnam, various preparations for the major activities of the much-awaited event are being finalized by the various committees. Among them are the conduct of Scientific and Technical Conferences on 03–04 July 2008, ASEAN Youth Science Summit on 08-10 July 2008, the touted technology fair on 07-11 July 2008, and S&T awards will be up for grabs. This year's annual event will be graced by the country's top officials, no less than president Gloria Macapagal-Arroyo will formally open the 8th ASTW while vice-president Noli de Castro will close the said event.

And as if our hands are not yet full, we still managed to observe our very own 42nd founding anniversary last 18 June 2008. And for our very own anniversary—we preferred it simple yet meaningful—the Industry Assistance Division (IAD) arranged the conduct of symposium/technology presentations on the following:

a) Capability Building on Mechatronics Technology, Advanced Machinery Design and Testing
b) State of the Philippine Tool and Die Industry: a 2006 Study
c) Low-Cost Rapid Tooling Through Investment Casting Technology
d) Manufacture of Complex-Shaped Products through Multi-Axis Machining

MIRDC's personnel also participated in the conduct of assorted technology livelihood seminars on 19 June 2008. And at the end of the week-long celebrations, we also tried to return the Center to its pristine condition by conducting a clean and green activity on 20 June 2008.

So to all MIRDC staff who played a part and supported all of these activities, my sincere thanks to all of you. Credits are also due to all the members of the metals and engineering (M&E) sector who have celebrated and shared with us their aspirations that through the years has enabled the Center to continue to exist and serve the industry.

Rolando T. Viloria, CEO III
Executive Director

metals industry TRENDS & EVENTS

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Improved Locally Developed Coco-Coir Machines Out in the Market

The locally developed coco coir machines such as micro-decorticating, slivering, and twining machines will be featured by the Metals Industry Research and Development Center (MIRDC) in the 2008 Asean Science and Technology Week (ASTW)/2008 National Science and Technology Week. The event coincided with the 50th anniversary celebration of the Department of Science and Technology (DOST). The machines are hoped to draw enthusiasm to the crowd of academician, investors, researchers, and the public.

The mechanized micro-decorticating machine separates coir fibers of indigenous raw material, the wasted coconut husks; while the slivering and twining machines produce strands of coir fibers and bundles of two-ply ropes which are also used as input materials for the in demand geo-textiles nets, bags, plant container hangers, wall decors, and other matting products. Specifications of these coco coir machines are shown below.

Micro-Decorticating Machine

The previous micro-decorticator uses the crushing action of multiple, fixed blades to separate the fibers but the new design were made of replaceable blades with holder. The holder is strategically welded on the rotating drum that spins at 2000 revolutions per minute. The design and configuration of blades cause the rapid separation of fibers and dust as the husks are crushed against a set of fixed counter blades arranged horizontally and parallel to the axes of the decorticating blades. From 8 hp, the improved machine is now run by a 14-hp diesel engine.

Slivering Machine

Slivering machine is a motorized machine composed of crumpet, a motor, and a casing that holds the slivered bundle of strand. It is used for twisting the coir together in order to produce a rope-like strand. This is run by a single phase ½-hp electric motor instead of the ¼-hp motor used by its predecessor. It can produce 3-meter long of strands per minute while the old design is only capable of yielding a meter long of strand per minute.

Twining Machine

The twining machine produces 2-ply rope of 4-6 mm diameter by intertwining the 2 strings of loose and twisted coco fibers through two conical spools. The rope or yarn will then be wound and spanned by a revolving spooler in the spindle assembly. The production capacity is about 96 kgs per day of twined fibers. The improved design is easy to operate because of the removal of the belt conveyor. And the increase in production capacity from 24 to 96 kgs per day is attributable to the use of a flexible and collapsible spindle/spooler mechanism that markedly reduces the production cycle.

Equally flexible feature is the inclusion of a frequency inverter that allows the machine to twine not only coco coir but also other fibers like abaca, piña, and others.

Machine Name (Cost)	Production Capacity	Size (l x w x h)	Prime Mover	Fuel Consumption	Weight	Changes/Improvements
Micro Decorticator (PhP 107,500.00)	3,000 husks/day	1.35 x 0.6 x 1.08	14 hp diesel engine, 2000 rpm	14 li./day	200 kgs.	8 hp=>14 hp blades replaceable with holder
Slivering (PhP 50,000.00)	380 m long strands/day	0.735 x 0.52 x 0.70	½ hp 220 V single phase electric motor	-	50 kgs.	¼ hp => ½ hp
Twining (PhP 180,000.00)	96 kgs/day 4-6 mm dia.	2.4 x 0.6 x 0.6	2 hp single phase electric motor	-	200 kgs.	The conveyor was removed and parallel bundle of strands are used to produce twined ropes
Total Amount	**P 337,500.00***					

*** Subject to change without prior notice**

MIRDC's New Corporate Vision... from p1

scientific and technological services supporting the growth and global competitiveness of the metals, engineering and allied industries, was coined by the management staff and middle managers of the Center last December 2007 during their strategic planning.

By adopting the new vision, MIRDC once again asserted its commitment and dedication to be constantly responsive to the needs of its stakeholders effectively serving as springboard to notch up the capabilities of the local industry. The said vision also provides a coherent description of the services that the Center guarantee to give to its stakeholders.

Top execs (L-R) Dr. Agustin M. Fudolig, Engr. Arthur Lucas C. Cruz, and Engr. Rolando T. Viloria award plaque of appreciation to retirees

State of the Philippine Tool and Die Industry: A 2006 Study

The 2006 industry study of the tool and die sector details the overall performance of the sector and by and large presents a situationer covering the status of the tool and die shops in the country as of 2006. The primary data in this study were gathered through a survey of the 121 tool and die shops, representing about 71 percent of the estimated 171 tool and die shops as of 2005. Data were specifically obtained through fielded questionnaires, personal interviews, and actual plant visits. Questionnaires were distributed to various regions designed to elicit responses that would on the aggregate reflect the present performance of the industry, its structure and scope of operations, and the problems and difficulties it currently faces. Additional information required to assess the status of the industry was developed by using available data from various statistical sources and related industry studies.

The Industry

Eighty percent of the total number of respondents are made up of independent firms while 20 percent are in-house die making shops of manufacturing firms. Most of the companies (43%) are located in the National Capital Region (NCR) or Metro Manila, the rest of the surveyed firms are in Regions III, IV, VII, and XII.

The predominant type of organization is corporation followed by single proprietorships. The Philippine tool and die industry is mainly Filipino-owned. In terms of capitalization, 80 of the 121 firms are classified as small to medium-scale having capital investments from PhP 100,001 to PhP 40,000,000 while 14 are considered to be large-scale with capitalization of more than PhP 40 million.

Manufacturing is the most common type of business among the surveyed tool and die shops with 47 percent share. About 15 percent operate on a job-order basis while the rest are engaged in both activities.

Imports & Exports

Meanwhile, the Philippine exports of mold and die products in 2005 posted a 56.19 percent increase over 2003 level. In 2005, exports reached US$ 3.13 million, up by US$ 553 thousand over 2003 level of US$ 2.58 million. The increasing trend in exports earnings indicates a growing demand for such products in the foreign market. The bulk of these die and mold products exported in 2005 were molds for rubber and plastics, which garnered 50 percent share while molds for minerals comprise 17 percent share. Japan remained the country's top export market with total purchases amounting to US$ 979,000.

On the other hand, in 2005, imports of dies and molds amounted to US$ 44.38 million, an increase of nine percent from US$ 40.71 million in 2004. Between 2003 and 2005, imports of die and molds registered an average growth rate of 5.13 percent. Rubber and plastics molds constituted the largest demand for imports in 2005, taking a hefty 68 percent of total imports. Molds for metals accounted for 18 percent, while molds for glass registered seven percent, molds for mineral, five percent and dies for extruding metals accounted for two percent. Japan remained the dominant supplier of imported dies and molds, accounting for 29 percent of total imports in 2005 followed by Korea, 21 percent and Taiwan, nine percent. All these countries were also the key supplier of molds for rubber and plastics. Japan is the primary source of dies and molds for metals and metal carbides while glass molds are sourced in China and France. Myanmar (Burma) is the main source of molds for minerals.

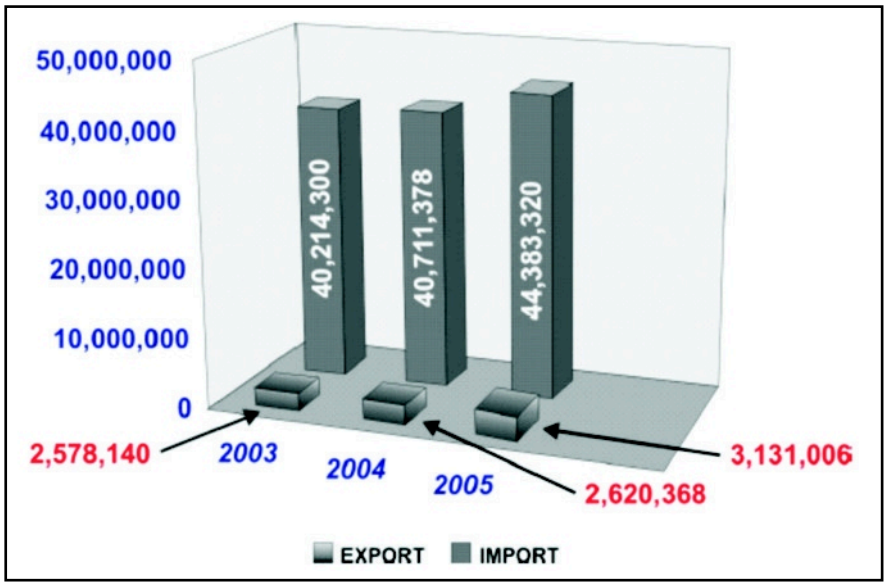
The country's manufacturing industry has been continuously dependent on imported molds and dies. The export-import ratio for 2005 alone was 1:14.

Industry's Workforce

Industry's workforce is made up of 5,862 workers. Production workers account for 68 percent of the total workforce while the remaining are non-production workers. Majority of the production personnel have formal training due to the rigorous and exacting nature of the job.

Raw Materials Consumption

Generally, the largest component of production cost is raw materials. Raw materials used in tool and die operations include alloy steel, mild steel, carbides, and other metals such as stainless steel and plastic molding materials.



Import and Export Performance of the Philippine Tool and Die Sector, 2003-2005

T&D Equipment

A total of 1,947 of machines/equipment were accounted for during the survey. Sixty-six percent of the total machine tools of the respondents are composed of general-purpose machines while only 31 percent are specialized machines. The ratio of general purpose to specialized

machine tools is about five to two. Most machine tools are in good condition. Some of the equipment being utilized by the industry have been in operation for 20 or more years. Almost all of the survey respondents practice quality control mainly for dimensional accuracy using basic measuring instruments such as calipers and micrometers. However, only 22 are confirmed to have coordinate measuring machine.

International standard complied to by these firms include: standards for jigs, press dies, die for casting, molds for plastics, etc. which can be sourced out at the Bureau of Product Standards (BPS). Other references or source of standards used by tool and die makers are punch plastic molding special orders, standard components, design standards from JICA training, Futaba standards (for assembly guide, angular pin, ejector pin, etc.), and standard components for plastic mold and die cast from Misumi (for design of ejector pins, sprue, bushings, etc.)

The application of advanced technologies among die and mold shops during the last ten years has increased considerably. Among the 121 shops, 68 shops or 56 percent are using EDM, and 11 percent are using wire-cut. Several respondents also disclosed that they are using more advanced and sophisticated equipment like Vertical Machining Center (VMC), CNC Machining Centers, CNC EDM Wirecut, and CNC EDM Sinker.

Problems of the Industry

The following problems are causes of concern in the industry as gleaned from the survey:

(a) Technical – At present, the foremost constraint affecting manufacturing capability is the lack of training centers. The shortage of workers skilled in the design and modern production of tools, dies and molds can be traced to the lack of training center with advanced training facilities and developed training curriculum and manuals. The industry also has inadequate technical support facilities, specifically for heat treatment and industrial chrome plating, deterring their capability to improve the service life of their molds and dies. Another critical factor is the limited tool and design expertise available. From data obtained from the survey, the sector has very little pool of designers, it accounted for only three percent of the total workforce.

(b) Workforce – The lack of tool and die makers is the most common workforce problem of the industry. This insufficiency is partly due to the inadequate training programs available in the industry and the continuous exodus of our trained workers for abroad. In order to improve the sector, it needs adequate training for its workforce. Some of the shops, however, are developing and upgrading the skills of their technicians and engineers by sending them to seminars such as those sponsored by MIRDC.

(c) Equipment – Price of equipment is perceived by the respondents as their major problem area, followed by cost of repairs and maintenance, sourcing, import and export rules and regulations. The study also noted the use of outdated machine tools by the tool and die makers limit production of more complex and higher precision dies and molds. Most shops cannot afford to buy modern equipment. The high cost of raw materials and supplies also strain their capability to improve their facilities.

(d) Raw Materials – Most of the respondents cited the high cost of raw materials as one of their major concerns since these are mostly imported. Other problems are raw materials sourcing, quality, and import and export rules and regulations.

(e) Finance – The high interest rates imposed by private lending institutions hinder the tool and die shops to increase their working capital. Other problems cited by the respondents are limited working capital, sourcing of capital, collateral, and lack of financing institutions.

(f) Marketing – The survey respondents list irrational price competition as their major marketing problem. Competition from foreign suppliers is also a pressing problem for most of the respondent shops. Local manufacturers find it difficult to compete with foreign manufacturers as some end-users opt to import their molds and dies rather than have them manufactured locally. The relatively low productivity of the industry makes it difficult to compete with foreign suppliers equipped with up-to-date facilities and staffed with highly skilled workforce.

(g) Utilities – One of the basic problems confronting the industry is the high cost of electricity. Another problem of the industry is the lack of infrastructure support for transport, communication and power supply. Disruption of production normally arises due to lack of this infrastructure support.

(h) Government Regulations – Of the various government regulations affecting the industry, shop owners register discontent against the amount of taxes being levied on the sector. Another area of concern among shop owners is the high import tariff on raw materials and equipment, compounded by the complicated customs procedures.

Survey respondents indicated optimistic and positive business outlooks about tool and die prospects in the country despite their current problems.

On the average, about 56 percent of shops have plans to expand within the next two to five years on the areas of production capacity, new production process, and new products.

The major challenge of the tool and die industry sector is that it needs to create a dent in the Southeast Asian market where China is leading in the industry. Likewise, the sector needs to learn from its previous experiences and learn from those of the Southeast Asian neighbors, Europe, and the US to improve capabilities, capacities, and production. In general, however, the Philippine tool and die sector will always have a room for growth, as its demand is felt both in the domestic and international markets. While it may take time to compete with the rest of the Asian countries, it has shown great potential. The sector must respond to the global challenge of becoming at par, technology-wise, with its more developed counterpart through modernization for better productivity and improvement of their product quality.

MIRDC Beneficiaries, Recognized Among "The 50 Men and Women of Science"

Two of the recipients of "The 50 Men and Women of Science" got interventions from the MIRDC on their metalworking ventures. They are Mr. Arden A. Siarot and Mr. Philip N. Tan.

Mr. Arden A. Siarot is the brain behind the successful Cebu-based Arden Classic, Inc. (ACI). It specializes in handcrafted home furnishings accented with coco inlay, silver, brass, or metal accessories.

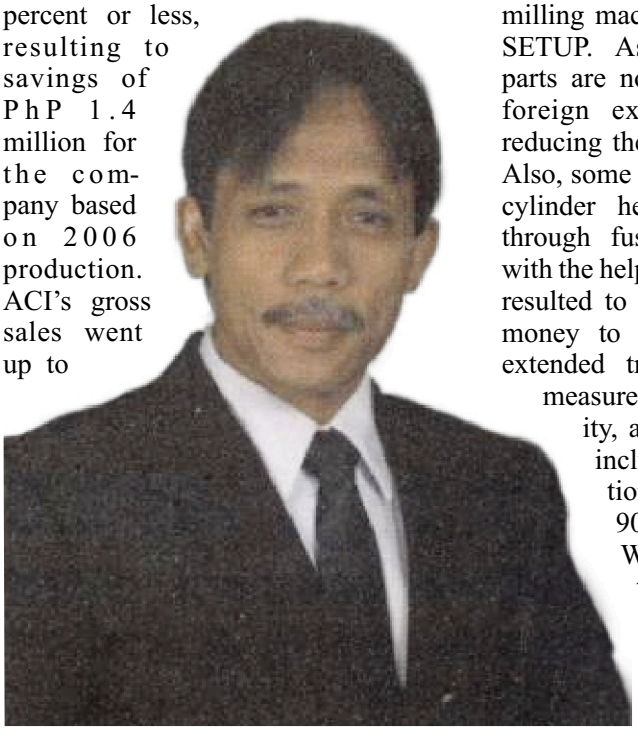
In 2004, Mr. Siarot's plated metal accessories were assessed by the MIRDC and he was able to establish his in-house electroplating facility through the DOST-Small Enterprises Technology Upgrading Program (SETUP). Further, the MIRDC conducted training to Mr. Siarot and his production personnel on electroplating operation. By then, Mr. Siarot's in-house electroplating facility sharply cut rejects down to 3 percent or less, resulting to savings of PhP 1.4 million for the company based on 2006 production. ACI's gross sales went up to PhP 21 million in 2006, a three-fold increase from its 2004 level. Monthly production volume expanded 113 percent from 3,000 to 6,400 furniture and home furnishings items in 2006. From subcontracting, ACI became a full-fledged furniture maker and exporter that meets the growing demand of foreign buyers.

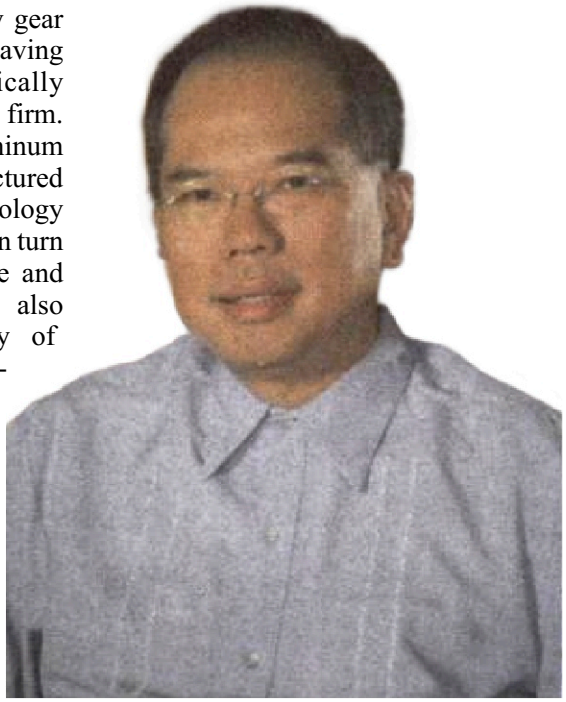
On the other hand, Mr. Philip N. Tan, the president and chief executive officer of Wellmade Motor and Development Corp. in Cebu, is pursuing a convergence strategy through its major field of specialization: manufacturing of metal component parts, on-site/in-place machining hot/cold fusion welding, and machining/fabrication of high precision parts for the transport, power plants, and manufacturing business.

The company was able to acquire accurate automatic gear hobber and milling machines through the DOST-SETUP. As a result, machinery gear parts are no longer imported saving foreign exchange and drastically reducing the down times of the firm. Also, some metal parts like aluminum cylinder heads are remanufactured through fusion welding technology with the help of MIRDC, which in turn resulted to savings both in time and money to customers. MIRDC also extended training on accuracy of measurements and traceability, and cost estimation, including implementation process for ISO-9001:2000. As such, Wellmade is among the first Filipino machine shop to be awarded ISO-9001:2000 as certified by the TÜV Rheinland Philippines.

Mr. Tan managed to transform his business from a micro-sized company of 12 people in 1995 to almost 10 times its original size with three plants in Northern Mandaue, Central Cebu, and Southern Talisay. It has become as one of the biggest and modern workshops in the Philippines.

Mr. Arden A. Siarot and Mr. Philip N. Tan deserve to be recognized for their ground breaking contributions to science and technology development. The recognition for "The 50 Men and Women of Science" was made by the DOST as it celebrates its Golden Anniversary in June 2008.





Mr. Arden A. Siarot and Mr. Philip N. Tan (L-R), recipients of "The 50 Men and Women of Science" during the DOST Golden Anniversary Celebration.

PDMA Invites Exhibitors to PDMAEC 2009

The Philippine Die and Mold Association (PDMA) now accepts reservations of booths for its upcoming event, the PDMAEC 2009. The show will be held from 27-30 August 2009 at the World Trade Center Metro Manila (WTCMM). PDMAEC 2009 is the 4th exhibition and conference which will feature the latest technologies on die and mold, machine tools, metalworking machinery, equipment, accessories, hardware, and other related products and services.

Organized by the PDMA and co-managed by the MAI Management Philippines, the PDMAEC 2009 is among the lined-up activities to be undertaken by the Association in its effort to help the Government in promoting the country's die and mold industry.

For inquiries, interested participants may contact MAI Management Philippines through telephone no. (63-2) 8982198, fax no. (63-2) 8901087, email: mai_mgt@compass.com.ph or PDMA Secretariat through telephone nos. (63-2) 8370431 to 38 loc. 463 and telefax no. (63-2) 8370764.

SME Managers off to Train in Korea

The government of Korea organized an "Executive Training Program for Asian SMEs" which was held from 14-24 May 2008 at the Small & Medium Business Training Institute (SMBTI), Ansan, Korea. It was participated in by the Philippine and Thailand delegations. The Philippine delegation was composed of the SME managers from the different industry associations. Along with them are Engr. Edilbert M. Dela Peña who represented MIRDC and officials from the Board of Investments (BOI) and the Deparment of Trade and Industry (DTI).

The training program aimed at introducing innovative management of prominent SMEs and large companies to enhance competitiveness specially for the small and medium businesses. It also fosters business cooperation between Korea, Thailand, and Philippines. Topics include: SME and Export Promotion Policy; Technology Transfer and Commercialization Policy and Technology Transfer Case in Korea; SME's Operation Management; Six Sigma Management Method; and Issues to Improve SMEs System.

Philippine and Thailand delegations participated in the "Executive Training Program for Asian SMEs" conducted by the Korean Government

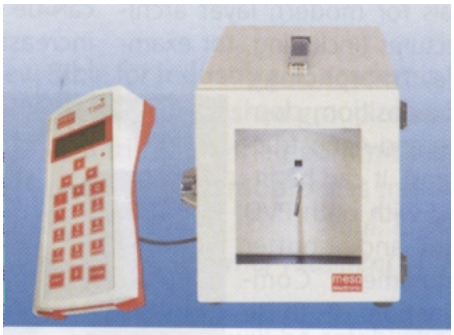
Foil tester for storing measurements

With the Foil Tester FPG 1.0 it is possible to determine and indicate directly the C-level in furnace atmospheres by foil tests. Additional calculations from the difference in weight of the foil are not necessary. In the display of the terminal, each step is indicated in clear text, so that the instrument can be operated without error.

Benefits of the tester are:

- ➔ Quick, trouble-free determination of carbon level actual values in furnace atmospheres
- ➔ Simple operation by means of menu assistance in plain text in German and in all main foreign languages
- ➔ Automatic and quick indication of the weight percent carbon in the furnace atmosphere, directly in % C
- ➔ Up to 5 or 9 (option) different foils can be checked simultaneously
- ➔ Automatic calibration
- ➔ Accessories included
- ➔ New Terminal T300 and USB-stick for storing measurements

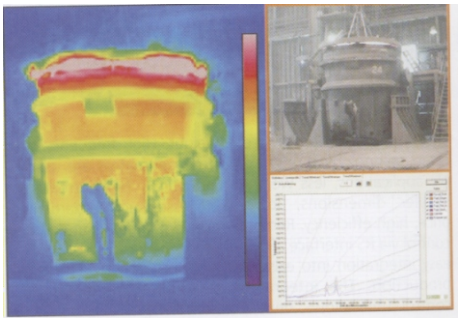
Source: Heat Processing (6) Issue 2 2008, p.148



New thermal imaging cameras with alarm function

With its new cameras, IMPAC is setting standards in the low-cost segment of thermal imaging systems. The IVN 780-P is a portable high resolution thermal imager especially designed for the detection of failures in electrical, mechanical and industrial equipment, e.g., check of insulation materials. It is possible to use an alarm function for the immediate display of critical temperatures (HotSpot detection). This leads to an early detection of deficiencies and the prevention of costly damages. The fixed-installed cameras of HS-Vision Series have been specifically designed for automatic localization of thermal anomalies. The parameter setup of characteristic thresholds (e.g., maximum temperature) enables the user to configure visual or audible alarms, or both, for permanent monitoring of processes and equipment. Be it for temperature measurements in production processes (slag detection, forming processes) or for checking insulation materials (melting pot, torpedo ladle), the cameras have already proven their worth in applications all over the world.

Source: Heat Processing (6) Issue 2 2008, p. 148, 149



High-end spectrometer for analysis of metals

Spectro Analytical Instruments GmbH & Co. KG, Kleve, Germany, recently introduced a new generation of its stationary Spectrolab analyzers. The new version of this high-end spectrometer features a new hybrid optics system, a new read-out unit and a new plasma generator developed by Spectro in 2006. Spectrolab, which now reaches lower detection limits of down to a few mg/kg, is suitable for all metals analysis tasks. All common basic materials in any combination can be handled by the system. The new hybrid optics processes the direct light from the spark unit simultaneously by up to 108 PMT receivers and 22 CCD lines. The use of two parallel capturing technologies enables so far unattainable lower detection limits. In typical applications, such as the measurement of trace elements in iron alloys, Spectrolab reaches lower detection limits below 1 mg/kg, for example for Al, B, Ca, Cu, and Mg.

More flexibility and a distinctly higher resolution are achieved by expanding the focus to 750 mm through an optimized arrangement of the detectors. The optics system is accommodated in an aluminum shell, which is constantly held under controlled pressure and stable temperature. This ensures maximum reproducibility of the results. To make optimal use of the potential provided by the new hybrid optics, the new generation Spectrolab comes with a new read-out system. It no longer determines the complete quantity of light in the PMT range, but measures the light quantities of each individual spark with integration times in the microsecond range. This provides more reliable results at higher statistical security.

Source: Casting Plant & Technology 4/2007, p.49

New application reports: Reliable biofuels testing

Biofuels are quickly becoming an important ecological alternative to gasoline and diesel. Elemental analysis with X-ray fluorescence (XRF) and optical emission spectrometry with inductively coupled plasma (ICP-OES) is well suited to the monitoring of biofuel components and biofuel blend quality and contents. Spectro has developed new applications for the elemental analysis of biofuels that are now available for the Spectro Phoenix II and Spectro iQII instruments and for the Spectro Genesis and Spectro Arcos ICP-OES instruments.

Drawing on years of practical experience analyzing conventional fuels, Spectro offers a comprehensive information package for analyzing biofuels available online. New application reports document continuous monitoring of the quality of biofuels with the four Spectro Instruments while remaining in compliance with the relevant fuel regulations and specifications. Visitors to the site also will find a new online brochure with information dealing with current fuel legislation.

"Within the framework of climate protection, biofuels are receiving a great deal of attention as well as political backing. In many industrial nations, law facilitating the use of alternative to gasoline and diesel are under consideration or already in place," explains Dirk Wissman, Product Manager for X-ray fluorescence analysis at Spectro. "The European Union is leading the way. Their 2003/30/CE directive compels fuel manufacturers to increase the share of biofuel on the fuel market from today's 2% to 5.7% by 2010." Before manufacturers and suppliers bring large amount of biofuels into the free market, analytical procedures for the continuous monitoring of their contents need to be well defined. Bio gasolines from sugar cane and biodiesels from palm, rapeseed, and coconut are considered to be ecologically harmless. Their bio components contain no harmful materials such as benzene and toluene, and produce little damaging emissions.

Although bio gasolines are currently used as fuel extenders for upwards of 10% of regular fuels, these fuels may contain sulfur—an element for which strict limiting values in fuels are in effect worldwide—that needs to be closely monitored. In addition, vegetable oils contain phosphorus in the form of phospholipids, which its higher concentrations may lead to the formation of abrasive deposits that can cause engine damage. High concentration of alkali and alkaline earth elements including sodium, potassium, magnesium and calcium, also can lead to corrosion damage in filters and fuel injectors. For these reasons, limiting values have been defined for the above named elements in biodiesel, and limiting values have been set for chlorine, copper and lead as well in bioethanol and bioethanol gasoline mixtures.

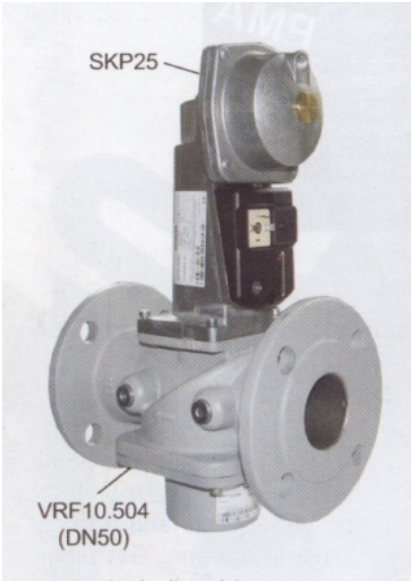
The Spectro iQ and Spectro Phoenix II XRF Instruments are well suited to measurement of sulfur content. The Spectro iQ II also can be used to screen for phosphorus, potassium, calcium, copper, and lead. The Spectro Acros and Spectro Genesis ICP-OES instruments are capable of monitoring relevant limiting values for all of the above.

Source: Lab Asia, January/February 2008, p.10

Modular gas valves for biogas applications

The production and usage of biogas as an alternative fuel has increased vastly over the past few years. For over 20 years, Siemens Building Technologies (SBT) has designed and marketed VRF and VRH gas valves for corrosive gases including biogas, recycling and digester gas. The VR gas valves are very well suited for applications with gases outside the standard families I to III and can also be used for many types of process gases. The biogas/recycling gas valves have a robust cast iron body (GG20) and are available in nominal sizes DN 40 to DN 125. The external measurements and connections are identical to those of the VGF/VGH valves for standard gases, such as natural gas, propane, butane, and air. Robust and resilient materials, including special alloy valve springs and special elastomers, are used inside the VR valves, which resist aggressive gases, such as hydrogen sulfide. Because of the different and varying composition of bio and recycling gases, it is always recommended to determine the gas composition. For this reason, an aptitude test of the VR valves should be made in case of variation between the identified and usual gas composition. SBT supports its customers for this aptitude test and carries out the examination free of charge. The VRF/VRH valves can be combined with the proven and well-known SKP actuators. No matter which gas type is used, the burner manufacturer can always use the actuator and function unit and adapt the valve body to the corresponding gas type. The electro-hydraulic actuators are available with three different types of pressure regulators for constant, differential or proportional pressure regulation, as well as shut-off actuators. Since the pressure regulator is an integral part of the actuator head, there is only little risk of condensation entering the regulator. Each actuator is compatible with all nominal sizes of SBT's valve range and can be fixed in several positions on the valve body.

Source: Heat Processing (6) Issue 2 2008, p.148



Low-Cost Rapid Tooling Through Investment Casting

A. ALMIRANEZ, A. ADANZA, J. MALLARI, F. JAPITANA

Conclusion (from October-December 2007 issue)

The silica sand serves as a backing support to counteract the metallo-static pressure inside the ceramic mold. This minimizes run out during pouring. Silica sand therefore not only minimizes, if not eliminates, run out but also minimizes distortion during solidification.

Testing and Performance Evaluation

Mold for wax injection, soap molds, and stamping molds for permanent mold casting were produced and tested.

AISI 1020 was used as mold material. Mold for wax injection and soap molds show a very satisfactory performance comparable to the metal molds produced by machining process.

AISI 4140 material was used for the stamping mold. Stamping molds produced have been subjected to actual stamping runs and the tool life have been proven comparable to the performance of the "hard tools."

For permanent mold used in permanent mold casting of aluminum, JIS FC-30 was adopted. For permanent molds, cast iron material was adopted. The sprue and runner should be already incorporated during wax pattern making process. Parting line should also be clearly defined in this stage. The performance of the mold was found out to be very satisfactory for the purpose. In molds or die with more than 100 mm in overall width and thickness, it is sometimes necessary to grind or mill the surface for maximum flatness to avoid run out during casting of metal onto the permanent mold.

It has been found out also that the molds or dies produced using this processs is 10 % to 20% of the cost of the die or mold produced using the machining process.

Therefore, toolings with properties comparable to that of the hard toolings can be produced at a relatively short time and a lesser cost by employing investment casting technology. Investment casting process offers a greater flexibility in choosing composition of toolings. Investment casting process can become more economically feasible and toolings can be made at a shorter time employing the "wax-mold less process."

Highly Efficient and Accurate Machining Using Five- and Six-Axis Control

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Continuation from previous issue...

4. DATA GENERATION FOR 6-AXIS CONTROL VIBRATION CUTTING

4.1 Generation of PNF data

The system calculates points contacting with the small radius ball end mill for each intersection curve, as shown in Fig.11(a). In the next stage, the system generates PNF information by arranging the cutting point between the contact point and the dividing point on the character line with equal intervals. In order to reduce the load to the non-rotational cutting tool, C-PNF data is arranged between the residual part of 5-axis machining and the target character line in consideration of the depth of cut, as shown in Fig.11(b).

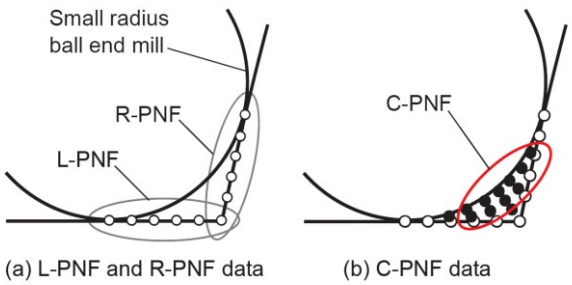


Figure 11. Generation of PNF data for 6-axis machining

4.2 Generation of CL data

Decision on tool attitude considering the vibration cutting

A commercially available vibration cutting unit (SB-150: Taga Electric Co.) was used in the study. Figure 12 shows the non-rotational tool used for the vibration cutting. The tool is attached to the oscillator through the special holder designed to generate the appropriate vibration of the cutting tip. The tool tip vibrates in a constant direction. It is important that the

Figure 12. Non-rotational cutting tool used for 6-axis vibration cutting

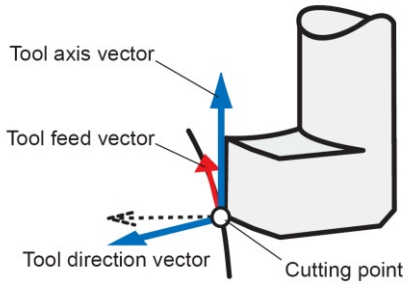
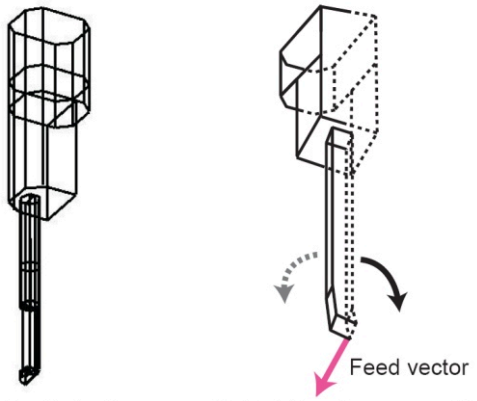


Figure 13. Composition of cutter location for 6-axis machining



(a) Defined wire-frame model

(b) Rotational movement for avoiding interference

Figure 14. Interference check and avoidance of non-rotational tool using wire-frame model

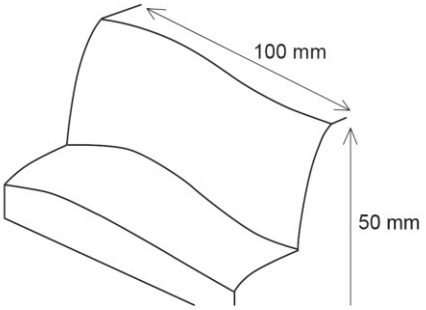


Figure 15. CAD model defined for machining experiment

Table 1(a). Machining condition of 5-axis machining

Tool radius [mm]	1.5
Spindle speed [rpm]	5,000
Feed rate [mm/min]	800
Target cusp height [mm]	0.1
Depth of cut [mm]	0.2

Table 1(b). Machining condition of 6-axis machining

Frequency [kHz]	19
Amplitude [mm]	36
Feed rate [mm/min]	400
Pick feed [mm]	0.1
Depth of cut [mm]	0.2

vibrational direction should be matched with the tool feed direction to carry out an appropriate vibration cutting [11].

CL data for 6-axis control machining is determined by the cutting point P, the tool axis vector T, and the tool direction vector D, as shown in Fig.13. In case of the non-rotational tool in Fig.12, the tool axis T agrees with the normal vector N. The vector D is obtained by rotating the outer product vector D0 of the vectors, T and F, around T by 10 degrees.

Check and interference avoidance

As shown in Fig.14(a), the shape of non-rotational tool is expressed by the 3-dimensional wire-frame model for the cutter interference check. The interference is detected by judging the intersection between line segments expressing the tool shape and surfaces to be machined. If all line segments do not intersect with the machined surface, it is considered that there is no interference at the cutting point. When the intersection point is the same as the vertex of line segment even if the intersection is detected, the state is regarded as the contact for the machining. When the tool interference is detected, the interference avoidance must be done.

As mentioned above, since the direction of vibration and cutting should always match, the movement for interference avoidance is limited to only a rotation around the tool feed vector F, as shown in Fig.14(b). As the first step, it should be determined which interferes with the machined surface, the right or left element of tool shape. Right- and left-handed rotations are selected for the interference with left- and right-hand element, respectively. The tool attitude is changed by rotating the vectors, T and D, to the decided rotational direction. Rotation angle θ

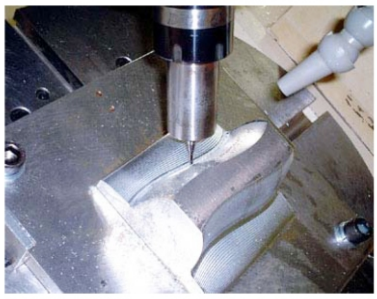


Figure 16. Actual 5-axis control machining

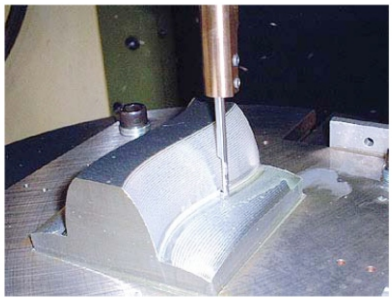


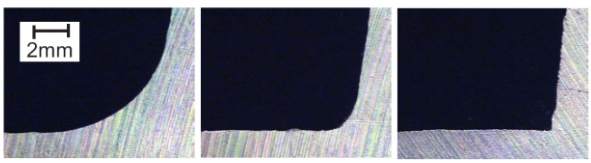
Figure 17. Actual 6-axis control machining

in one avoidance operation can be arbitrarily set. When the interference check is done to the corrected tool attitude and interference is detected again, the tool attitude is rotated more θ degree. Finally, vectors T and D are obtained by repeating the above-mentioned interference check and avoidance until the interference is not detected.

5. MACHINING EXPERIMENT

In order to verify the validity of the machining method proposed in the study, CAM system was developed to generate CL data on the basis of 3-dimensional CAD data of machining object shapes, and machining experiments were carried out. The 3-dimensional solid modeler DESIGNBASE (RICOH, Inc.)[12] was used for the definition of shape and the development of CAM program. The character line consisting of two curved surfaces was defined as the machining object, as illustrated in Fig. 15. Table 1 shows each cutting condition. Since the maximum rotational speed of Cs-axis is low, the feed rate of 6-axis control machining is half of 5-axis control machining. In general, the maximum feed rate decreases when the number of control axis increases.

At the beginning, two curved surfaces were finished with R5 ball end mill after rough cutting. Then, the cutting remaining around the character line was intensively removed through simultaneous 5-axis control machining with R1.5 ball end mill. Finally, the character line was finished by the simultaneous 6-axis control vibration cutting. Figures 16 and 17 show the state



(a) After rough cutting with R5 ball end mill

(b) After 5-axis cutting with R1.5 ball end mill

(c) After 6-axis cutting with non-rotational tool

Figure 18. Machined results after each process

Table 2(a). Machining time of 5-axis and 6-axis machining

Machining	5-axis	6-axis
Number of path	45	24
Average time for one path [sec]	14.9	54.8
Machining time [sec]	671	1315
Total machining time [sec]	1986	

Table 2(b). Machining time of 6-axis machining

Machining	6-axis
Number of path	164
Average time for one path [sec]	54.8
Machining time [sec]	8987

of 5- and 6-axis control machining, respectively. The machining condition of 5- and 6-axis control was excellent, and the clear character line was obtained.

Figure 18 shows the cross-sections of the character line after each machining. It can be confirmed that the areas near the character line are surely removed by each machining. Table 2 is an examination of the machining efficiency. It took 8,987 sec. to complete the shape from the state of Fig.18(a) to that of Fig.18(c) by using only 6-axis control machining. On the other hand, in case of applying 5-axis control machining and 6-axis together, 5- and 6-axis machining took 671 sec. and 1,315 sec., respectively. The total machining time for getting the final shape is 1,986 sec. It is understood that the proposed machining method is far more efficient.

CONCLUSION

Aiming at obtaining a clear character line, the study proposes an efficient machining method, using 6-axis control machining together with 5-axis control one. Thus, the method of generating appropriate CL data for the character line machining was described, based on the geometry information on 3-dimensional CAD. Each CL data is generated by using the cutting point data described in the same format. The CAM system developed in the study can automatically generate the interference-free CL data for 5-axis control machining by applying the tool attitude determination method which employs 2-dimensional C-Space. The system also generates CL data for 6-axis control machining, taking account of the characteristics of the vibration cutting and the tool interference. Then, the CL data calculated by using the system was converted into the actual NC data, and the machining experiment was carried out. It was found that the proposed method enables us to shorten the machining time greatly by using 5- and 6-axis control machining methods together. In addition, the machined character line was clear, and it confirmed that the proposed machining method was effective also in the light of the machining accuracy.

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