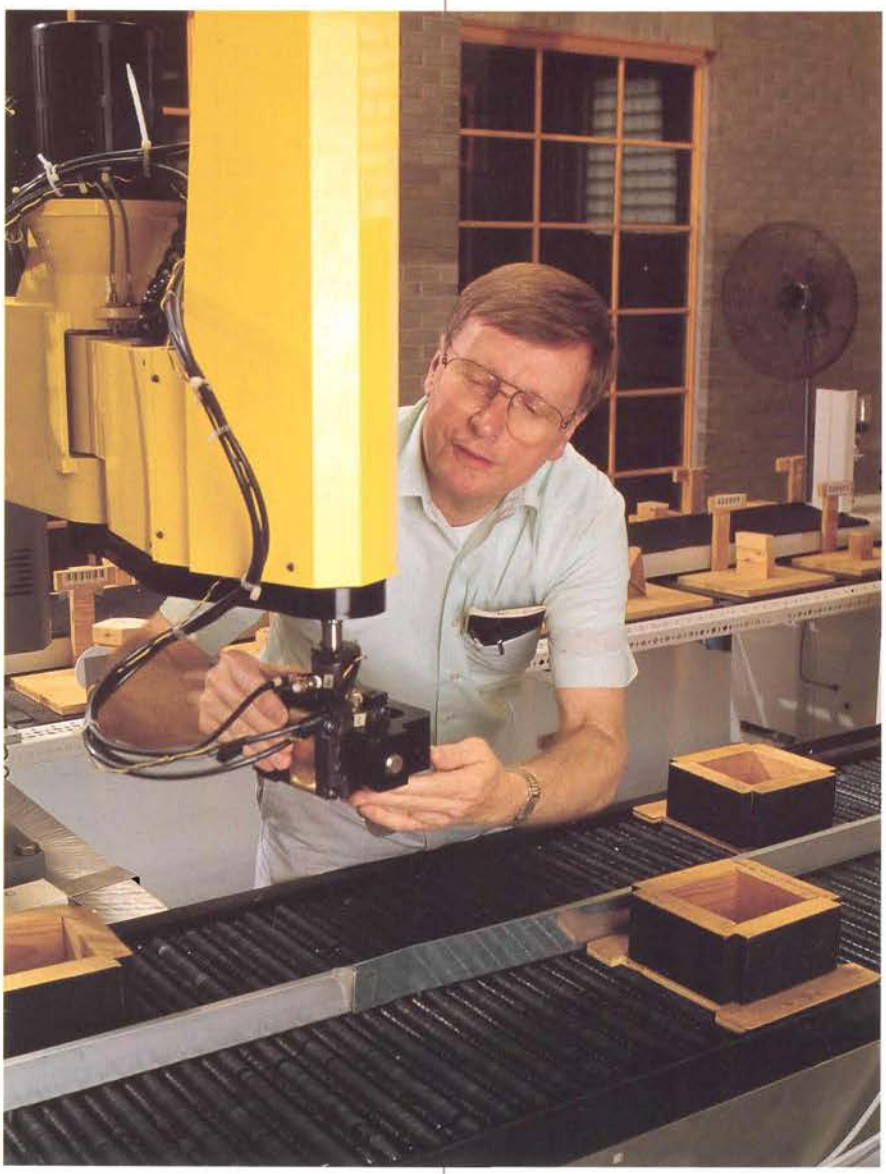
PURDUE UNIVERSITY

# TECHNICAL ASSISTANCE PROGRAM

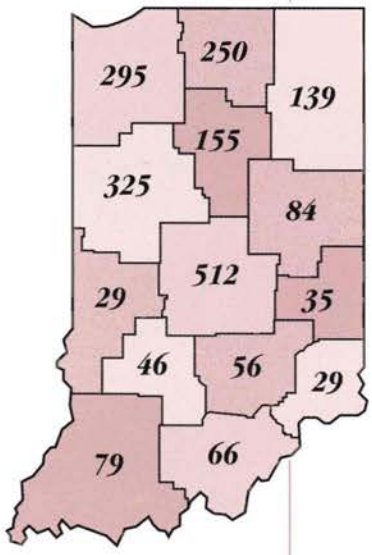
*ANNUAL REPORT*
*YEAR ENDING JUNE 30, 1993*

## THE MISSION

OF THE TECHNICAL ASSISTANCE PROGRAM AT PURDUE UNIVERSITY IS TO HELP INDIANA BUSINESS, INDUSTRY, AND GOVERNMENT IMPLEMENT NEW TECHNOLOGIES FOR THE ECONOMIC BENEFIT OF CLIENTS AND THE STATE.



*THE PURDUE ENGINEERING RESEARCH CENTER IS A MAJOR RESEARCH EFFORT DEDICATED TO THE ADVANCEMENT OF PRODUCT DESIGN AND MANUFACTURING SYSTEMS. COLIN MOODIE, PROFESSOR OF INDUSTRIAL ENGINEERING, CONDUCTS RESEARCH IN THE CENTER AND APPLIES THE RESULTS TO THE OVER FIFTY COMPANIES HE VISITS EACH YEAR AS A TAP FACULTY REPRESENTATIVE.*



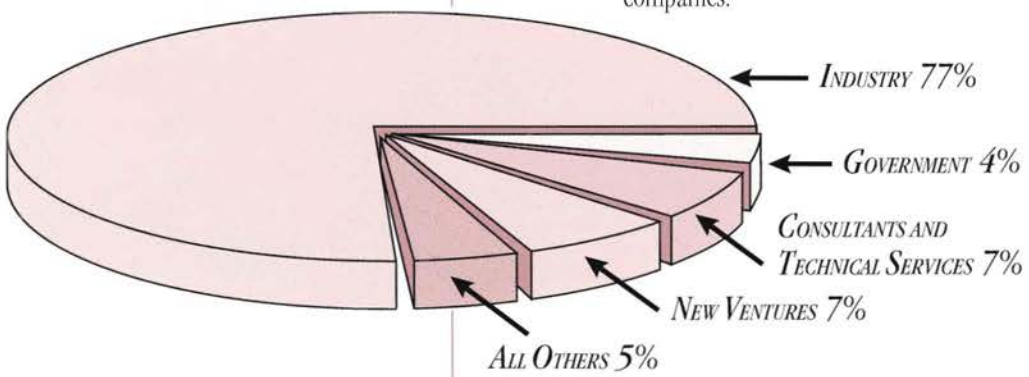

## Projects by Economic Region

May 1986 through June 1993—
The Technical Assistance Program has served organizations throughout the state, including companies in every manufacturing sector.

Total Projects: 2,100

## The Program Case Load

As shown by this chart, over three-fourths of the program case load comes from industry. The majority of the organizations served are small- to medium-sized manufacturing companies.




## The Technical Assistance Program

is funded by the State of Indiana through the Indiana Business Modernization and Technology Corporation.

# DIRECTOR'S MESSAGE

THE STATEWIDE TECHNICAL ASSISTANCE PROGRAM PROVIDES rapid, confidential, and individual assistance to Indiana businesses and government units. Supported by a grant from the Indiana Business Modernization and Technology Corporation and administered by the Schools of Engineering at Purdue, the TAP program helps clients implement new and advanced technologies and information for their economic benefit.

This *Annual Report* describes typical projects performed this year and summarizes the results. In seven years, the Program has responded to 2,100 requests for technical assistance from 1,419 Indiana companies. This year TAP worked with 337 clients across the state, providing technical assistance in engineering, manufacturing, food science, industrial pharmacy, and management. Projects continued to become more complex, increasing the effort required to complete them.

Faculty and graduate students with the program travel extensively throughout the state, visiting clients to collect data and present project results; 220 trips were made to client facilities during the year. Client evaluations are used to measure project performance. Almost 95 percent of the responses indicate that TAP program staff solved the correct problems, providing timely and valuable assistance. The fact that almost one-third of new project requests come from former clients also indicates client satisfaction. The favorable economic impact results are presented in the *Annual Report*.

The Technical Information Service unit of TAP locates and delivers new technical information to clients. Requests for technical information and documents continue to be numerous: TIS completed 387 in-depth research assignments and delivered over 13,600 documents this year; the peak delivery rate was nearly 1,500 documents per month.

The TAP summer intern program placed 26 engineering, technology, and management students with Indiana firms this summer, bringing the six-year total to 108 interns placed. Many TAP clients are introduced to new technologies that may require extended time to adopt; a summer intern can provide valuable support to these companies. An intern project may be to infuse new technology, introduce new analysis tools, or implement improved production methods. The intern and the company receive direction from TAP faculty as needed during the summer.

Several Indiana companies have hired former interns for permanent employment following their graduation. Another company hired a TAP graduate student after he worked with them on several projects.

The Technical Assistance Program and Technical Information Service responded quickly and effectively to many challenging requests from Indiana companies. The economic benefits of the results—application of advanced technologies and new information—helped many companies to improve their competitive positions. This *Annual Report* suggests the breadth and depth of the successful technology transfers which have improved the economy of Indiana and increased the ability of Indiana companies to compete worldwide.

Alan T. McDonald
July 1993

# TECHNICAL ASSISTANCE PROGRAM

SINCE 1986, THE PURDUE UNIVERSITY TECHNICAL ASSISTANCE PROGRAM has worked closely with Indiana companies to improve manufacturing competitiveness, assist in new product development, implement advanced industrial management tools, and solve difficult technical problems. A team of 40 faculty, graduate students, and professional staff work with hundreds of companies throughout the state each year.

The program staff meet in person with company representatives to define projects and ensure that the assistance provided is timely, feasible, and technically sound. Many measures of program effectiveness are taken, including the impact on capital investment, sales, and employment. Nearly 95 percent of those working with the program report positive results.

The many achievements listed in this report demonstrate the strong commitment of both Indiana companies and the Technical Assistance Program to work together to improve the state's economic competitiveness.

The program's activities during the seven years ending June 30, 1993 include:

- Technical Assistance Projects: 2,100 projects have been undertaken for Indiana companies on a wide range of technical issues.
- Technical Information Services: Over 2,000 companies and individuals have received needed information from the program.
- Summer Intern Program: 108 students have been placed with Indiana companies to work on product development and manufacturing improvement projects.

## AREAS OF EXPERTISE

ELECTRICAL ENGINEERING
ELECTRICAL ENGINEERING TECHNOLOGY
ENVIRONMENTAL ENGINEERING
CIVIL ENGINEERING
INDUSTRIAL ENGINEERING
MATERIALS ENGINEERING
MECHANICAL ENGINEERING
INDUSTRIAL MANAGEMENT
FOOD SCIENCE
INDUSTRIAL PHARMACY
LIBRARY RESEARCH

## EVALUATION SUMMARY

Based on Client Evaluations of TAP
May 1986 through June 1993

| | Year 1* | Year 2* | Total |
|---|---|---|---|
| Capital Investment | $13,679,000 | $1,755,600 | $15,434,600 |
| Dollars Saved | $4,838,500 | $4,018,000 | $8,856,500 |
| Increased Sales | $27,719,400 | $82,769,000 | $110,488,400 |
| Jobs Added | 167 | 405 | 572 |
| Jobs Saved | 292 | 301 | 593 |

** Following TAP assistance*

ECONOMIC IMPACT DATA—The project results shown here are based on material provided by the users of the program's services. One in three client evaluations includes specific economic impact data which is summarized in this chart. Many other evaluations include positive benefits that are not quantifiable. In total, nearly 95 percent of the evaluations state that help from the Technical Assistance Program was beneficial and that the recommendations are being used.

*The Purdue University school of engineering is one of the nation's largest, and has extensive research and teaching laboratories. The TAP faculty use these facilities to help companies define engineering problems and identify solutions (routine testing is referred to professional testing laboratories). Eric Furgason, professor of electrical engineering, and graduate student, Doug Munro, are shown in a diagnostic instrument laboratory working on a project to identify the best method of protecting a new electronic device from power surges.*

# PROJECT EXAMPLES

*Nick Sorak, professor of electrical engineering technology at Purdue Calumet, and Bob Crone, Manufacturing Manager, examine the electrical schematics of a packaging machine.*

■

Alloy Industries, Inc. is a major producer of automotive aftermarket universal joints. The Michigan City company requested TAP assistance in solving functional problems with a five-year-old packaging machine that has seldom worked properly. Using his experience in electrical engineering technology, Nick Sorak was able to quickly diagnose the cause of the problem. With this information, the company soon had the machine fully operational, and is now saving about $3,000/year in packaging costs.

## Alloy Industries, Inc.

■

*Mark Pyclik, graduate student, Jon Bell, national marketing manager, and Joe Pearson, professor of mechanical engineering, review a solar radiation test on a fiberglass panel.*

■

Professor Joe Pearson and Mark Pyclik, graduate assistant, helped Goshen-based Fabwel Composites design and build an environmental test chamber to simulate the effects of solar radiation on the fiberglass reinforced panels the company manufactures for the recreational vehicle, transportation, marine, and emergency vehicle industries. TAP also assisted in the development of a panel surface temperature estimating program based on the solar absorptance values of the accent striping colors that are applied to the panels. Both projects have helped the company improve products and increase market share.

## Fabwel Composites

■

*Keith Smith, professor of management, and Newt Crenshaw, President of Four Star Fabricators, review plans for one of the company's large fabrications.*

■

Four Star Fabricators of Petersburg produces custom designed heavy metal plate fabrications for the aluminum, mining, and power industries. As a company faced with many new business opportunities and challenges, they asked TAP for help in addressing these issues with carefully thought out strategic planning. Four Star was very pleased with the input and advice from TAP in the strategic planning process, and is now implementing plans which are expected to significantly increase long-term sales volume.

## Four Star Fabricators

■

# PROJECT EXAMPLES

*Joe Pearson, professor of mechanical engineering, Ken Combs, manager, Don Sitter, engineering lab manager, and Bob Woody, electrical engineer, examine a volume measuring apparatus.*

Wabash National is a Lafayette-based manufacturer of semi-trailers and related products. During the past twelve months, TAP provided a significant contribution to the company's technical needs in two areas. First, a team led by Joseph Pearson, assisted the company in developing an accurate method for environmental modeling of cross-country motor freight shipments. The second project was the development of a method for measuring the volume of air brake reservoirs used on the company's unique Road-Railer bimodal product line. The TAP recommendations were used to construct an inexpensive apparatus that has significantly increased the accuracy and efficiency of the measurements.

## Wabash National

*James Kudla, quality control manager, William Nuerge, vice president of operations, and Garnet Peck, professor of pharmacy, inspect a new production machine.*

Lafayette Pharmaceuticals, Incorporated is a major supplier of barium sulfate products for radiographic analysis. During the past year, TAP has helped this Lafayette company with two projects. The first was to evaluate internal audit recommendations assuring continued company compliance to FDA regulations, and the second was to assist in the development of a high-density barium sulfate suspension product. Both projects were successful; the company continues to operate well within FDA guidelines, and the new suspension product is now being marketed.

## Lafayette Pharmaceuticals

*Scott Vest, materials engineering student, Sam Hruska, professor of materials engineering, and Joel Maxwell, product design engineer, observe the application of the company's pneumatic cylinders.*

Fort Wayne is the headquarters for PHD, Inc., a company that supplies pneumatic and hydraulic products used for factory automation. The company's products must operate accurately through millions of cycles, and product longevity is an important competitive factor. In order to improve the functional life on one product line, the company asked for TAP assistance in evaluating the effects of various lubricants. The TAP analysis resulted in specific recommendations that have been successfully implemented to extend the life expectancy of this product line.

## PHD Inc.

# Technical Information Service

*TIS staff from left to right, Linda Christie, Heidi Petruzzi, Rebecca Marthey, Suzanne Ward (manager), Vickie McLaughlin, Linda Chadwell, and Lynette Carte.*


*Document delivery is available overnight or same-day via Fax.*

Successful companies must keep abreast of market trends, new technologies, and the activities of their competitors. Over 2,000 clients have used the Technical Information Service to save time and money in obtaining the information they need. Through the following services, companies can quickly and inexpensively obtain information on virtually any topic. The charges for these information services vary by use and are estimated in advance.

- Delivery of Documents: Each month, business people throughout the state order over 1,100 documents for delivery to their offices. Documents include patents, scientific reports, news media articles, information on markets and competitors, and journal articles. Same-day service via FAX is available.
- Patent Information: The Purdue University Libraries house one of the 70 U.S. Patent Office Depositories. Patent searches and document deliveries are made very quickly.
- Information Searches: Business people needing in-depth information on a technical, business, or scientific topics can benefit from this service. Purdue library resources and worldwide on-line data bases are used to find the best available information for the client.
- Technology Alert Service: This service provides automatic updates of new developments on a given topic, saving clients significant time in monitoring subjects of special interest.
- Dial-up Access to the Purdue Libraries: With a personal computer and a modem, clients can dial into the Purdue Libraries on-line catalog and search for book and journal titles on hundreds of subjects. Books can be sent for a three-week loan, and copies of documents can be ordered.

## TIS Activity Summary

Based on Requests
February 1989 through June 1993

| | 1989-90 | 1990-91 | 1991-92 | 1992-93 | Total |
|---|---|---|---|---|---|
| Information Projects Completed | 414 | 407 | 419 | 387 | 1,627 |
| Document Orders Filled | 3,203 | 9,108 | 14,969 | 13,632 | 40,912 |

*Information for Indiana companies and businesses is obtained from sources throughout the world. During the past four years, clients have ordered over 40,000 documents.*

# TAP Summer Intern Program

– The TAP Summer Intern Program has proven to be an Outstanding Value for Indiana Companies

Many small- and medium-sized Indiana companies have needs for short-term engineering help but cannot find it at a reasonable cost. The TAP summer intern program is designed to fill this need by providing highly motivated graduate and undergraduate engineering and management students for 12-week projects. Students from all areas of engineering, technology, and industrial management are available for a wide range of summer assignments.

Through this program, the TAP faculty work with each company to define the scope of the work and identify the best student for each assignment. Visits and phone calls to the students are made during the summer as needed to assist them in successfully completing the projects.

The most common summer projects are:

- Development of improved plant layouts
- Implementation of cellular manufacturing and process improvements
- Product research and development
- New product design
- Development of total quality management systems
- Implementation of manufacturing management systems
- Development of effective product costing systems
- Implementation of systems to meet environmental regulations

The results from summer intern projects have been significant, with many companies making job offers to students upon graduation. The following examples illustrate the wide range of projects undertaken in 1993 and the great talent that is available to Indiana companies.

SUMMER INTERN PROGRAM

*1988 Through 1993*

*Total Interns: 108*


*A number of companies have made repeated requests for interns and have made job offers to the students upon graduation.*

*Don Horning, manager, Environmental & Regulatory Services, and Michael Ketcham, a master's degree student in environmental engineering, observe one of the company's reactors.*

■

Countrymark Cooperative, Inc., headquartered in Indianapolis, is the third largest agricultural cooperative in the nation and has facilities in Indiana, Michigan, and Ohio. Michael was assigned the task of conducting process efficiency evaluations needed to ensure compliance with current and future environmental regulations.

## Countrymark Cooperative, Inc.

■

*Shimon Nof, professor of industrial engineering, William T. Wall, Manager of Manufacturing, and Nitin Khanna, student in industrial engineering, discuss the summer project.*

■

Continental Group is an East Chicago manufacturing company which provides engineering, manufacturing, and installation of heavy industrial equipment for the metals producing and processing industries. Nitin was assigned the task of developing and implementing a total quality system needed to meet the increasing demands of major customers.

## Continental Group

■

*Shimon Nof, professor of industrial engineering, Kim Baker, student, John Staggs, plant engineer, and Julie Lubs, student. A third intern, not shown, was Jeff Stirling.*

■

Merchandising Equipment Group/Div. of SteelWorks is a Cambridge City manufacturer of display fixtures for major retailers. The company is in the process of making many manufacturing improvements, including production line redesign, upgrading to CNC machines, and work cell reorganization. The three industrial engineering students were employed to work on these tasks.

## SteelWorks

■

*Tim Tucker, a student in mechanical engineering, worked under the direction of Clifford Byard, manager of engineering and product development.*

■

ML-KS is a major manufacturer of sliding film bearings for heavy-duty diesel and light aircraft engines. The company is located in Greensburg, Indiana. During the past summer, Tim was assigned a number of quality engineering projects, including the evaluation of bearings from the new machine cell shown above.

## ML-KS

■

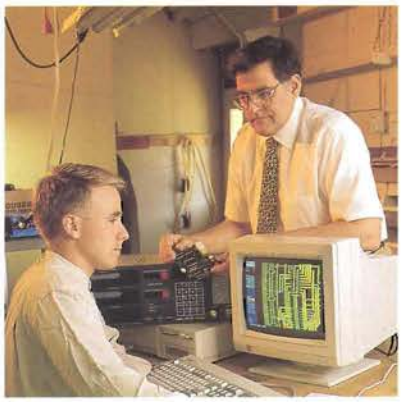
*David Miller, plant engineer, Charles Rice, director of engineering and facilities, and Jeremy Heyerly, a student in civil engineering, review project progress.*

■

The Kendallville plant of Newnam Manufacturing, Inc. produces gray iron castings for automotive refrigeration and air conditioning markets. Jeremy was assigned the task of working with both company and regulatory officials to implement the closure of an on-site mono-fill.

## Newman Manufacturing, Inc.

■



*Michael Simmons, a graduate student in electrical engineering, and Michael Stoll, president, review progress on the summer project.*

■

Reproduction Technologies, Inc. (RTI) is a manufacturer of voice logging recorders for use in police and fire departments, 911 systems, and other public safety applications. The company is located in Bristol and is developing advanced digital technology recording systems needed to meet new customer requirements and to keep ahead of foreign competition. Michael's project involved applying digital telephone technology to the new system design. Research funding is being provided in part by the Indiana Business Modernization and Technology Corporation.

## Reproduction Technologies, Inc.

■

**John E. Grimmer**
*Founder and Chief Executive Officer of GrimmerSchmidt Corporation*

## Advisory Council

The Technical Assistance Program is assisted by an Advisory Council consisting of 30 outstanding leaders from industry, consulting, government, and education. The chairman of the Council is John E. Grimmer, Founder and Chief Executive Officer of GrimmerSchmidt Corporation in Franklin, Indiana.

# Technical Assistance Program Staff

## Faculty and Professional Staff

**Alan T. McDonald**
*Director, Technical Assistance Program*
*Professor, Mechanical Engineering*

**David R. McKinnis**
*Associate Director Technical Assistance Program*

**Wayne L. Ewbank**
*Manufacturing Laboratory Supervisor*
*Industrial Engineering*

**Eric S. Furgason**
*Professor*
*Electrical Engineering*

**Samuel J. Hruska**
*Professor*
*Materials Engineering*

**Bernard J. Liska**
*Professor*
*Food Sciences*

**Rebecca J. Marthey**
*Information Specialist*

**Colin L. Moodie**
*Professor*
*Industrial Engineering*

**Shimon Y. Nof**
*Professor*
*Industrial Engineering*

**Joseph T. Pearson**
*Associate Professor*
*Mechanical Engineering*

**Garnet E. Peck**
*Professor*
*Industrial Pharmacy*

**Heidi A. Petruzzi**
*Information Specialist*

**Charles F. Scholer**
*Professor*
*Civil Engineering*

**Keith V. Smith**
*Professor*
*Management*

**Nikola M. Sorak**
*Professor*
*Electrical Engineering Technology*

**Suzanne M. Ward**
*Manager*
*Technical Information Service*

## Graduate Students

Jeffrey R. Brown
*Management*

Ana Dan
*Management*

Greg A. Eberle
*Civil Engineering*

Ouattara Fatogoma
*Environmental Engineering*

Royden P. Grove, Jr.
*Mechanical Engineering*

Brian D. Grzelewski
*Mechanical Engineering*

M. Kirk Holcomb
*Materials Engineering*

Richard W. Johnson
*Environmental Engineering*

Keith M. Kelble
*Industrial Engineering*

Timothy D. Lyon
*Mechanical Engineering*

Douglas J. Munro
*Electrical Engineering*

Mark W. Pyclik
*Mechanical Engineering*

Richard L. Segar
*Industrial Engineering*

Gary A. Smith
*Industrial Engineering*

Graeme M.H. Warren
*Industrial Engineering*

## Administrative Staff

J. Lynette Carte
*Clerk*

Linda K. Chadwell
*Clerk*

Linda L. Christie
*Library Assistant*

Vickie L. McLaughlin
*Clerk*

Cindy L. Meadows
*Administrative Assistant*

Sherry L. Million
*Secretary*

## Program Contacts

### For Technical Assistance and Summer Interns

David R. McKinnis, Associate Director
Technical Assistance Program
Purdue University
1284 Civil Engineering Bldg., Rm. G-175
West Lafayette, Indiana 47907-1284

Phone: (317) 494-6258
FAX: (317) 494-9187

### For Technical Information

Suzanne M. Ward, Manager
Technical Information Service
Purdue University
1206 A.A. Potter Engineering Center
West Lafayette, Indiana 47907-1206

Phone: (317) 494-9876
FAX: (317) 494-0142

# GUIDELINES FOR COMPANIES REQUESTING ASSISTANCE

### The Technical Assistance Program

(TAP) provides help to Indiana companies in solving problems and implementing new technologies in manufacturing, product development, and management.

### The Most Common Requests for Assistance Include

1. Manufacturing:
   - Improved plant layout.
   - Application of cellular manufacturing.
   - Process improvement.
   - Improved quality assurance methods.
   - Solution to environmental problems.
2. Product Development and Engineering:
   - Design advice for specific engineering questions.
   - Material selection for specific applications.
   - Analysis of corrosion problems.
   - Identification and demonstration of new methods for product design, testing, and evaluation.
3. Management:
   - Improvement of product costing systems.
   - Development of better methods for industrial marketing.
   - Assistance with strategic planning.

### Requirements of the Participating Company

In order to effectively work together, the following requirements are made of the participating company:

1. Meet in person with TAP representatives, either at Purdue or at the company.
2. Clearly state the question or problem.
3. Provide appropriate materials and documents.
4. Complete an evaluation of TAP services.

### The TAP response

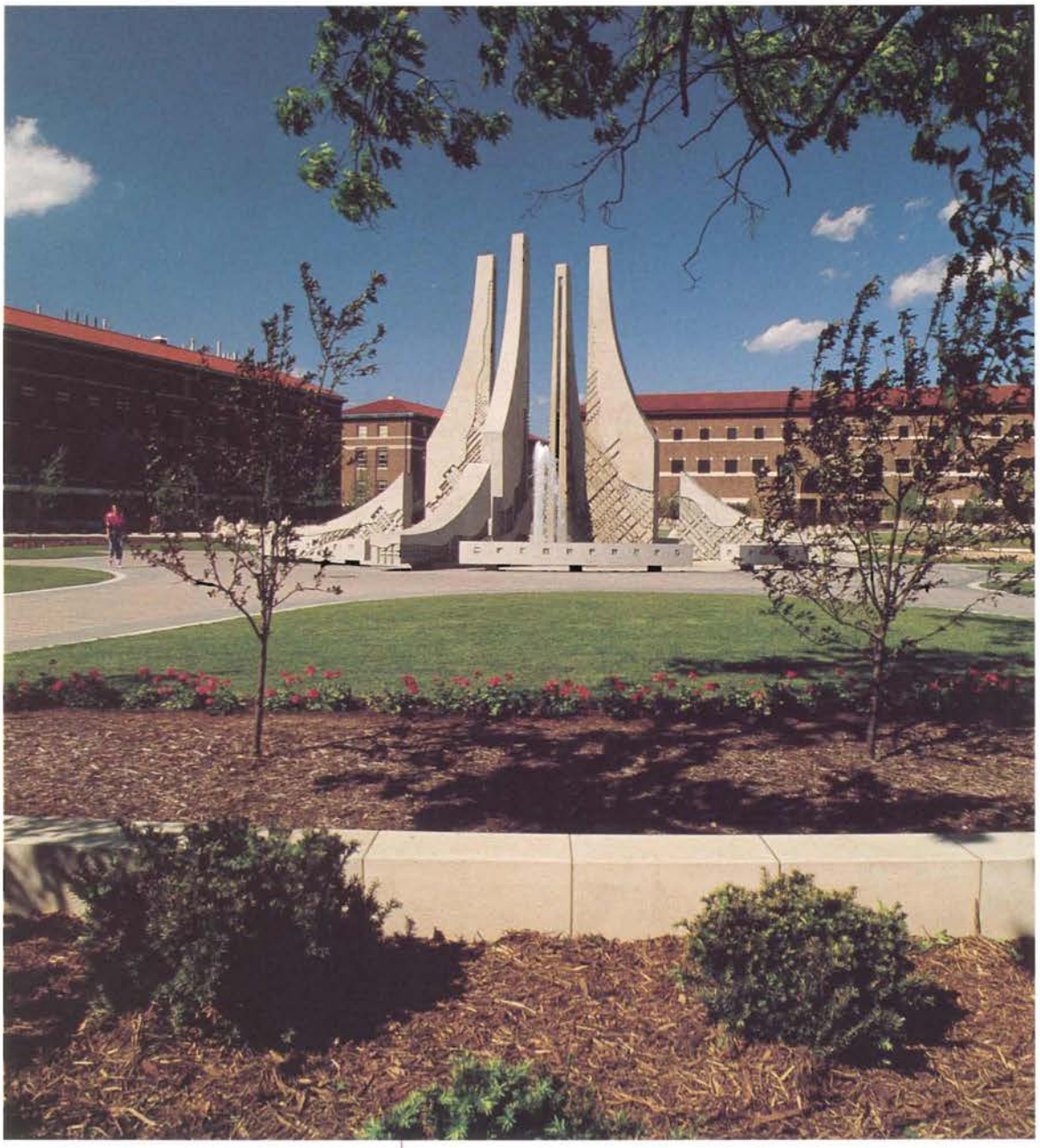
1. TAP faculty work closely with company personnel during the course of a project with the purpose of providing tangible benefits to the firm. The amount of time devoted to each project is normally limited to a total of five days by TAP personnel. This time may be spread over a period of a few weeks. Visits to company facilities are made as needed.
2. Our conclusions are put in writing. When appropriate, the written recommendations are presented in person.
3. To follow up on TAP recommendations, some companies employ an engineering or management student for a summer work project. TAP's summer intern program is an excellent source of temporary engineering and management expertise.

**Please note:** TAP does not design components or products for a company (however, summer interns can perform design projects). TAP does not endorse products or processes and does not perform testing to industry standards. Companies may not use TAP analyses in advertising or any other form of endorsement.

**Fees:** Most technical assistance is provided without charge to the company. Fees for technical information are estimated in advance.

**Confidentiality:** TAP keeps all company information strictly confidential, including the names of companies that contact the program (the companies in this report have given TAP permission to describe their projects).

*The Technical Assistance Program works with companies on an individual basis. Program faculty and staff travel extensively, making over 200 company visits per year. Photographed above are Wayne Ewbank, industrial engineering, David McKinnis, Associate Director of TAP, and Gordon Kerst, President of Kerst Pallet Co. in Veedersburg. Wayne Ewbank helped the company solve start-up problems with a machine designed to cut plastic retainers used in large batteries. With his help, the company can now meet its delivery schedules. One full-time employee has been added for this job.*



*The Purdue University Technical Assistance Program is administered by the Schools of Engineering. Purdue is Indiana's link in the nationwide chain of 68 land-grant schools established by the Morrill Act in 1862. Purdue is a public university which adheres to the spirit of the Act "to foster agriculture and the mechanic arts." The Purdue engineering programs consistently rank in the top five nationwide.*



Designed by Pamela Burroff-Murr, Engineering Productions Office
Photography by John Underwood and Dick Myers-Walls, Center for Instructional Services


Technical Assistance Program
Purdue University
1284 Civil Engineering Building, Room G-175
West Lafayette, Indiana 47907-1284

Phone: (317) 494-6258
FAX: (317) 494-9187

Cover Printed on Recycled Paper