The Industrial Assessment Center at Mississippi State University

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Mississippi State University (MSU)
Industrial Assessment Center (IAC)
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Executive Summary

The Mississippi State University Industrial Assessment Center (IAC) is one of 26 centers supported by the U.S. Department of Energy (DOE) at universities across the country. The Mississippi State University IAC in existence since 1994 provides plant assessments at no cost to eligible small and mid-sized manufacturers categorized in Standard Industrial Classification (SIC) Codes 20-39. Client eligibility is based on gross sales below $100 million, fewer than 500 employees at the plant, annual utility bills more than $100,000 and less than $2 million, and no in-house professional staff to perform an assessment. IAC assessment benefits include no cost to the clients, increased profitability and competitiveness, confidentiality, non-regulatory, non-obligatory, and student involvement.

Comparison of Actual Accomplishments with the Goals and Objectives of the Project

TASK 1: Conduct industrial assessments in the defined geographic area and promote the IAC Program and enhance recruitment efforts for new clients and expanded geographic coverage

Eligible small and mid-sized manufacturers categorized in Standard Industrial Classification (SIC) Codes 20-39 in the Mississippi IAC service area were and continue to be in sufficient numbers. Historically, the Mississippi State University (MSU) Industrial Assessment Center (IAC) has averaged 25 assessment-days annually, a best fit for the operation methodology of the MSU IAC. The MSU IAC has conducted 308 assessments (with over than145 different zip codes) from 1994 through August 2006. In 2002-2006 the MSU IAC conducted 104 assessments. Table 1 shows the potential client base from which the MSU IAC draws clients and the total number of assessments performed by the MSU IAC from 1994-2006.

Table 1. Assessment Opportunities in the MSU IAC Service Area

	SIC Codes 20-39 in Service Area	Candidate Clients Eligible in Service Area	Assessments Performed by MSU IAC
Mississippi	*3,938	2,000	280
Alabama	*3,875	1,950	20
Tennessee (Shelby County)	**1,181	600	8
Total	8,894	4,550	308

*Source: 2004 Harris Manufacturers Directory; Mississippi, Alabama.
**Source: Memphis Light, Gas and Water

The MSU IAC develops its clientele through direct contacts with a facility, outreach activities, recommendations from the TFM, and partnering with State agencies, local utilities, and other service providers. The *Directory of Manufacturers* for Mississippi and Alabama (updated annually) are primary sources used by the MSU IAC to identify potential clients. Also

MSU IAC students will recommend facilities, and as the MSU IAC is traveling to an assessment location, observations of potential clients sited along the way are noted.

Responding to invitations from outreach activity opportunities to present information about the IAC program are increasingly valuable sources for locating new clients. As energy rates have escalated in recent years, industrial representatives attending outreach activities have become more receptive and interested in MSU IAC assessments. Often in attendance in these outreach activities are local utility and service providers, who will contact the MSU IAC to conduct assessments for facilities in their areas. Many of the assessments conducted in the non-TVA areas of Mississippi have been through contacts with Entergy and Mississippi Power, the non-TVA electrical utility providers in the State. Additionally, a number of former MSU IAC students are currently working for utility service providers in Mississippi, Tennessee, and Alabama; these former students utilize the MSU IAC services when appropriate. Examples of IAC outreach activites to build a client base are as follows:

A presentation was made before the MSU Economic Development Outreach Forum about the IAC. Economic development officers and other officials attended the conference to hear about all the outreach opportunities MSU has to offer to the state of Mississippi.

A presentation was made about the IAC to the East Mississippi Business Development Corporation who was holding an existing industry summit titled " Measurements, Profits and manufacturing" for industry leaders located in East Mississippi.

The MSU IAC was invited by the Mississippi Manufactures Association (MMA) Energy Committee Meeting to present information about the IAC.

Mississippi Power invited Mississippi State University Industrial Assessment Center to hold an exhibitor booth at the Mississippi Power Annual Energy Management Symposium in Hattiesburg, Mississippi.

Mississippi Power (Southern Company) visited the MSU IAC to discuss a more active arrangement with the IAC program. With the higher fuel and utility costs their customers are realizing, Mississippi Power is very much interested in energy conservation implementation. They want to play a more active role in the MSU IAC's recommendations in terms of participating in helping a facility implement MSU IAC recommendations. (Note: MS Power told the MSU IAC that in a survey with their customers the utility provider was rated unsatisfactory in assisting their clients with energy conservation.)

Southern Company (Mississippi Power) wrote a story about the MSU IAC that appeared in one of their publications.

TASK 2: Promote and increase the adoption of assessment recommendations

The technical field office for the IAC program has accumulated complete data for Btu and dollar savings from 2001 through 2004. The IACs are still completing the data for 2005 and 2006. From 2002-2004 the MSU IAC recommended 518,000 Btu's of energy savings to its' clients. The clients have implemented 102,000 Btu's of energy savings resulting in 2 million dollars in savings. Table 2 shows the MSU recommended savings and implemented savings from 2001-2004. Factors that contribute to lack of implementation are: (1) a number of qualifying facilities with lower than average utility bills, (2) facilities that are shut down, (3) lack of capital to finance recommendations, (4) energy costs being viewed as not an important

consideration by some facilities, and (5) apprehension about implementing some recommendations by some industries.

Table 2. MSU IAC Summary of Recommended and Implemented Energy and Cost Savings

	Recommended Energy Savings (MMBtu)	Recommended Energy, Productivity, and Waste Savings ($)	Implemented Energy Savings (MMBtu)	Implemented Energy, Productivity, and Waste Savings ($)
2001	101,621	1,076,534	19,151	352,031
2002	201,358	1,674,506	22,779	358,154
2003	106,589	3,567,690	30,846	991,295
2004	209,735	2,687,287	47,573	662,912

In consultation with the Project Officer and the Field Management Organization, the MSU IAC continues to follow-up with selected clients at 12-month intervals to document increased implementation rates, replicated and spin-off measures, and reports any associated metrics to the Field Management Organization. Starting in 2003 the MSU IAC returned to selected facilities with proposed recommended savings of at least $100,000 to present formally the recommendations. These efforts have proven successful given the increased in implementations as shown in Table 2 for years 2003 and 2004. Table 3 illustrates MSU IAC's follow-up activities and additional savings.

Table 3. 12-month Follow-up Efforts and Results

Client Name/Audit Number	Initial Audit Date	Follow-up Date	Additional Metrics Reported to Field Manager
MS-0242 Clarion Ledger	9/18/03	Initial follow-up date 2/9/05	$21,000 + implementation savings *(pending)*
MS-0243 Marathon Cheese	10/02/03	Initial follow-up date 2/9/05—made numerous return calls since	Has not returned follow-up phone call
MS-0244 Spring Industries	10/16/03	Initial follow-up date 2/9/05	$48,000 + implementation savings
MS-0245 Tupelo Fiber	10/29/03	Initial follow-up date 2/9/05—made numerous return calls since	Has not returned follow-up phone call
MS-0246 Consolidated Catfish	12/05/03	2/22/05	$31,000 + implementation savings
MS-0247 Trilogy Communications	1/14/04	Initial follow-up date 2/14/05—made numerous return calls since	Has not returned follow-up phone call
MS-0248 Trilogy Communications	1/15/04	Initial follow-up date	Has not returned follow-up phone call

		2/14/05—made numerous return calls since	
MS-0249 North American Pipe Company	1/28/04	2/23/05	$75,000 + implementation savings
MS-0250 Mega Plastics	2/05/04	Initial follow-up date 2/21/05—made numerous return calls since	Has not returned follow-up phone call
MS-0251 PeopLounger	2/23/04	2/21/05	$17,000 + implementation savings
Super Sagless	9/22/04	8/1/05	$49,747
Natchez Trace Greenhouses MS-0232 and MS-0288	5/30/03 and 12/04	Feb. 05, Feb. 06, Feb. 07	$103,218

TASK 3: Provide educational opportunities, training, and other related activities for IAC students

The MSU IAC prides itself on the degree of involvement with students. The MSU IAC employs six or seven undergraduate students in its normal operation. Since 1994, each MSU IAC student has averaged going on 15 assessment visits. Out of the 15 assessments, each student has averaged being the lead student on at least four of the assessments.

Once students are recruited, interviewed, and hired, the MSU IAC begins the training process. The topics taught are as follows:

1. Safety practices in the industrial environment,
2. Use of OIT software tools,
3. Office protocol and rules,
4. Diagnostic equipment instructions and training,
5. Computer network capabilities,
6. Software for report writing,
7. Procedures for conducting an assessment,
8. Report writing guidelines and timetables,
9. Analysis of utility bills and rate structures.

Table 4 lists the diagnostic instrumentation training received by the MSU IAC students.

Table 4. MSU IAC Diagnostic Instruments

Thermocouple
Anemometer, Kane-May KM-4107 Extech L864518
Infrared Thermometer, Rayteck, ST20 Pro
Digital Thermometer, Fluke 51
Ultrasonic Leak Detector
Combustion Analyzer, Bacharach 24-7187 Enerac, Pocket 100
KWh Meter, TIF Instruments KW220-3

Light Meter, Beha 93-1065F
Clamp Multimeter, Extech 380947
Power Factor Meter
Stroboscope, Monarch Nova-Strobe
Thermo-Hygrometer, Extech L840102
Volumetric Flow Meter
Ultrasonic Flow Meter, Dynasonics UFX
Distance Meter
Measuring Wheel
TRMS Power Meter, AEMC 3910
Low Flow Balometer, Alnor 6200D
Infrared Camera, Fluke

Educational advantages for students working for the MSU IAC are the opportunities to assess energy needs and to develop energy and cost savings to industry while gaining valuable training, knowledge, and experience. The technical and communications skills obtained by the students are summarized in the following text blocks.

Technical Skills

- Analyzing utility bills
- Collecting and analyzing data
- OIT software tools
- Learning to use diagnostic instrumentation
- Energy auditing practices
- On-line equipment catalogs
- Mastering computer software skills
- Safety training
- Financial analysis

Communications Skills

- Oral
  - Telephone protocol
  - Electronic mail
  - Interviewing
  - Information retrieval
  - Teamworking
- Written
  - Technical writing
  - Process documentation
  - Specifications

MSU IAC students often find that site visits and assessment report preparation demonstrate to them the importance of courses such as chemistry, engineering economy, thermodynamics, fluid mechanics, heat transfer, engineering analysis, electrical engineering systems, material science, technical writing, and measurement laboratory courses.

Since 1994 sixty-five students have worked for the MSU IAC. Five of these students have been graduate students. The Center can document the career paths of thirty-five of these students since leaving the MSU IAC. Table 5 delineates the career paths of the twenty-nine. Many of those attending graduate school pursued a course of study in the thermal sciences or in energy-related topics. Thus, more than 50 percent of MSU IAC students have made energy-engineering career choices. The IAC program tracks former IAC student workers to capture those who continue to impact energy savings. For example the IAC Newsletter featured an article about one of MSU IAC's student workers regarding energy savings projects he implemented in his company.

Table 5. Career Paths of MSU IAC Alumni

Staff Engineer for the MSU IAC	4
Graduate school	12
Work with energy providers/consultants	8*
Energy-related industries	5
Other	6

*Includes all four Staff Engineers who are employed with utilities or ESCOs.

TASK 5: Coordinate and integrate Center activities with other Center and IAC Program activities, DOE's Industrial Technologies programs and others.

The MSU IAC uses OIT software (MOTORMASTER, PSAT, AIRMaster, Steam System Assessment Tool, Steam System Scoping Tool, 3E Plus, and PHAST) when appropriate. Each report contains an explanation of the OIT tools with a discussion of the DOE assessment tools in the DOE CD, *Decision Tools for Industry*, which is presented to the client at the exit interview of the site visit. The inclusion of a narrative description of the assessment tools serves to reinforce the information and the utility of the DOE CD.

In 2005 and 2006 EERE and OIT asked the IACs to be involved in the Save Energy Now (SEN) by conducting assessments for "large-size" clients. The MSU IAC conducted assessments for 3 SEN clients as requested by the technical field office.

ORNL funded a special project for the MSU IAC to perform an energy audit of the Internal Revenue Service in Memphis, Tennessee. *TRACE 700, A* Building Heating and Cooling Simulation Software, was used to access the energy usage at the IRS facility.

The MSU IAC organized an IES web cast presentation (four hours) on IES Systems (CHP) installations. The MSU IAC students attended all four modules.

Chris Emplaincourt, Assistant Director of the IAC, was asked to design a 8 ft. x 4 ft. poster to be presented in Washington DC (DOE CHP Steering Committee) depicting the CHP success story of the Mississippi Baptist Medical Hospital (MBMH) in Jackson, MS during Hurricane Katrina. The MBMC did not shut down during the 57 hours Jackson was without power due to the CHP system installed 15 years ago. On the poster is a list of MSU and NCSU IAC assessments in which CHP recommendations were made.

The MSU IAC and Department of Mechanical Engineering partnered with GA, NC, MS State Energy Offices, NCSU and GA. Tech IAC's and Universities in a funding opportunity titled State Partnerships to Accelerate Industrial Energy Efficiency and "Save Energy Now". The Industrial State Special Project [Funding Opportunity Announcement DE-PS36-06GO96026] was submitted and awarded (DOE said it was the best proposal of those submitted). The contract is for $300k and will be split evenly between GT, NC State, and MS State. MSU will receive $100,000 plus $30,000 additional dollars from The Bagley College of Engineering ($25K) and Eka Chemical ($5K). The grant will run from October/2006 – March/2008. Mississippi State University (MSU IAC) will help sponsor process heat and steam training and host a regional technology forum on new and emerging industrial process technologies inviting facilities with SIC Codes 26, 28, and 29 representing Paper & Allied Products, Chemicals & Allied Products, and Petroleum Refining & Related Industries, respectively, from the geographic regions of Mississippi, West Alabama, West Tennessee, and Southeast Arkansas (service area for the MSU Industrial Assessment Center at the time the proposal was submitted). The training will focus on ITP suite of Best Practices industrial systems training and tools using Qualified

Best Practices Instructors to promote information and access to information that will assist these industrial facilities in saving energy. To raise awareness about new and emerging process technologies that have demonstrated significant saving potential ITP Technology Portfolio Managers will be utilized in the forum.

TASK 6: Other tasks or special projects, as needed, and as determined by DOE to be advantageous to the program and in furtherance of IAC Program goals.

Ken York, staff engineer for the MSU IAC, wrote a paper for a graduate level class on uncertainty analysis regarding the use of the TRACE 700, *A* Building Heating and Cooling Simulation Software, for IRS Project.

Chris Emplaincourt, an assistant director for the MSU IAC, developed promotional material for the *CHP Center SE*.

The IAC is included as an assist group in the Southeastern Regional Combined Cooling, Heating, and Power Application Center Research Project (CHPCenterSE)
DOE Funded.

Dr. B.K. Hodge (Director of the MSU IAC) and Mary C. Emplaincourt (Assistant Director of the MSU IAC) submitted a STAC proposal on July 15, 2005 through the Mississippi Development Authority to install a gas turbine at Eka Chemicals to utilize hydrogen currently being vented into the atmosphere. The STAC proposal included the following participants: Eka Chemical, MDA and its equivalent in the state of Washington, Washington State University, North Carolina State University, TVA, and EPRI. The proposal was to purchase and install a hydrogen-fuelled combustion turbine with a heat recovery steam generator (HRSG) for utilization of the excess hydrogen (presently being vented into the atmosphere) at the Columbus, MS, Eka Chemical facility. The electrical output from the equipment will be used to offset the purchased electricity and capture the turbine exhaust for steam production. Additionally, in the proposal Eka Chemical is deeding for five years I acre of land, as well as, supplying hydrogen at their site for entities involved with hydrogen research and needing a hydrogen source. The budget summary is as follows:

Cash contributions: $6,015,000
In-kind contributions: $354,690
STAC contribution: $1,508,634

(Cash and in-kind)/STAC = 4.22

The President of MSU funded a special project in which the MSU IAC students were asked to assess one of the newer engineering research buildings on campus to determine the energy efficiency of the operation. This task was asked in response to the high energy costs MSU was receiving in its billing. Also the assessment was to serve as a pilot for the Maintenance Dept. of the MSU to use as they assessed other buildings on campus. We proposed three options and one option was the one the President was interested in implementing.

<u>Night and Weekend Setback Option Adopted</u>

Occupied set point (M-F: 8:00 a.m. to 10:00 p.m.; weekend 8:00 a.m. to 5:00 p.m.): 72 degrees F
Unoccupied drift point: summer – 85 degrees F, winter – 60 degrees F

Electric Savings = 21% of electric bill = $36,750/yr
Natural Gas Savings = 44% of gas bill = $10,350/yr

Two IAC students designed an automated system to wash gourds for technical elective credit ---the design is an outgrowth of a recommendation made to an IAC client Knud Neilson (MS-0281) in Evergreen, Alabama.