INFRASTRUCTURE FOR INDUSTRIAL MODERNIZATION



Technical Assistance Program

Purdue University

Annual Report Year Ending June 30, 1996

Director's Message



INFRASTRUCTURE: AN UNDERLYING BASE OR FOUNDATION, ESPECIALLY FOR AN ORGANIZATION OR A SYSTEM.

Purdue University has been an integral part of Indiana's economic well-being since its founding as a land-grant institution in 1869. Today, there are thousands of alumni making positive contributions in every sector of business, industry, and government. University research in areas such as pharmaceutical products, medical devices, communication technology, transportation, advanced manufacturing, and agriculture benefits the everyday lives of our citizens.

In recent years, the era of intense international competition has driven the need for new forms of support to Indiana's large and very important manufacturing sector. The Technical Assistance Program (TAP) was established in 1986 to provide technical infrastructure for industrial modernization in Indiana. Since that time, TAP has assisted thousands of Indiana companies with assessments of new technologies, environmental compliance, factory modernization, manufacturing management, product development support, and technical information. This joint effort between talented university faculty, graduate engineers, and staff, and the hard working people in manufacturing, has generated a substantial impact on the state's economy.

The work of industrial modernization is never complete. There is every indication that competition will become even more intense and that new challenges will arise. However, the many examples in this report demonstrate that Indiana companies can continue to compete internationally, grow, and prosper. The faculty, graduate engineers, and staff of the Technical Assistance Program look forward to working with Indiana manufacturers to meet the new challenges and help secure the economic vitality of the state.

Robert A. Greenkorn July 1996 The Technical Assistance Program provides a broad range of services to Indiana companies through a team of over forty faculty, graduate engineers, and staff located at four Purdue campuses.







Assessment of new technologies...

In our era of rapid technological change, companies find TAP a valuable resource for the assessment of new technological developments such as advanced 3-D modeling, graphical manufacturing simulation, finite element analysis, design of experiments, high speed machining, nondestructive testing, and rapid prototyping. MOHAMMAD ZAHRAEE (LEFT), PROFESSOR OF MECHANICAL ENGINEERING TECHNOLOGY AT THE PURDUE CALUMET CAMPUS, DEMONSTRATES THE ADVANTAGES OF THE USE OF SOLID MODEL-ING TO A NEW LOCAL COMPANY.

Environmental compliance...

TAP guides companies through the complex permitting process, and identifies the best alternatives for the treatment of industrial wastes.

BOB JACKO (RIGHT), PROFESSOR OF ENVIRONMENTAL ENGINEER-ING, HELPS A SOUTHERN INDIANA COMPANY UPGRADE THEIR ENVIRONMENTAL CONTROL SYSTEMS TO MEET THE CLEAN AIR ACT REGULATIONS.

Factory modernization...

Companies utilize TAP for improvement of plant layout, assembly lines, manufacturing work cells, quality systems, and individual production processes.

COLIN MOODIE (RIGHT), PROFESSOR OF INDUSTRIAL ENGINEER-ING, ASSISTS A GOSHEN COMPANY WITH THE REDESIGN OF A FURNITURE ASSEMBLY LINE.

Manufacturing management...

Accurate product costing systems, focused industrial marketing, and careful strategic planning are very important in today's global business climate. KEITH SMITH (LEFT), PROFESSOR OF MANAGEMENT, PROVIDES STRATEGIC PLANNING GUIDANCE TO A RAPIDLY GROWING PETERSBURG METAL FABRICATOR.

Product development support...

TAP supports product development efforts by providing advice on design methods, material selection, product testing, industry standards, and manufacturing processes. LYNN SCHLAGER, PROFESSOR OF MECHANICAL ENGINEERING AT INDIANA UNIVERSITY-PURDUE UNIVERSITY FORT WAYNE, DEVEL-OPS PERFORMANCE SPECIFICATIONS FOR A HYDRONIC HEATING UNIT FOR A LOCAL COMPANY.

Technical information ...

The Technical Information Service (TIS) provides patents, standards, technical reports, market data, and the latest information on virtually any topic to a wide range of businesses and organizations.

TIS SHIPS OVER 15,000 DOCUMENTS PER YEAR. MANY COMPA-NIES TAKE ADVANTAGE OF OVERNIGHT SERVICE.

Expertise for extended projects...

Through summer interns and graduate student externs, Indiana companies receive the benefit of highly qualified and motivated students for in-depth manufacturing, product development, and industrial management projects.

Links to economic development resources...

TAP and TIS work closely with companies to link their needs to other Purdue programs offering in-house training, distance education, export assistance, research, pollution prevention assistance, and support for business attraction and retention. Referrals are also routinely made to state and federal programs, testing laboratories, and consulting engineers.







Economic Impact Data

The results detailed in this report include millions of dollars in cost reductions, job creation and retention, and significant capital investment in communities throughout the state. These achievements demonstrate the strong commitment of Indiana companies and the Technical Assistance Program to work together to improve the state's economic competitiveness.

ECONOMIC IMPACT SUMMARY

Based on Client Evaluations of TAP Work With Industry May 1986 through June 1996

	Year 1*	Year 2*	Total
Capital Investment	\$20,982,400	\$5,585,600	\$26,568,000
Dollars Saved	\$7,932,030	\$6,279,340	\$14,211,370
Increased Sales	\$39,762,300	\$99,889,500	\$139,651,800
Jobs Added	296	601	897
Jobs Saved	627	571	1,198

* Following date of TAP assistance

The project results shown here are based on information provided by the users of the program's services. Over ninety percent of the evaluations state that help from the Technical Assistance Program was beneficial and that the recommendations are being used.

PROJECTS BY ECONOMIC REGION May 1986 through June 1996



Total Projects: 3,227

 TAP faculty are available from four Purdue campuses.

The Technical Assistance Program has served organizations throughout the state, including companies in every manufacturing sector. NFRASTRUCTURE: AN UNDERLYING BASE OR FOUNDATION, ESPECIALLY FOR AN ORGANIZATION OR A SYSTEM.



SUMMER INTERNS AND EXTERNS BY YEAR May 1988 through June 1996

ASSISTANCE PROJECTS BY YEAR



PROGRAM FUNDING FOR FISCAL YEAR 1995-96

TAP is funded from a combination of state, university, and industry sources.



* Indiana Business Modernization and Technology Corporation, Indianapolis.

** Includes \$300,000 for summer interns paid directly by their employer.

Technical Information Service

TIS offers comprehensive research and document delivery services on a cost-recovery basis to companies in every business sector.

TIS ACTIVITY SUMMARY

Based on Requests February 1989 through June 1996

INFORMATION PROJECTS COMPLETED



DOCUMENT ORDERS FILLED



Examples of TAP Assistance



JIM MATHERS, VICE PRESIDENT, DAVID MATHERS, PRESIDENT, AND BOB HOLDEN, GRADUATE ENGINEER IN ENVIRONMENTAL ENGINEERING, EXAMINE RECENTLY CUT VENEER.

Thiesing Veneer Company, Inc. Mooresville

The environmental permitting process can require extended effort in the collection of supporting data. Normally, a company can use existing emission factors for the permit calculations. Because emission factors have not been developed for Thiesing's wood handling processes, the company requested TAP assistance in estimating their particulate emissions. The normal method of calculating emissions for Thiesing's processes requires an expensive procedure. After analyzing the company's processes, TAP was able to provide a cost effective engineering solution for estimating the emissions. The TAP assistance saved the company \$15,000 and has shortened their permitting process.

ENVIRONMENTAL PERMITTING AND TRAINING Teledyne Casting Service

Teledyne Casting Service produces large gray iron castings for the transportation industry. The nature of the processes Teledyne uses for production requires employees to understand and comply with environmental regulations. Teledyne hired Laurie to train personnel on environmental regulations. She also assisted Teledyne with its environmental permitting efforts and supported the manufacturing engineers with cost analyses.

Dwyer Instruments, Inc. Michigan City

The successful integration of design and manufacturing is a challenge faced by all innovative companies. Dwyer Instruments in Michigan City is one of the nation's leading manufacturers of pressure, flow, level, and temperature instrumentation. To support continued sales growth, TAP was asked to help integrate the design and manufacturing of a new low-pressure transducer designed for very high accuracy. The TAP engineering analysis of the mechanics of the device identified steps in the assembly process that were critical to the production of the new product. This information has been used to develop an assembly technique that consistently produces instruments meeting very tight performance specifications. The new product is now in the early production stage and will help Dwyer strengthen their position in the growing market for instruments that measure low pressure.

PROJECT MANAGEMENT C.H. Kraus

Fort Wayne

C.H. Kraus is a specialty fabrication manufacturer facilitating its rapid growth through installation of on-line information systems. John's assignment was to integrate project management functions. This included building a database for use by employees throughout the plant to determine load schedules, track work-in-process, and identify shipping information.



LAURIE ROPEL, ENVIRONMENTAL ENGINEERING SUMMER INTERN, AND DENNIS NICHOLS, MANUFACTURING MANAGER, DISCUSS ENVIRONMENTAL TEST RESULTS.



TED KOSTEK, GRADUATE ENGINEER, JOHN CAHILL, ENGINEERING GROUP SUPERVISOR, AND JOE PEARSON, PROFESSOR OF MECHANICAL ENGINEER-ING, DISCUSS NEW PRODUCT DEVELOPMENT.



JOHN PORCO, A SUMMER INTERN FROM THE SCHOOL OF MANAGEMENT, AND NATE SLAUSON, OPERATIONS MANAGER, DISCUSS PLANT TRACKING OF A SHEET METAL PRODUCT.



DOUG MANSFIELD, VICE PRESIDENT OF MANUFACTURING, AND CURT JENKINS, MANAGER OF HARNESS & CABLE PRODUCTS, REVIEW SYSTEM PLANS WITH NARAYE WILLIAMS, GRADUATE ENGINEER, AND SHIMON NOF, PROFESSOR OF INDUS-TRIAL ENGINEERING.

Kirby Risk Corporation

Lafayette

Kirby Risk Corporation has expanded operations in response to increased demand for its quality-certified wire harness products, which are used on various large engines and tractor trailers. Their customers demand very high quality standards, just-in-time delivery, and rapid response to design changes. NaRaye Williams has completed two extern sessions with the company. In the first session (1994-95), she helped convert the existing assembly line to multiple flexible cells with integrated electronic testing. After completing her M.S. thesis research on the design of TestLAN, a networking approach to integrated facility design based on her work with the company, she was employed in a second extern session (1995-96) to design a new assembly facility. Currently, NaRaye is working on her doctoral research to extend the theoretical aspects of TestLAN following her experience at Kirby Risk Corporation. Her work has been a significant part of the company's development of responsive cost-efficient computer-integrated manufacturing systems.

Ftoating Docks Manufacturing Company

Indianapolis

Floating Docks manufactures and installs customized docks in waterways throughout the Midwest. While each design is unique, they are constructed from stock materials. Jody's assignment was to automate the support paperwork. She developed a library of part designs using AutoCAD which has shortened the time to develop site and assembly drawings and the customer quotation process.

Motion Control Industries, Inc. Logansport

Motion Control Industries, Inc. provides friction materials for the specialty brake and clutch market. As part of an effort to improve the capability to develop new products, Tom was employed as a summer intern to computerize the operation and control of dynamometers used in the product design and testing process. His work has resulted in improved data accuracy, expanded testing capabilities, and improved collection and presentation of technical information.

Anchor Industries, Inc.

Evansville

Anchor Industries in Evansville is the nation's largest manufacturer in its field of custom fabric products. Their product line consists of thousands of items such as tents, awnings, and soft luggage. Bill Loudermilk has been using the Purdue Technical Information Service for over eight years. Through this service, he has obtained numerous technical documents, reports, standards, and engineering documents. For example, he requested data on the amount of hail by region and season, important information for their tent product line. According to Mr. Loudermilk, "The TIS service has always been very responsive. They have saved our company a great deal of time and effort in obtaining the information we need for our research and development programs."



JODY KNOLL, MECHANICAL ENGINEERING TECH-NOLOGY SUMMER INTERN, AND BOB JENKS, DESIGN ENGINEER, REVIEW DRAWINGS OF INSTALLATION PLANS.



ERIC FURGASON, PROFESSOR OF ELECTRICAL AND COMPUTER ENGINEERING, TOM VOGL, SUMMER INTERN, AND JOE FOX, MANAGER OF RESEARCH AND DEVELOPMENT, REVIEW IMPROVEMENTS TO DYNAMOMETER TESTING OF FRICTION MATERIALS.



BILL LOUDERMILK (SECOND FROM LEFT), VICE PRESI-DENT OF ENGINEER-ING, REVIEWS ONE OF THE COMPANY'S MANUFACTURING PROCESSES.



KAROLY FEKETE, GRADUATE ENGINEER, AKIN ECER, PROFESSOR OF MECHANICAL ENGINEERING AT INDIANA UNIVERSITY-PURDUE UNIVERSITY INDIANAPOLIS, ALEX MAURER, AND RICH MAURER, PRESIDENT, EXAMINE THE COMPANY'S HIGH PERFORMANCE HOCKEY TAPES.



JOHN BEST, MECHANICAL ENGINEERING SUM-MER INTERN, AND RICHARD LEWIS, QUALITY ASSURANCE MANAGER, EXAMINE A PRODUCT READY FOR SHIPMENT.

Hockey Tech

Indianapolis

Hockey Tech is an Indianapolis packager and distributor of four scientifically designed tapes used on ice and roller hockey sticks. In order to meet tight specifications such as a high coefficient of friction, TAP was contacted for assistance with material selection and performance evaluation. The TAP evaluation guided the company through a design process that has resulted in the development of high performance tapes. Hockey Tech has grown to seven employees and is now selling its tape under the brand name "STICK IT" in over six hundred stores and pro shops in the United States and Canada.

Ventra Corporation

Columbus

Many Indiana manufacturers are pursuing ISO 9000 and QS 9000 certification in accordance with customer requirements. Summer interns provide an ideal resource to assist the certification process through the preparation of internal documentation and procedures. Ventra Corporation, a manufacturer of air and fluid reservoirs, hired John to assist with the updating of quality procedures to support their certification effort.



JOHN BACH, DIRECTOR OF PUBLIC WORKS, AND VINCENT TABOR, CIVIL ENGINEERING SUMMER INTERN, DISCUSS CURBING MEA-SUREMENT RESULTS.

Town of Highland

Highland

Municipal organizations commonly use the Technical Assistance Program to find qualified summer help with civil engineering projects. Vincent marked and measured curbing as part of a curb replacement project in Highland. In addition, Vincent provided AutoCAD drafting support and assisted with the implementation of a geographical information system program by providing software expertise.

Wells Electronics, Inc.

South Bend

Wells Electronics is a leading manufacturer of burn-in and test sockets for the international semiconductor industry with operations in Japan, Singapore, the United Kingdom, and South Bend. The company requested TAP assistance in consolidating three separate plants into a new, highly productive manufacturing facility. Working closely with the company, TAP developed recommendations for the tool room and manufacturing areas that have been used to increase productivity by twenty-five percent in the new facility. This substantial improvement is helping the company lead the competition and increase market share in their very competitive international markets.

Bassett Rotary Tool Company

Monticello

Bassett Rotary Tool Company manufactures solid carbide round shank cutting tools with a major emphasis on milling and drilling. A large potential customer asked Bassett to design an end mill with the capability to machine thin-walled cast iron compressor components holding extremely tight tolerances. Bassett asked TAP to help develop and test the unique tool geometry required for this application. The joint effort was successful and Bassett has obtained substantial orders from the new customer. Manufacturing capacity and employment has been increased by twenty percent to produce the new end mill.

Aero Industries, Inc.

Indianapolis

Aero Industries assembles to-order roll tarps and flatbed kits for the trucking industry. Many of the orders the company receives are for single items which require extensive documentation. Aero employed a team of interns to accelerate the implementation of an integrated MRP and financial software system intended to simplify and automate customer order processing.



DAVID MCKINNIS, ASSOCIATE DIRECTOR OF TAP, DALE O'CHAP, EXECUTIVE VICE PRESIDENT AND CHIEF OPERATING OFFICER, AND SARA MCCOMB, GRADUATE ENGINEER, EXAMINE PRODUCTION IN THE COMPANY'S NEW SOUTH BEND FACILITY.



TOM CHIOVOLONI, VICE PRESIDENT OF MANUFACTUR-ING, AND JOE ELGOMAYEL, PROFESSOR OF INDUSTRIAL ENGINEERING, DISCUSS A UNIQUE END MILL DESIGN.



RODNEY BLUE, INDUSTRIAL ENGINEERING INTERN, FRED IVERSEN II, MECHANICAL ENGINEERING IN-TERN, JIM TUERK, PRESIDENT, THOMAS SMITH, INDUSTRIAL ENGINEERING INTERN, AND ERIC ANDRESEN, MECHANICAL ENGINEERING INTERN, DISCUSS THE ASSEMBLY PROCESS FOR A PRODUCT.

TAP FACULTY



Akin Ecer Professor Mechanical Engineering IUPUI



Joseph I. ElGomayel Associate Professor Industrial Engineering



Eric S. Furgason Professor Electrical and Computer Engineering



Samuel J. Hruska Professor Materials Engineering



Robert B. Jacko Professor Environmental Engineering



Ferdinand F. Leimkuhler Professor Industrial Engineering



Colin L. Moodie Professor Industrial Engineering



Joseph T. Pearson Associate Professor Mechanical Engineering



Garnet E. Peck Professor Industrial Pharmacy



Lynn M. Schlager Associate Professor Mechanical Engineering IPFW



Charles F. Scholer Professor Civil Engineering



Keith V. Smith Professor Management



Mohammad A. Zahraee Associate Professor Mechanical Engineering Technology, Calumet





Robert A. Greenkorn TAP Director, Professor Chemical Engineering



David R. McKinnis TAP Associate Director



Cindy L. Meadows Administrative Assistant



Sherry L. Million Secretary



Jack W. Posey Consultant, Industrial Engineering



Juanita L. Thayer Secretary



Suzanne M. Ward TIS Manager



J. Lynette Carte Clerk



ß Linda K. Chadwell Clerk



Linda L. Christie Library Assistant



Katherine M. Markee Information Specialist



Rebecca J. Marthey Information Specialist



Vickie L. McLaughlin Lead Documents Assistant



Monica Musser Clerk



Heidi A. Petruzzi Information Specialist



TAP GRADUATE ENGINEERS

Charles J. Adam Mechanical Engineering

Gonzalo R. Castro Industrial Engineering

Karoly Fekete Mechanical Engineering

Derek M. Fetzer Industrial Engineering

Raul L. Garcia Industrial Engineering

Nath Gopalaswamy Mechanical Engineering

Robert W. Holden Environmental Engineering

Rudy H. Kizer Materials Engineering

Ted M. Kostek Mechanical Engineering

K'uang J. Ku Mechanical Engineering

William H. Lee Industrial Engineering

Douglas J. Lutterloh Mechanical Engineering

Heather M. Macrafic Management

Thomas A. Mahon Civil Engineering Sara A. McComb Industrial Engineering

R. David Monahan Industrial Engineering

Sergio F. Palanca Industrial Engineering

Michelle L. Parsons Management

Michael L. Rydson Intern Program

Chiang-Sheng Shiue Mechanical Engineering

Cara J. Shreves Industrial Engineering

Jennifer K. Stevens Industrial Engineering

Charles A. Thompson Electrical and Computer Engineering

John E. Thompson Environmental Engineering

Cliff C. Travis Industrial Engineering

NaRaye P. Williams Industrial Engineering

Chung-I Yen Civil Engineering

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The Purdue Economic Development Team

Purdue University provides a full range of educational, business assistance, and research programs for Indiana manufacturers, businesses, and governmental units. **The Purdue Resource Directory** provides a complete listing. Call (317) 494-6838 to request a copy.

> AGRI-BUSINESS ASSISTANCE Cooperative Extension Service Phone: (317) 494-8491

DISTANCE LEARNING

Continuing Engineering Education Phone: (317) 494-7015 Continuing Education Phone: (800) 359-2968

EXPORTING ASSISTANCE Center for International Business, Education, and Research Phone: (317) 494-4463

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POLLUTION PREVENTION Indiana Pollution Prevention and Safe Materials Institute Phone: (317) 494-6450

RESEARCH AND DEVELOPMENT Division of Sponsored Programs Phone: (317) 494-6200

TECHNICAL ASSISTANCE

Technical Assistance Program Phone: (317) 494-6258

TECHNICAL INFORMATION Technical Information Service Phone: (317) 494-9876

TRANSPORTATION INFRA-

STRUCTURE ASSISTANCE Highway Extension and Research Project for Indiana Counties and Cities Phone: (800) 428-7639

TO CONNECT TO THE ABOVE PROGRAMS, PLEASE VISIT THE WORLD WIDE WEB ADDRESS: http://www.ecn.purdue.edu/TAP/Other_Assistance_Programs/

Please note that the 317 area code will change to 765 on February 1, 1997.



How to Request Assistance

Technical Information

The extensive technical collections of Purdue University, as well as sources worldwide, are used to fill information needs on virtually any topic.

TYPICAL PROJECTS

Technical articles Patent searches Industry standards Marketing data

COSTS AND CONFIDENTIALITY

Each request is quoted individually. Typical fees are \$150 for an in-depth information search and \$14 for each document sent. All work is kept confidential.

CONTACT FOR TECHNICAL INFORMATION:

Suzanne M. Ward Manager Technical Information Service

Phone: (317) 494-9876 Fax: (800) 289-3144

Assistance Projects

These projects provide recommendations on a wide range of issues including manufacturing improvements, product development, costing and environmental problems.

TYPICAL PROJECTS

Plant layout Process improvement Design recommendations Environmental problem resolution Activity-based cost accounting

COSTS AND

No charge for services, but limited to five days of Purdue input. All project information, including company name, is strictly confidential.

Summer Interns

This program provides companies with well qualified students for twelve-week summer projects.

TYPICAL PROJECTS

Product design Environmental permits Facilities planning Product costing Manufacturing systems

COSTS AND CONFIDENTIALITY

Interns are employed directly by the company. Total compensation for the summer ranges from \$4,500 to \$7,000. There is no charge for limited faculty assistance. All projects are kept confidential.

CONTACT FOR TECHNICAL ASSISTANCE PROJECTS, SUMMER INTERNS, AND GRADUATE STUDENT EXTERNS:

David R. McKinnis Associate Director Technical Assistance Program

Phone: (317) 494-6258 Fax: (317) 494-9187 E-mail: tap@ecn.purdue.edu http://www.ecn.purdue.edu/TAP/

Graduate Student Externs

This program is for advanced projects requiring a graduate student and a faculty for an extended period of time.

TYPICAL PROJECTS

Advanced product modeling Computer-integrated manufacturing Manufacturing systems development

COSTS AND CONFIDENTIALITY

Each project is separately quoted and fees are paid to the Technical Assistance Program. A onesemester project costs approximately \$12,000. Confidentiality is negotiated for each project.

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World Wide Web

Current information about TAP is now available on the World Wide Web. Companies can easily review project examples, learn about program services, and request assistance through this site. The address is:

http://www.ecn.purdue.edu/TAP/

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