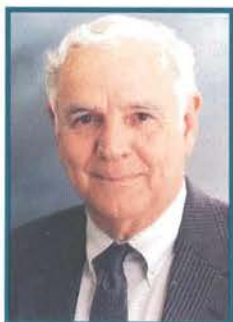




TECHNICAL
ASSISTANCE
PROGRAM
PURDUE UNIVERSITY

ANNUAL REPORT
YEAR ENDING JUNE 30, 1995



DIRECTOR'S MESSAGE

A year of expanded services to the state:

The past year has been one of positive change and expansion for the Technical Assistance Program (TAP). The overall demand for program services was the highest ever, and the economic impact in the organizations served was again substantial.

Since the establishment of TAP in 1986, program faculty, graduate engineers, and staff have traveled extensively to meet in person with companies, businesses, and governmental units. TAP personnel make hundreds of visits per year to fulfill the mission of helping Indiana clients implement new and advanced technologies for the economic benefit of the state.

In an effort to become even more accessible to the needs of Indiana companies, TAP has begun making technical assistance and summer intern services available from Purdue campuses throughout the state.

Regional staff expansion:

In addition to the team of faculty, graduate students, and staff based at the West Lafayette campus, TAP has added faculty consultants at the Indianapolis, Fort Wayne, and Calumet campuses. A central phone number and internet address makes re-requesting assistance from any location simple and convenient. With this expansion of TAP to three additional campuses, many Indiana companies are now within a short driving distance of a program location.

Summer intern expansion:

Indiana companies, businesses, and governmental units expressed a need to find highly qualified local students for summer projects. In response, TAP expanded the summer intern program by making students available from all fifteen Purdue campuses and statewide technology sites. Over two-thirds of the summer interns placed in 1995 were from their employer's local area.

The above expansions were made possible with additional funding from the state through the Indiana Business Modernization and Technology Corporation, so that TAP can continue its effort to bring needed services to more companies in every region of the state.

As you review this report highlighting the TAP program's activities and impact in the past year, you will see how Indiana companies are continuing to lead the midwest and the nation in upgrading their capabilities to compete both domestically and internationally. The Purdue Technical Assistance Program is pleased to be a key part of this effort.

Ferdinand F. Leimkuhler

July 1995

The Technical Assistance Program is funded by the State of Indiana through the Indiana Business Modernization and Technology Corporation.

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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, over ninety percent of the evaluations state that help from the Technical Assistance Program was beneficial and that the recommendations are being used.

EVALUATION SUMMARY

Based on Client Evaluations of TAP Projects
May 1986 through June 1995

	Year 1*	Year 2*	Total
Capital Investment	\$15,114,400	\$3,885,600	\$19,000,000
Dollars Saved	\$5,361,405	\$4,979,500	\$10,340,905
Increased Sales	\$31,185,800	\$88,677,000	\$119,862,800
Jobs Added	211	503	714
Jobs Saved	551	501	1,052

* Following date of TAP assistance

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.



Offering a wide range of services to Indiana companies.

TECHNICAL ASSISTANCE PROJECTS

DESCRIPTION

THESE SHORT 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 CONFIDENTIALITY

NO CHARGE FOR SERVICES, BUT LIMITED TO FIVE DAYS OF PURDUE INPUT. ALL PROJECT INFORMATION, INCLUDING COMPANY NAME, IS STRICTLY CONFIDENTIAL.

TECHNICAL INFORMATION SERVICE

DESCRIPTION

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.

SUMMER INTERNS

DESCRIPTION

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.

GRADUATE STUDENT EXTERNS

DESCRIPTION

THIS PROGRAM IS FOR ADVANCED PROJECTS REQUIRING A GRADUATE STUDENT AND A FACULTY FOR AN EXTENDED PERIOD OF TIME.

TYPICAL PROJECTS

- ADVANCED PRODUCT MODELING
- COMPUTED-INTEGRATED MANUFACTURING
- MANUFACTURING SYSTEMS DEVELOPMENT

COSTS AND CONFIDENTIALITY

EACH PROJECT IS SEPARATELY QUOTED AND FEES ARE PAID TO THE TECHNICAL ASSISTANCE PROGRAM. A ONE-SEMESTER PROJECT COSTS APPROXIMATELY \$10,000. CONFIDENTIALITY IS NEGOTIATED SEPARATELY FOR EACH PROJECT.

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

David R. McKinnis
Associate Director
Technical Assistance Program
Purdue University
1284 Civil Engineering Building
Room G-175
West Lafayette, IN 47907-1284

Phone: (317) 494-6258
Fax: (317) 494-9187
E-mail: tap@ecn.purdue.edu
World Wide Web address:
<http://tap.www.ecn.purdue.edu/tap/>

CONTACT FOR TECHNICAL INFORMATION:

Suzanne M. Ward
Manager
Technical Information Service
Purdue University
1206 Potter Engineering Center
Room 364-M
West Lafayette, IN 47907-1206

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

TECHNICAL ASSISTANCE PROGRAM

AREAS OF EXPERTISE

CIVIL ENGINEERING
ELECTRICAL AND COMPUTER ENGINEERING
ENVIRONMENTAL ENGINEERING
FOOD SCIENCE
INDUSTRIAL ENGINEERING
INDUSTRIAL ENGINEERING TECHNOLOGY
INDUSTRIAL MANAGEMENT
INDUSTRIAL PHARMACY
MATERIALS ENGINEERING
MECHANICAL ENGINEERING
MECHANICAL ENGINEERING TECHNOLOGY
TECHNICAL INFORMATION

PROJECTS BY ECONOMIC REGION

May 1986 through June 1995—

The Technical Assistance Program has served organizations throughout the state, including companies in every manufacturing sector.

▼ TAP faculty are available from four Purdue campuses.
Total Projects: 2,808



The Purdue University Technical Assistance Program makes the vast resources of Purdue readily available to Indiana business, industry, and governmental units. Since 1986, TAP has worked closely with Indiana companies to improve manufacturing competitiveness, assist in new product development, implement advanced industrial management tools, and solve difficult environmental problems. Over fifty faculty, graduate students, and professional staff from four Purdue campuses 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, cost reduction, sales, and employment. Over ninety percent of those companies using 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.

TECHNICAL ASSISTANCE PROJECTS

To date, 2,808 projects have been undertaken for Indiana companies on a wide range of technical issues. The most common requests for assistance include:

1. **Advanced Manufacturing**
 - Plant layout in production and warehouse areas.
 - Implementation of work cells.
 - Process improvements for machine centers, assembly lines, and individual work stations.
 - Systems development such as scheduling, computer-aided design, and computer-integrated manufacturing.
 - Reduction of material handling costs.
2. **Product Development and Engineering**
 - Review of design changes and improvements.
 - Adoption of computer-aided design.
 - Material selection for specific applications.
 - Solve problems such as corrosion or component failure.
 - Identification and demonstration of new design, testing, and evaluation methods.
3. **Environmental**
 - Determine if a plant or process is within EPA regulations.
 - Assist in understanding and completing the environmental permitting process.
 - Solve specific waste treatment and disposal problems.
 - Compliance with the Clean Air Act.
 - Find consultants, test labs, and summer interns for extended projects.
4. **Industrial Management**
 - Improvement of product costing and financial systems.
 - Assistance with strategic planning.
 - Development of improved methods for industrial marketing.
 - Evaluation of proposed plant and equipment investments.

Several projects are described in detail on pages 6 and 7.

TECHNICAL INFORMATION SERVICE (TIS)

Since 1989, companies and individuals have received over 2,575 information searches and 71,175 documents from this service. Questions fall into the following categories:

- Specific engineering and technology questions 37%
- Marketing information 26%
- Biological, veterinary, and pharmaceutical sciences 14%
- Management issues 12%
- Agricultural questions 7%
- Other 4%

SUMMER INTERN PROGRAM

To date, 213 students have been placed with Indiana companies to work on product development, manufacturing, environmental, and industrial management projects.

Typical projects include:

- Plant layout and process improvement.
- AutoCAD implementation.
- Implementation of ISO 9000.
- Development of Clean Air Act permits.
- Product design, testing, modeling, and evaluation.
- Implementation of activity-based cost accounting.
- Infrastructure projects for municipalities.

See pages 10 and 11 for sample projects.

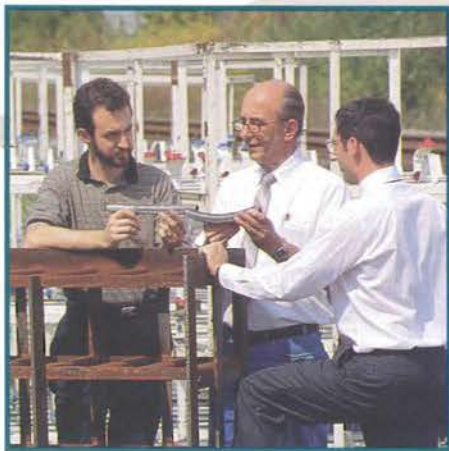
GRADUATE STUDENT EXTERNS

This program addresses the need of small and medium-sized Indiana companies for extended product design and manufacturing system development projects. These projects involve the work of both a graduate student and a faculty member, and can have a duration of one or more semesters. Five graduate students performed extern projects during the past year on advanced manufacturing systems projects. *See page 11 for sample extern projects.*



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 web site. The address is:
<http://tap.www.ecn.purdue.edu/tap/>



Metal Distortion Problem Solved

LAUCK MANUFACTURING COMPANY

Indianapolis

Dan Slightom, president of Lauck Manufacturing, Sam Hruska, professor of materials engineering, and Rudy Kizer, TAP materials engineering graduate student, inspect a new heat treating rack.

For many years, Lauck Manufacturing, a sheet metal fabricator, has supplied special racks used in heat treat ovens by an automotive die casting company. Last year, this company installed robotic loading and unloading of the castings heat treated on these racks. This automation created more stringent requirements on these racks, which easily distort in the harsh environment of heat treat ovens. Lauck Manufacturing was required to solve the distortion problem to meet the customer's continuous improvement requirements. A review of this problem by TAP resulted in a recommendation to produce these racks from an alternate alloy. The recommendation has been successfully implemented, securing \$120,000 in annual sales.



Flow Design for a Multi-Cavity Injection Die

OVERTON & SONS TOOL & DIE COMPANY, INC.

Mooreville

Nath Gopalaswamy, TAP mechanical engineering graduate student, Chuck Rogers, engineering assistant, Akin Ecer, professor of mechanical engineering at Indiana University-Purdue University at Indianapolis, and Ron Overton, president, review a new die design.

Overton is a rapidly growing company specializing in carbide tooling, gages, compacting dies, and special machines for the medical, tooling, and magnet industries. To support expanding business with a major customer in the magnet industry, TAP was asked for help in the flow design of a new generation of multi-cavity high capacity magnet dies. The TAP study resulted in specific recommendations for the die material flow. These recommendations were successfully implemented in the die design, resulting in both high production and high quality for Overton's customer. In addition, TAP's engineering assistance on this project has helped Overton secure ongoing business with this important customer.



Battery Disposal

MIKE MADRID COMPANY, INC.

West Lafayette

Bob Jacko, professor of environmental engineering, and Mike Madrid, company president, examine the batteries and flashers used at construction sites.

The Mike Madrid Company performs traffic control and pavement marking work for public works projects throughout Indiana and the midwest. Like other companies in this field, disposable batteries are used to power the flashing warning lights used at construction sites. The Technical Assistance Program helped the company develop a safe and economical battery disposal program that meets all current environmental regulations.



Increased Manufacturing Productivity

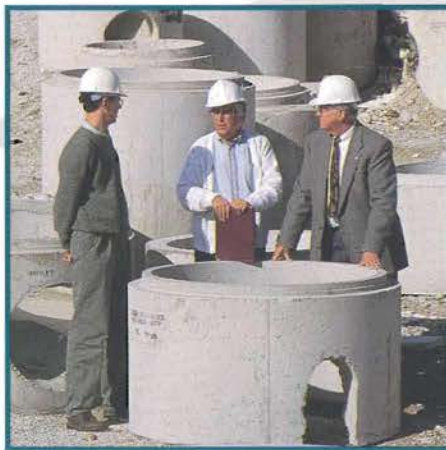
PAR-KAN COMPANY

Silver Lake

Jeff Chambers, manufacturing manager, and John Rohrer, special projects manager, discuss process improvements with Graeme Warren, TAP industrial engineering graduate student, and Colin Moodie, professor of industrial engineering.



The sheet metal fabrication business has traditionally required high levels of labor and material handling costs. Par-Kan, a sixty employee fabricator with major business in refuse containers, asked TAP for help in improving overall manufacturing productivity. A review of company operations resulted in recommendations for improved material handling, plant layout, and welding fixturing. Numerous improvements have been implemented since receiving the TAP recommendations, and, at this point, the company has achieved one-third of its near-term goal to increase manufacturing productivity by fifteen percent.



Increased Production Capacity and Cost Reduction

THORN-ORWICK, INC.

Corydon

Tom Mabon, TAP civil engineering graduate student, Bill Thorn, president/owner, and Chuck Scholer, professor of civil engineering, discuss company plans to increase production.



Thorn-Orwick is a leading southern Indiana manufacturer of precast concrete products for sanitary sewers, storm sewers, and utility structures. In order to support continued sales growth and to reduce costs, the company decided to produce their concrete internally. TAP was called to help develop efficient material handling methods for the concrete mixes. The TAP recommendations from faculty in both industrial and civil engineering were successfully implemented, resulting in an annual savings of over \$100,000. The TAP assistance has also been a key factor in the growth of company employment by eighteen employees. Bill Thorn was pleased with both the results and the people he worked with, stating: "The Purdue staff's high level of interest is appreciated, and is very important to small companies."



Product Performance Testing

TRU-FLEX METAL HOSE CORPORATION

West Lebanon

Win Thomas, president, and Joe Pearson, professor of mechanical engineering, discuss the testing of large diameter flexible hose.



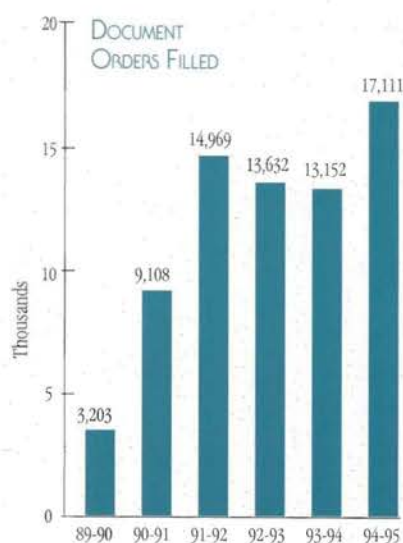
The flexible metal hose produced by Tru-Flex is used around the world in numerous industrial applications. In the competitive international market for grain transfer hose, customers require verification of the product's ability to meet specific material transfer capacity rates. TAP was asked to help develop a practical and economical method of testing the product. Using a combination of company fixtures and Purdue laboratory equipment, the product was accurately tested and was found to meet all customer requirements. The findings and test procedures were documented in both a video and a written report. As a result of the TAP assistance, the company has tripled its sales in this market segment, and has obtained a sound method for testing additional material transfer hose products.

Left to right: Suzanne Ward (manager), Heidi Petruzzi, Monica Musser, Linda Christie, Linda Chadwell, Vickie McLaughlin, Lynette Carte, Rebecca Marthey.



TIS ACTIVITY SUMMARY

Based on Requests
February 1989 through June 1995

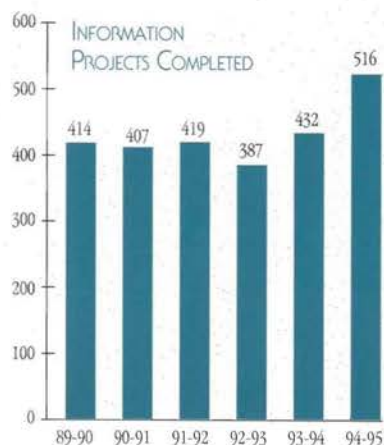


What do TIS clients say about the information they receive? Here is a sample of recent comments:

"Thank you so much for all your help. I don't know what I'd do without you folks."

"TIS has provided our company with very valuable marketing information which has helped us break into previously unexplored markets."

"I am very pleased with both the responsiveness and the quality of services. You always provide prompt and accurate responses."



TECHNICAL INFORMATION SERVICE

- Patents for lawn mowers.
- Industry standards for windows.
- Ternary alloy phase diagram.
- Market information about drive line couplings.

These are just a few examples of the types of information needs which the Technical Information Service (TIS) staff handle quickly and cost-effectively. TIS offers comprehensive research and document delivery services on a cost-recovery basis to companies in every kind of business.

Research Services: From the hundreds of databases available, TIS information specialists select the ones appropriate for each client's needs.

Document Delivery: Each month, TIS clients place over 2,000 document orders for articles, conference papers, technical reports, book loans, government reports, industry standards, patents, and other types of documents. Nearly eighty percent of the items requested are available in the Purdue University Libraries. TIS staff obtain non-Purdue items on a special order basis. Most orders can be shipped on a rush basis, if required. TIS staff are also experts at obtaining international documents.

Patents: The Purdue University Libraries are one of seventy U.S. Patent Office depositories. The local collection contains over two million patents from 1967 to present.

To obtain a cost estimate for an in-depth information search, call (317) 494-9876 and ask to speak with an information specialist. To request documents, fax your order to (800) 289-3144.



Update of
Plant Layouts

DAWN FOOD PRODUCTS

Crown Point

Dean Fox, plant engineer of Dawn Food Products, reviews plant layouts with Kenneth Ricard, technical graphics summer intern, and Terry Burton, professor of technical graphics in the School of Technology.

Dawn Food Products is a rapidly growing producer of raw and baked frozen pastries. Their products require a heavy investment in food processing machinery, manufacturing space, and supporting utilities. Kenneth Ricard was employed to document the existing machinery, floor space, and utilities using computer-aided drawing. His work will support the company's efforts to efficiently maintain current facilities, and to add additional capacity in the future.

TAP SUMMER INTERN PROGRAM

Each year, TAP helps Indiana companies, businesses, and cities find well-qualified and highly motivated students for summer projects such as:

- AutoCAD and computer graphics implementation.
- Environmental permits.
- ISO 9000 procedure writing.
- Plant layout.
- Computer programming.
- Production process improvement.
- Product design.
- Civil engineering.
- Product costing systems.
- Strategic planning and marketing.
- Employee development.

Through this program, companies can very quickly find the right student for their summer project needs. The students are employed directly by the company and have access to Purdue faculty for advice on their summer assignments. Most students are visited by faculty during the summer.

TAP also makes every effort to find local students for each position. Students are available from all fifteen Purdue campuses and Statewide Technology sites. Last year over two-thirds of the interns were from their employer's local area.

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 1995 and the great expertise that is available.



SUMMER INTERN PROGRAM

1988 through 1995

Total Interns: 213

◆ Students from all fifteen Purdue campuses and State-wide Technology sites are available.

1996 SUMMER INTERN INFORMATION

Students will be available for work from May 6 through August 16. Call (317) 494-6258 by March 31, 1996 to request resumes.



Infrastructure Improvement
and Expansion

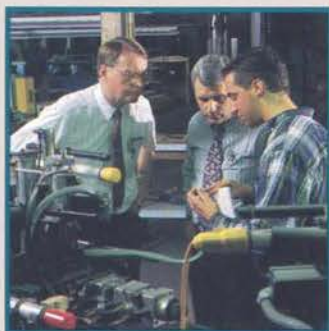
CITY OF GREENCASTLE

Greencastle

Christopher Barnes, Greencastle city engineer, and Steve Summerlot, civil engineering summer intern, review a new project.



Recent economic growth in the City of Greencastle has required the improvement and expansion of many infrastructure components, including the sewer system, roads, and streets. As an intern in a small city, Steve performed a wide variety of projects, including sewer plant improvements, hydraulic studies, surveying, and traffic counts.



Material Handling and
Product Flow

GENCORP

Evansville

Colin Moodie, professor of industrial engineering, Scott Baker, manager of engineering, and Mel Leeb, Jr., industrial engineering intern, observe a polymer welding machine.



GenCorp is a technology-based company supplying profile extrusions to the appliance, automotive, and reprographics industries. Material processes are a key element to success in this high volume business. Mel's summer project was to improve the material handling and flow processes for appliance gasket materials.



Manufacturing Layout
for a New Facility

COMPONX, INC.

North Vernon

John Durlacher, manufacturing engineer, Pam Patterson, mechanical engineering summer intern, and Joe Pearson, professor of mechanical engineering, examine a refrigerator ice and water dispenser.



ComPonX produces insert molded parts, wiring harnesses, and small assemblies for the appliance, automotive, and lighting industry. Continued business expansion required the addition of a new 12,000 square foot facility. Pam's summer assignment was to develop the manufacturing layout for this facility.



Quality, Product Design,
and Plant Layout

MASTER MACHINE CORPORATION

Indianapolis

Dominic Morone, mechanical engineering technology student at Indiana University-Purdue University at Indianapolis, and Greg Wilczak, process engineer, review company production plans.



Small companies such as Master Machine must rely on employees to perform many different duties. During his summer with the company, Dominic Morone, a local student in mechanical engineering technology at the Indianapolis campus, performed projects in quality control, ISO 9000, computer-aided design, and plant expansion planning.



Production and Environmental Projects

HITACHI CABLE INDIANA, INC.

New Albany

Greg Juliot, plant manager, and David Kirchgessner and Mark Eickholtz, both mechanical engineering technology students at the New Albany Purdue Statewide Technology campus, discuss production of vacuum brake hose.

Hitachi Cable produces brake and power steering hose for the automotive industry. In order to complete a number of important summer projects, the company employed David Kirchgessner and Mark Eickholtz, local students from the Purdue New Albany Statewide Technology program. David's primary assignment was to collect and analyze data needed to support environmental compliance, and Mark's assignment was to improve the system of producing product samples.



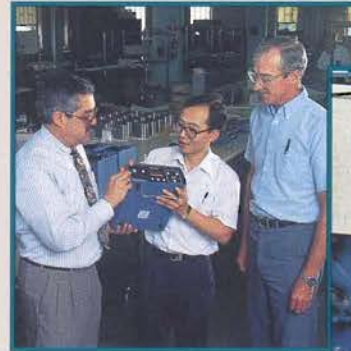
Environmental Permitting, Policies, and Procedures

FLUIDRIVE, INC.

Brookston Area

John Haney, agricultural engineering intern, and Larry Dalton, vice president of operations, review plans for a new painting system.

Fluidrive is an expanding manufacturer of steerable hydraulic axle and air suspension systems. John Haney was employed to study and complete the environmental permits for a new paint system, and to develop environmental policies and procedures that will support continued company growth.



Concurrent Engineering and Energy Management

SERADYN

Indianapolis

Marty Weinstein, director of quality, Chin-Yin Huang, industrial engineering graduate student extern, and Jim Kircher, vice president of operations, review plans for improved engineering processes.

Kevin Scheib, manufacturing engineering manager, and Jia-yeh Wang, industrial engineering graduate student extern, discuss energy management systems for a reactor.

Seradyn designs and manufactures precision scientific test equipment, reagents, medical diagnostic kits, and analytical instruments. Two graduate students were employed during the summer for advanced projects. Chin-Yin Huang began the development of an integrated information system for product design, manufacturing, and sales, using concurrent engineering principles. Jia-yeh Wang's assignments included improving process control for production reactors and developing an effective energy load shedding system.

TAP FACULTY



Akin Ecer
Professor
Mechanical Engineering
IUPUI



Joseph I. ElGomayel
Associate Professor
Industrial Engineering



Eric S. Furgason
Professor
Electrical Engineering



Samuel J. Hruska
Professor
Materials Engineering



Robert B. Jacko
Professor
Environmental Engineering



Bernard J. Liska
Professor
Food Sciences



Colin L. Moodie
Professor
Industrial Engineering



Joseph T. Pearson
Associate Professor
Mechanical Engineering



Garnet E. Peck
Professor
Industrial Pharmacy



G. Allen Pugh
Associate Professor
Industrial Engineering
Technology, IPFW



Lynn M. Schlager
Associate Professor
Mechanical Engineering
IPFW



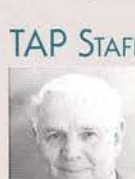
Charles F. Scholer
Professor
Civil Engineering



Keith V. Smith
Professor
Management



Mohammad A. Zahraee
Associate Professor
Mechanical Engineering
Technology, Calumet



Ferdinand F. Leimkuhler
TAP Director, Professor
Industrial Engineering



David R. McKinnis
TAP Associate Director



Cindy L. Meadows
Administrative Assistant



Sherry L. Million
Secretary

TAP STAFF



Jack W. Posey
Consultant, Industrial
Engineering



Juanita L. Thayer
Secretary



Suzanne M. Ward
TIS Manager



J. Lynette Carte
Clerk



Linda Chadwell
Clerk



Linda Christie
Library Assistant

TIS STAFF



Rebecca J. Marthey
Information Specialist



Monica Musser
Clerk



Vickie McLaughlin
Library Assistant



Heidi Ann Petruzzi
Information Specialist

GRADUATE STUDENTS

Shahid S. Ahmed
Industrial Engineering

Amy B. Baker
Industrial Engineering

Rodney D. Bertsch
Management

Anthony G. Chan
Mechanical Engineering

Chockalingam Ganapathi
Industrial Engineering

Nath Gopalaswamy
Mechanical Engineering

Brian E. Hannum
Mechanical Engineering

Robert W. Holden
Environmental Engineering

Kelly D. Kirkland
Management

Rudolph H. Kizer
Materials Engineering

Jacob P. Klosteman
Management

K'uang J. Ku
Mechanical Engineering

Christoph Lueneburger
Mechanical Engineering

Thomas A. Mahon
Civil Engineering

Sara A. McComb
Industrial Engineering

Kevin P. Mostek
Industrial Engineering

Mark E. Newcomb
Mechanical Engineering

Mark K. Ratcliffe
Industrial Engineering

Bernadette Rodriguez
Industrial Engineering

Phillip W. Shoopman
Environmental Engineering

Jennifer K. Stevens
Industrial Engineering

Charles A. Thompson
Electrical Engineering

John E. Thompson
Environmental Engineering

Graeme M. H. Warren
Industrial Engineering

Brian L. Wasson
Industrial Engineering

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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