



CAD/CAM

NEWSLETTER



January 1987

Information Compiled by the Canadian CAD/CAM Council

for the Advancement of Computer Integrated Manufacturing *

Summary of this Issue

- 1 - Finding One's Way
- 2 - Developments in CIM in 1986 - Recommended References
- 3 - Reference Issue
- 4 - Video Tapes as a Media for Technology Diffusion
- 5 - CAD/CAM Articles of Recent Interest
- 6 - Conference dates for 1987
- 7 - CAD/CAM Quotes
- 8 - Abstracts Section Attached Provides Selected Update

1. Finding One's Way

To those who by chance are of knowledgeable background, CIM is like a labyrinth. Possible directions, alternatives and pathways for adoption and development abound. Furthermore, new developments are continually changing the scene. New applications are suddenly made possible by new capabilities. Pathways previously unconnected suddenly become so by new interfaces as the process of integration continues its relentless, yet massive, attack.

To the newcomer, CIM may appear either more confusing or less confusing. It may seem more confusing because of the "vertical learning curve"; the large number of concepts, technologies, vocabularies and organizations with which one needs to be familiar. It can, of course, appear much simpler to those whose vision is confined to only a small part of the total picture.

"Plan from the top-down; implement from the bottom up", is frequently quoted, and valid advice, especially where genuine computer integrated manufacturing is involved. But this requires, as a pre-requisite, a substantial amount of valid, overall, conceptual knowledge.

A large amount of advertising and related activity now exists for the purpose of attracting new entrants to the world of CIM. The CAD/CAM

Newsletter could not attempt to perform that function nearly as well and it is best left to those who can. The Newsletter does, however, have a role to play in assisting those who, having entered the world of CIM, then wish to find their way. This we can do by continually reporting on new developments and trends, new sources of expertise and information and new developments in other countries. Hopefully, all in an unbiased manner and all with the broadest possible interpretation and definition of what CIM really means. This includes its technological, managerial and sociological aspects. Seldom has a technology emerged which seems certain to change so much.

2. Developments in CIM in 1986 - Recommended References

One purpose of the abstracts section included in the CAD/CAM Newsletter each month is to alert Canadian readers to new developments in CIM and to source material that can be a valuable time saver for both managerial and technical personnel.

If one were choosing the "TOP 40" from the references presented in the Newsletter in 1986, those provided on the special supplement enclosed would be included. Also if previous reprint "primers" on CIM technology were to be updated, such as the "Reprint #3" still available from the Department of Regional Industrial Expansion, these 1986 entries selected would be candidate articles, based on their theme and content.

For the busy manager or manufacturing systems engineer, the references enclosed should be helpful in understanding and applying CIM. In most cases those listed have been chosen from an examination of the full paper, although in a few cases only the abstract, as given in the CAD/CAM Newsletter, was available. For convenience, they are grouped into four general subject categories:

a) Management and Strategic Planning for CIM

Those dealing with the management of CIM and the strategic planning necessary for it.

b) Trends and Developments

Those dealing with significant trends or novel developments, especially those illustrating the highly innovative nature of some applications. For example, these include a sheet metal FMS, an FMS for wire harness manufacture, the use of robots in furniture making and CIM applied to clothing manufacture. One describes a manufacturing plant for cosmetics in which the use of automated guided vehicles, able to leave the guide path and self-navigate for distances up to fifteen feet, saved equipment costs and installation expense. Another describes the use of a colour ink jet print head to place designs on ceramics prior to firing. Still another illustrates the use of a robot controlled grinding wheel to cut the patterns on crystal glassware. Truly, CIM includes more, and presents more opportunities, than we often realize.

c) CIM Benefits and Economic Justification

Those dealing substantially and helpfully, with the identification of the benefits and economic justification for CIM. The Canadian CAD/CAM Council is defining and recommending a number of projects for implementation by government, one of which is in this subject area.

d) CIM Technology Descriptions

Those that are particularly helpful in understanding the CIM technologies and the many difficult choices to be made before any particular company's application becomes a reality.

3. Reference Issue

When things are changing it is important to have outside sources of information.

As readers of the CAD/CAM Newsletter are aware, the January and February issues have, for the past several years, been reference issues listing the technology centres, technical societies and publications that are all part of the CAD/CAM information structure.

It would appear as a valid observation on 1986, that while CAD/CAM activity continues to grow exponentially in volume, the number of organizations involved is stabilizing. For this reason, and because copies of the January and February 1986 Newsletters can still be requested from the Secretariat of the Canadian CAD/CAM Council as noted at the end of this issue, it has been decided to forego the annual reference issue in 1987.

For the convenience of readers, particularly those who may be new to the newsletter, the following "short-list" of journals, books and directories is offered. Details on these and others are available in previous newsletter issues during 1986, particularly January and February.

Suggested Journals*

- | | |
|------------------------------|--|
| - Assembly Engineering | - Canadian Machinery & Metalworking |
| - American Machinist | - Manufacturing Engineering |
| - CAD/CAM & Robotics | - Managing Automation (see October Newsletter) |
| - Commline | - Manufacturing Productivity Frontiers |
| - Control Engineering | - Modern Machine Shop |
| - The FMS Magazine | - Modern Materials Handling |
| - Gateway - The MAP Reporter | - Production Engineering |
| - Iron Age | - Robotics Today |
| | - Robotics World |

* A special list of journals for CAD/CAM in electronics, printed circuit boards and semiconductors provided by the Ontario Microelectronics Centre was included in the CAD/CAM Newsletter dated February 1986.

Suggested Books*

- "CAD/CAM: Computer Aided Design and Manufacturing"
M.P. Groover, E.W. Zimmers, Prentice-Hall Inc.
- "Handbook of Industrial Robotics"
S.Y. Nof. (ed), John Wiley and Sons, Inc.
- "The World Yearbook of Robotics Research and Development"
P. Scott (ed), Kogan Page
- "1986 NC/CAM Guidebook"
Modern Machine Shop

* See also the seven publications on the strategic and economic importance of CIM listed in the November - December 1986 issue.

Suggested Directories and Product Guides

- "Robotics, CAD/CAM Market Place"
R.R. Bowker Company
- "Reference Guide to CAD/CAM and Robotics Centres in Canada and the U.S.A."
NRC Publication 24511, \$10 prepaid. Available in English or French.
- "Computer Aided Design (CAD) Directory" Second Edition \$59.95
P.C. Flora (ed) Technical Database Corp.*
- "Computer Aided Manufacturing (CAM) Directory" Second Edition \$59.95
P.C. Flora (ed) Technical Database Corp.*
- "International Robotics Industry Directory" Fourth Edition \$66.95
P.C. Flora (ed) Technical Database Corp.*
- "1987 Robotics World Directory"
By the publishers of Robotics World (Communication Channels, Inc.)

* Available in Canada through J. Wiley & Sons Canada Limited.

Conferences

See section 7 of this issue.

4. Video Tapes as a Media for Technology Diffusion

The CAD/CAM Newsletter for May 1986 listed forty-two different media commonly used for technology diffusion. These ranged all the way from technical journals, seminars and conferences to casual conversation with friends and associates.

Clearly the use of video tape will be used increasingly as one of the cost effective media for reaching the large and diverse audience involved in CIM. As the CAD/CAM Council has pointed out in some of its reports, if

ten percent of the two million persons employed in the Canadian manufacturing industry are to acquire a working knowledge of this technology and its concepts, the number of persons involved is approximately two hundred thousand.

Two video tapes have recently been seen by the newsletter editor that illustrate successful use of this media. Both are from Canadian sources and both illustrate that effective results are possible without elaborate or expensive production facilities.

- "Manufacturing Technology and the Work Place" - (18:32 min.) A key figure in the presentation is Alan Scharf who coordinates the presentation on how CAD/CAM and CIM are being used at the Saskatchewan Research Council and by Saskatchewan companies to increase productivity and their competitive position. The presentation emphasizes that this must be done by Canadian companies on an even greater scale in the future.
- "Cutting Chips - The Changing Times" - (17:44 min.) This production is the result of work by Mr. R. Boudreau and S. Brittain at the New Brunswick Community College in Bathurst and St. John. The key figure in this presentation is S. Brittain who, assisted by others, shows how CAD and CAM can be linked to form an integrated system. This is illustrated in a working example with information flowing from product conception and design to machine understandable language, graphic tool path display for verification and finally to actual manufacture of the part in a flexible manufacturing cell.

The persons responsible for these examples are to be congratulated for their effort and the results achieved. As the report of the National Technology Policy Roundtable produced by the Canadian Advanced Technology Association observes; "If even ten percent of unemployment is attributable to lags in technology diffusion, or if a ten percent improvement could be made, the saving in unemployment insurance alone would be \$1 billion per year, to say nothing of the social improvement".

In 1986 TV Ontario commenced filming and production of a series on CAD/CAM and robotics at various sites in Canada. It is understood that this will be released in March 1987 as four half-hour programs, with background reports etc. available, under the title "Coming to a Factory Near You".

Newsletter readers are reminded that other video tape presentations are available, such as the "Manufacturing Insights" series, produced quarterly by the Society of Manufacturing Engineers, the PBS one hour production "The Robot Revolution", the Canadian Manufacturers' Association, "Canadian Manufacturing at the Cross Roads" and the OCAM production "Up to Speed". Information on the SME series may be found in the February 1986 CAD/CAM Newsletter and in the June 1986 issue for the PBS, CMA and OCAM material.

In addition, the Institute of Electrical and Electronics Engineers (IEEE) will broadcast a day-long video conference by satellite May 13, 1987 on the subject of computer integrated manufacturing. As with others in their "video conference seminars by satellite" series, this will be received at a large number of authorized receiving stations throughout North America on that day and is likely to be available later in video tape form by arrangement through IEEE sections in Canadian cities or the IEEE Region 7 headquarters in Toronto.

5. CAD/CAM Articles of Recent Interest

- "Postindustrial Manufacturing", R. Jaikumar
Harvard Business Review, Nov.-Dec. 1986, pp. 69-76.

This brief paper by a faculty member of the Harvard Business School presents the startling and disturbing findings from three years of investigation of 95 flexible manufacturing systems in the United States and Japan, representing more than half of those installed at that time.

According to the author's findings, while the system size, industry make-up and company size were similar in both countries, large differences exist in the way the flexible manufacturing systems have been designed and used in the two countries. In Japan there has been great emphasis on general system flexibility, reliability and the ability to run unattended. Much of this has been achieved in Japan by small teams of highly skilled engineers who stay with the system after development and who are responsible for its operation. In the U.S.A., companies are said to have used FMSs the wrong way - i.e. for high volume production of fixed parts rather than for parts flexibility. In the U.S.A. the design team tends to move on when operation commences thus inhibiting enhancements and flexibility.

These observations would seem to have special implications for Canadian industry where the need to handle short production runs is a common requirement. As noted in a 1984 presentation at the Ontario CAD/CAM Centre, the word "flexible" is a key word in the term flexible manufacturing systems. For example, depending on its design, an FMS can be flexible (or rigid) with respect to:

- The production schedule and order sequence
- The type and variety of parts that can be produced
- Variety of tools provided and handled
- The routing of parts within the system (e.g. on equipment breakdown)
- Future design changes in the parts produced
- The economics of changes in overall volume. That is the "break-even" point as business cycles ebb and flow

In the Japanese plants studied, all 22 systems met their companies' ROI criterion of a three year payback. In addition the composition of the work force changed so that engineers outnumbered production workers three to one.

The new role of management became the creation and nurturing of knowledge based project teams to produce a competitive advantage. The paper states that if U.S. companies mastered flexible automation as the Japanese have, they would have more than a fourfold increase in labour productivity.

6. Major Conferences for 1987

While the CAD/CAM Newsletter is provided in camera ready form by month end (or within a few days of month end) to the secretariat of the CAD/CAM Council, delays in translation, printing and distribution of three months have been frequently encountered in 1986. This has made it impractical throughout the year to list many conferences of potential interest since the lead time for available information is frequently less than that.

Nevertheless, many of the larger and major technical society meetings and conferences are planned and held on an annual basis. The following lists some of the largest and best known in order that readers may make attendance plans. In cases where the 1987 dates are not known to the editor, a previous date is given. It can be assumed in most such cases that the conference is held at approximately the same time each year and the organizers may be contacted for current information.

In addition, many of the CAD/CAM and robotics development and information centres located across Canada hold regular seminars and courses, some almost every week of the year.

- "Annual IEEE Design Automation Workshop"

January 20-23, 1987, Gold Canyon Ranch, Arizona.

Contact: J. Armstrong
EE Dept., Virginia Tech.
Blacksburg, VA 24061, U.S.A.
Telephone: (703) 961-7078

- "Computer Aided Process Planning"

March 4-5, 1987, Hyatt Regency Tech Center, Denver, Colorado

Contact: Maria Kisell
Society of Manufacturing Engineers
Dearborn, MI 48121, U.S.A.
Telephone: (313) 271-0039

- "NCGA Computer Graphics 87"

March 22-26, 1987, Philadelphia Civic Centre, Philadelphia, Pennsylvania

Contact: NCGA
2722 Merrilee Dr., Suite 200
Fairfax, VA 22031, U.S.A.
Telephone: (800) 225-NCGA

- "1987 International Conference on Robotics & Automation"

March 30 - April 2, 1987, Radisson Hotel, Raleigh, North Carolina.

Contact: A. Sanderson
Program Chairman
Robotics Institute
Carnegie-Mellon Univ.
Pittsburgh, PA 15213, U.S.A.
Telephone: (412) 268-2590

- "AIM-TECH 87 - Back to Basics"

March 29 - April 1, 1987, Sheraton Tara Hotel, Framingham, Massachusetts.

Contact: AIM-TECH
P.O. Box 1234
Beloit, WI 53511, U.S.A.
Telephone: (608) 364-7949

Note: The Association for Integrated Manufacturing Technology (AIM-TECH) is the new organization and name for the former Numerical Control Society.

- "Graphics Interface 87" (CHI + GI 1987)

April 5-9, 1987, Hilton Harbor Castle, Toronto, Ontario.

Contact: ACM Conference Management
11 West 42nd Street
NEW YORK, NY 10036, U.S.A.
Telephone: (212) 869-7440

Note: For 1987, sponsorship of the Canadian Graphics Interface Conference will be combined with the Association for Computing Machinery's Special Interest Group on Computer and Human Interaction (ACM/SIGCHI). The combined conference is known as CHI + GI 1987.

- "Robots 11 and 17th International Symposium on Industrial Robots"

April 26-30, 1987, Chicago Hilton and Towers, Chicago, Illinois.

Contact: Paul Harrington
SME Public Relations
P.O. Box 930
Dearborn, MI 48121, U.S.A.
Telephone: (313) 271-0777

- "MAP/TOP Users Group Meeting"

May 12-13, 1987, Pittsburgh, Pennsylvania.

Contact: Society of Manufacturing Engineers
One SME Drive
P.O. Box 930
Dearborn, MI 48121, U.S.A.
Telephone: (313) 271-1500

- "World Federation of MAP Users"
May 14-15, 1987, Victoria, British Columbia.

Contact: SME (as above) or
Canadian MAP Interest Group
c/o Canadian Standards Association
178 Rexdale Boulevard
Rexdale, Ontario
M9W 1R3
Telephone: (416) 747-4017

- "Vision '87: International Conference & Exposition on Applied Machine Vision"
June 8-11, 1987, Cobo Hall, Detroit.

Contact: Society of Manufacturing Engineers (as above)

- "6th Canadian CAD/CAM, Robotics & Automation Conference & Exposition"
June 16-17, 1987, Skyline Hotel, Toronto, Ontario.

Contact: Sue Harvey
Ontario Robotics Centre
743 Monaghan Road
Peterborough, Ontario
K9J 5K2
Telephone: (705) 876-1611

- "24th ACM/IEEE Design Automation Conference"
June 28 - July 1, 1987, Miami Beach, Florida.

Contact: D.E. Thomas, Program Chairman
24th DAC, MP Associates
7366 Old Mill Trail, Suite 101
Boulder, CO 80301, U.S.A.
Telephone: (303) 530-4333

- "ACM SIGGRAPH 87"
July 27-31, Anaheim, California.

Contact: SIGGRAPH 87 Conference Management
111 E. Wacker Drive, Suite 600
Chicago, IL 60601, U.S.A.
Telephone: (312) 644-6610

- "Third International Conference on Advances in Production Management Systems"
August 11-14, 1987, Winnipeg, Manitoba.

Contact: Dr. Andrew Kusiak,
Conference Chairman
Dept. of Mechanical & Industrial Engineering
University of Manitoba
Winnipeg, Manitoba
R3T 2N2
Telephone: (204) 474-9839

- ** - "Third Annual International Forum on Micro-Based CADD"
September 17-19, 1986, Colorado State University, Fort Collins, Colorado.

Contact: Office of Research,
Development and Training
Dept. of Industrial Sciences
Colorado State University
Fort Collins, CO 80523, U.S.A.
Telephone: (303) 491-5278

Note: As of January 30, the 1987 date for this highly regarded micro-based CADD conference had not yet been established, but this information is expected to be available soon.

- "CAD/CAM 87"
September 22-24, Montreal, Quebec.

Contact: CAD/CAM Association CAO/FAO
c/o D'Avirro & Ass.
1440, Ste Catherine ouest, Suite 701
MONTREAL (Québec)
H3G 1R8
Téléphone: (514) 879-9037

- "Design Automation Conference (ASME)"
September 27-30, Boston, U.S.A.

Contact: ASME or Program Chairman
S.S. Rao, School of Mechanical Engineering
Purdue University
West Lafayette, IN 47907, U.S.A.
Telephone: (317) 494-5699

- "Simulation 87"
October 12-13, 1987, Long Beach, California.

Contact: Simulation 87 Planning Committee
Attn: Darcy Clift-Coon
Technical Activities Dept.
Society of Manufacturing Engineers
One SME Drive, P.O. Box 930
Dearborn, MI 48121, U.S.A.
Telephone: (313) 271-1500

- "CAM-I's 16th Annual Meeting & Technical Conference"
October 26-29, Innsbrook, Florida.

Contact: Computer Aided Manufacturing - International, Inc.
611 Ryan Plaza Drive, Suite 1107
Arlington, TX 76011, U.S.A.
Telephone: (817) 860-1654

- "Autofact 87"

November 9-12, 1987, Cobo Hall, Detroit, Michigan.

Contact: Susan Gretchko
Society of Manufacturing Engineers (as above)
Telephone: (313) 271-1500 ext. 366

- "IEEE International Conference CAD - ICCAD-87"

November 9-12, 1987, Santa Clara, California.

Contact: ICCAD-87 Secretary
Mentor Graphics Corp.
1940 Zanker Rd.
San Jose, CA 95112, U.S.A.
Telephone: (408) 436-1500

7. CAD/CAM Quotes

- "Computer Integrated Manufacturing is hard to implement, and even harder to define. One thing is sure, though: you can't buy it."

Daniel S. Appleton, Datamation, December '84 and quoted by
B. Edberg and N. Nilsson in "Computerized Clothing Manufacturing.
A Means to Survival." World Textiles Conference, Manchester, May
1985.

- "Further we can conclude, that the ways are there, the means and the money are there - the only resource we are short of is time! Therefore, it seems appropriate to end by the following quotation from Lewis Carrol's book "Through the Looking Glass": 'The Red Queen said to Alice: "It takes all the running you can do, just to stay in the same place. If you want to move ahead - you must at least run twice as fast as that."'"

B. Edberg and N. Nilsson (as above).

- "When the 1981 recession hit the truck market, Hayes-Dana decided to produce axle housings at just one plant. Barrie stayed in operation because it produced axles at half the cost of manufacture at Thorold".

"Robotic-welding - A Competitive Edge for Hayes-Danna." Welding Design and Fabrication, p. 46-50, July 1985.

- "The first thing we look at on a proposed investment is the list of assumptions-----. At times you can ignore the ROA calculations; the assumptions make the decision for you."

J.T. O'Rourke, Allen-Bradley Co. in "Justification: Barriers to Competitive Manufacturing", Production (U.S.A.) p. 46-51, September 1985.

- "When we look back at the good things we've achieved (with CIM), its no exaggeration to say that the most important improvements were totally unpredicted. We simply didn't know enough to see what could be achieved."

E.I. Gaylord, Ingersoll Milling Machine Co. in "Justification: Barriers to Competitive Manufacturing" (as above).

- "The concept of factory automation is no longer something that U.S. manufacturers can write into yet another five year plan. Factory automation has reached the do or die stage. Competition from companies abroad that are already automated has become so intense that U.S. companies must initiate their first steps toward automation or admit they cannot stay in business."

S.F. Shapiro "Factory Automation Offers U.S. Industry New Lease on Life", Computer Design, August 1, 1985.

- "Process control systems can be very profitable. -----The traditional economic justification of such systems may be inadequate for this technology. Product quality is an intangible and how can you evaluate lost business or poor quality."

B. Berggren, President of Sweden's largest forest products company in a keynote address opening the Control Systems '86 Symposium. Pulp & Paper Journal, July/August 1986.

8. Twenty Selected Abstracts Provide a World View on CAD

For a review of CAD/CAM developments around the world, please refer to the selection of twenty abstracts in the section attached. These will assist your organization to meet both the management and technical challenges of computer integrated manufacturing.

By obtaining and using some of the references cited it is possible for industrial companies to save valuable management and engineering time in project planning and responding to the challenges of computer integrated manufacturing.

- 9. This newsletter may be reproduced in whole or in part. Reprinting in other Canadian publications is encouraged. Acknowledgement to the Canadian CAD/CAM Council would be appreciated.

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