

# The ELIMS Project

*CIM for gears sounds good, but how practical is it really? Arrow Gear Company's answer is "very practical indeed."*

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**A**rrow Gear Company of Downers Grove, IL, has implemented a computer system that fully integrates exchange between all of its computer applications. The ELIMS (Electronic Linkage of Information Management Systems) project has increased manufacturing productivity and reduced lead times.

The primary objective of the ELIMS project was to integrate all of Arrow Gear's business information and manufacturing computer systems, thereby creating a network of information between the mainframe computer, all PCs and CNC machine tools.

## Hardware and Software

The hardware and software necessary for the system originates with Arrow's new computer platform, an MAI GPX 5150 computer system. This computer utilizes a Unix-based operating system, which allows for the networking between the main system, the PCs and the CNC machine tools. The computer is similar to most PCs, only much more powerful, as it can support more

than 100 users simultaneously. Since all shop personnel routinely use computer terminals for shop-floor reporting, the capacity for this extensive volume was essential.

Equipped with 64 megabytes of RAM and 4.0 gigabytes of disk storage, it runs off an EISA bus, available in many PCs on the market today. This new computer, which is approximately 6" wide by 2' tall, replaces Arrow's 3 1/2-year-old computer, which was 7' wide by 4 1/2' high, a prime example of how quickly computer technology has advanced.

## Application Integration

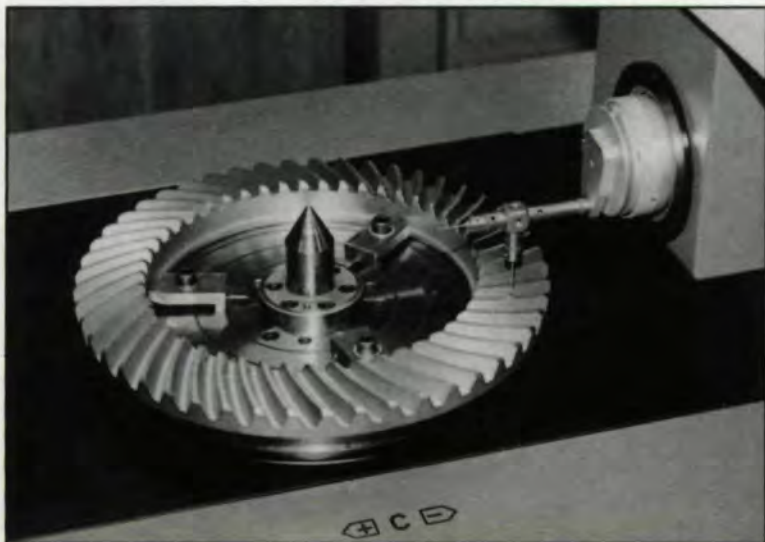
What makes the ELIMS project so unique is its extensive integration. As PCs have become more useful business tools, Arrow has been adding them to its information systems. Prior to ELIMS, access via PC to Arrow's main system could be achieved with a terminal emulation program, but files from different applications could not be shared. By utilizing the Unix-based system, users are now able to access information from the host system, the PCs and the CAD and CAM systems. This operating system is the key to the ELIMS project.

The technology that allows for this degree of integration has been around for quite some time, but because of the extensive work involved in system conversion, no one has taken full advantage of it. However, lower hardware costs have made it more viable.

## Custom Programs

The most significant challenge in implementing ELIMS was the need to write custom programs for all of Arrow's applications. Because writing new programs for an entire operation is such an enormous task, most companies Arrow's size have not developed a system of this type.

*A spiral bevel gear inspected on Arrow's Zeiss/Höfler inspection machine running in conjunction with Gleason G-AGE software.*





The process of writing new programs involved detailed analysis of current systems and improvement of those systems and their methods. The defining of future needs was also an important factor in this process.

#### **Implementation of the Project**

With the ELIMS project expected to be completed by the end of 1995, Arrow has implemented it in a number of phases.

The first phase was the development of an order entry system. This system ties in purchasing, accounting and shipping. This also affects engineering backlog integration, which is then used for shop floor scheduling.

An important specification of the project was ease of use. All menus utilize X-Windows (a network windowing system), which is very user-friendly. Subsequently, very little training is required.

Numerous other modifications to Arrow operations have taken place throughout the implementation of ELIMS. The engineering department has been completely revamped and is now equipped with nine CAD/CAM workstations. Each terminal is linked to a DEC/Applicon computer system. With this system's on-screen information retrieval capability, similar parts and required tooling can be found and modified if necessary. This information availability can save up to 35% on manufacturing engineering time.

A significant benefit to ELIMS is the capability for Electronic Data Interchange (EDI). EDI is used for the transfer of purchase order information and technical data between Arrow and its customers. This method has already been implemented with several Arrow customers. If the customer is utilizing a CAD system, his files can be sent to Arrow's engineers for review and then on to sales for the entry of the customer's order. Next, design engineering receives the files for any necessary design work. Once this is completed, files are downloaded to manufacturing engineering for further analysis required for the manufacturing process. If the design is that of a bevel gear, Tooth Contact Analysis (TCA) is performed with Gleason CAGE software. TCA allows for simulation of the tooth contact pattern under load. Once this analysis is complete, gear summary settings are developed.

In the case of a spur gear, UTS 500 soft-

ware is used to select or design a cutter and provide any missing gear data.

This development information then is used to update the CAD system, which draws the gear profile. Next, an engineer completes the gear drawing and the process information. The geometry of the CAD drawing file is then downloaded to Arrow's manufacturing CAM system, where it produces the information needed to run the machine tools. From there it is downloaded to the machine tools. When the operator is ready to run the job, he calls up the job number on his terminal and the program is loaded into the machine.

The time saved by this electronic method of downloading setup information is very dramatic. An example of the benefits of this capability can be seen in the Gleason Phoenix equipment used for producing cut and ground tooth spiral bevel gears. On conventional machine tools, setup and development is a very involved process taking up to several days. With the Phoenix machines, it is not uncommon to set up and develop a job in as little as three hours. The ability for fast setup and development time also allows for the economical processing of just-in-time lot quantities.

Information about the process, such as SPC figures, operator time and tooling, is captured electronically. Accounting information, cost information and productivity percentages provide analytical data, which may be required by the quality assurance and engineering departments.

The benefits of this comprehensive information system are numerous. Primarily, information is always readily available to anyone with terminal access.

In addition, job scheduling is made easier and more comprehensive with the reduction of paperwork and its associated errors.

Company officials believe Arrow is the first gear company in the country to use a system like this. Because of the substantial savings in processes and lead time reduction, ELIMS will give Arrow a competitive edge in the gear manufacturing industry. ☉

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