Industrial Assessment Center (IAC) at Arizona State University

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Currently, there are 28 IACs throughout the USA.
Enable manufacturers to *reduce costs* through:

- increasing energy efficiency
- improving waste management (including water use reduction)
- improving productivity

All at *no charge* to the manufacturer.
History of the IAC National Program

Industrial Assessment Centers

Energy and Cost Saving Assessments for Small and Medium-sized US Manufacturers

The USDOE Industrial Assessment Centers (IAC) are teams of university-based faculty and student engineers that provide no-cost energy, productivity, and waste assessments to small and medium sized US manufacturers nationwide.

After the site visit, a comprehensive report is developed that provides specific details on all cost-saving opportunities identified during the assessment, including applicable rebates and incentives.

The IAC program has already conducted over 17,749 assessments with more than 134,649 associated recommendations.

Average recommended yearly savings is $136,088.

- Started in 1976 by the US Dept of Commerce
- Moved to US Dept of Energy in 1978
- Funded by US DOE Advanced Manufacturing Office

Source: https://iac.university/#history
Version 1.0 (1990 – 2006)

- Performed 433 assessments throughout Arizona and in the Las Vegas area
- 3,563 total recommendations (8.1/assessment)
- 1,358 total implemented recommendations (3.1/assessment)

<table>
<thead>
<tr>
<th>Type of Recommendation</th>
<th>Average Recommended Savings Per Assessment</th>
<th>Average Implemented Savings Per Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>$63,477</td>
<td>$18,534</td>
</tr>
<tr>
<td>Waste</td>
<td>$2,993</td>
<td>$1,057</td>
</tr>
<tr>
<td>Productivity</td>
<td>$85,742</td>
<td>$15,761</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td><strong>$152,212</strong></td>
<td><strong>$35,352</strong></td>
</tr>
</tbody>
</table>

Source: https://iac.university/statistics
History of the ASU IAC (Part 2)

Version 2.0 (2017 – 2021) & Beyond?

- Competed for new award (~$1.5M total for 5 years)
- 13 assessments in Year 1 (through Sep 30, 2017)
- 20 assessments/year afterwards

https://iac.engineering.asu.edu/
How An Assessment Is Conducted

- Determine eligibility
- Obtain utility bills
- Conduct on-site assessment
  - Typically 1 day
- Generate recommendations for the facility
- Research and analyze recommendations
  - Generate simple payback for each recommendation
- Deliver confidential report within 60 days, outlining recommendations and their paybacks.
- Follow up 6 to 9 months later on implementation status
During the Assessment: Facility Tour
During the Assessment: Recording Data
During the Assessment: Measurements

Measurement Capabilities:

- Dataloggers for current, voltage, temperature, relative humidity
- Infrared temperature (laser and camera)
- Combustion emissions
- Light intensity
During the Assessment: Brainstorming

Read more at https://fullcircle.asu.edu/outreach/asu-center-helps-arizona-southwest-manufacturers-improve-energy-efficiency/
Typical Recommendations

**Energy**
- Compressed Air
- Motors
- HVAC
- Process Heating
- Steam Systems

**Productivity**
- Bottlenecks
- Process layout
- Training
- Scheduling

**Waste**
- Recycling
- Replace solvents
- Reduce trash or change trash pickup
ASU’s Top Ten Assessment Recommendations (4/10/2017)

<table>
<thead>
<tr>
<th>ARC</th>
<th>Description</th>
<th>Rec'd</th>
<th>Average Savings</th>
<th>Average Cost</th>
<th>Average Payback</th>
<th>Imp Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>UTILIZE HIGHER EFFICIENCY LAMPS AND/OR BALLASTS</td>
<td>435</td>
<td>$6,500</td>
<td>$10,582</td>
<td>2.7</td>
<td>44.8%</td>
</tr>
<tr>
<td>2</td>
<td>USE MOST EFFICIENT TYPE OF ELECTRIC MOTORS</td>
<td>293</td>
<td>$3,532</td>
<td>$5,693</td>
<td>2.3</td>
<td>53.7%</td>
</tr>
<tr>
<td>3</td>
<td>ELIMINATE LEAKS IN INERT GAS AND COMPRRESSED AIR LINES/ VALVES</td>
<td>224</td>
<td>$6,442</td>
<td>$979</td>
<td>0.4</td>
<td>72.6%</td>
</tr>
<tr>
<td>4</td>
<td>REDUCE THE PRESSURE OF COMPRESSED AIR TO THE MINIMUM REQUIRED</td>
<td>193</td>
<td>$3,221</td>
<td>$542</td>
<td>0.3</td>
<td>42.6%</td>
</tr>
<tr>
<td>5</td>
<td>INSTALL OCCUPANCY SENSORS</td>
<td>172</td>
<td>$1,148</td>
<td>$2,193</td>
<td>2.7</td>
<td>23.1%</td>
</tr>
<tr>
<td>6</td>
<td>USE MORE EFFICIENT LIGHT SOURCE</td>
<td>142</td>
<td>$2,237</td>
<td>$3,241</td>
<td>2.1</td>
<td>39.0%</td>
</tr>
<tr>
<td>7</td>
<td>REPLACE EXISTING HVAC UNIT WITH HIGH EFFICIENCY MODEL</td>
<td>135</td>
<td>$7,355</td>
<td>$12,312</td>
<td>2.1</td>
<td>38.7%</td>
</tr>
<tr>
<td>8</td>
<td>UTILIZE ENERGY-EFFICIENT BELTS AND OTHER IMPROVED MECHANISMS</td>
<td>127</td>
<td>$2,338</td>
<td>$62</td>
<td>0.0</td>
<td>56.6%</td>
</tr>
<tr>
<td>9</td>
<td>USE MULTIPLE SPEED MOTORS OR AFD FOR VARIABLE PUMP, BLOWER AND COMPRESSOR LOADS</td>
<td>115</td>
<td>$15,933</td>
<td>$19,888</td>
<td>2.1</td>
<td>25.0%</td>
</tr>
<tr>
<td>10</td>
<td>USE A LESS EXPENSIVE METHOD OF WASTE REMOVAL</td>
<td>97</td>
<td>$3,911</td>
<td>$279</td>
<td>0.1</td>
<td>39.3%</td>
</tr>
</tbody>
</table>

Sorted by the number of times recommended
ASU’s Top Ten Assessment Recommendations (4/10/2017)

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<tr>
<th>ARC</th>
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<th>Average Cost</th>
<th>Average Payback</th>
<th>Imp Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.4410</td>
<td>INSTALL AUTOMATIC PACKING EQUIPMENT</td>
<td>11</td>
<td>$453,925</td>
<td>$420,992</td>
<td>1.3</td>
<td>27.3%</td>
</tr>
<tr>
<td>4.1120</td>
<td>REPLACE OLD MACHINE WITH NEW AUTOMATIC MULTI-STATION TOOL</td>
<td>5</td>
<td>$408,920</td>
<td>$175,684</td>
<td>0.6</td>
<td>25.0%</td>
</tr>
<tr>
<td>4.6520</td>
<td>REPLACE EXISTING EQUIPMENT WITH MORE SUITABLE SUBSTITUTES</td>
<td>15</td>
<td>$393,211</td>
<td>$32,658</td>
<td>1.7</td>
<td>30.6%</td>
</tr>
<tr>
<td>2.3416</td>
<td>USE COMBINED CYCLE GAS TURBINE GENERATOR SETS WITH WASTE HEAT BOILERS</td>
<td>5</td>
<td>$336,851</td>
<td>$782,000</td>
<td>3.9</td>
<td>20.0%</td>
</tr>
<tr>
<td></td>
<td>CONNECTED TO TURBINE EXHAUST</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.3415</td>
<td>USE A FOSSIL FUEL ENGINE TO COGENERATE ELECTRICITY OR MOTIVE POWER; AND</td>
<td>23</td>
<td>$202,284</td>
<td>$756,094</td>
<td>4.9</td>
<td>13.0%</td>
</tr>
<tr>
<td></td>
<td>UTILIZE HEAT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.6110</td>
<td>BEGIN A PRACTICE OF PREDICTIVE / PREVENTATIVE MAINTENANCE</td>
<td>8</td>
<td>$152,269</td>
<td>$26,031</td>
<td>0.2</td>
<td>60.0%</td>
</tr>
<tr>
<td>4.3220</td>
<td>ELIMINATE OLD STOCK AND MODIFY INVENTORY CONTROL</td>
<td>8</td>
<td>$146,706</td>
<td>$19,430</td>
<td>1.7</td>
<td>71.4%</td>
</tr>
<tr>
<td>2.3212</td>
<td>OPTIMIZE PLANT POWER FACTOR</td>
<td>6</td>
<td>$145,037</td>
<td>$1,080,458</td>
<td>2.1</td>
<td>0.0%</td>
</tr>
<tr>
<td>4.4510</td>
<td>ADD ADDITIONAL PRODUCTION SHIFT</td>
<td>5</td>
<td>$143,624</td>
<td>$12,055</td>
<td>0.3</td>
<td>60.0%</td>
</tr>
<tr>
<td>4.7110</td>
<td>INITIATE A TOTAL QUALITY MANAGEMENT PROGRAM</td>
<td>6</td>
<td>$114,401</td>
<td>$5,321</td>
<td>0.2</td>
<td>80.0%</td>
</tr>
</tbody>
</table>

Sorted by the average savings

Source: https://iac.university/searchRecommendations
### Some Implemented Water-Related Recommendations (ASU)

<table>
<thead>
<tr>
<th>Description</th>
<th>Type of Plant</th>
<th>Savings</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>MINIMIZE BOILER BLOWDOWN WITH BETTER FEEDWATER TREATMENT</td>
<td>Pharmaceuticals</td>
<td>$2,518</td>
<td>$5,000</td>
</tr>
<tr>
<td>REDUCE WATER USE WITH COUNTER CURRENT RINSING</td>
<td>Brass Door Locks</td>
<td>$24,214</td>
<td>$900</td>
</tr>
<tr>
<td>TREAT AND REUSE RINSE WATERS</td>
<td>Cardboard Boxes; Corrugated Containers; Bottled Soft Drinks</td>
<td>$12,448 (ave)</td>
<td>$867 (ave)</td>
</tr>
<tr>
<td>MINIMIZE WATER USAGE</td>
<td>Juice Bottling</td>
<td>$3,515</td>
<td>$0</td>
</tr>
<tr>
<td>ELIMINATE LEAKS IN WATER LINES AND VALVES</td>
<td>Newspapers</td>
<td>$830</td>
<td>$200</td>
</tr>
<tr>
<td>USE FLOW CONTROL VALVES ON EQUIPMENT TO OPTIMIZE WATER USE</td>
<td>Pasta Food Products</td>
<td>$1,648</td>
<td>$30</td>
</tr>
<tr>
<td>RECYCLE WHITE WATER</td>
<td>Manufactured Homes</td>
<td>$14,029</td>
<td>$500</td>
</tr>
</tbody>
</table>

Source: [https://iac.university/searchRecommendations](https://iac.university/searchRecommendations)
Qualifications for a Free Assessment

- Standard Industrial Code between 2000-3999 (i.e. manufacturing/industrial)
- Gross annual sales less than $100,000,000
- Annual energy bills between $100,000 and $2,500,000
- Fewer than 500 employees on site

Note: some exceptions (up to 2 per year) are allowed.
We’re **always** looking for new clients!

**Partners**
- RevAZ/Arizona Commerce Authority (NIST Manufacturing Extension Partnership for Arizona)
- Nevada Industry Excellence (same for Nevada)
- Lincus, Inc. (ESCO serving Arizona, California)
- Others?

**Marketing Approaches**
- Cold calling, mailing, Google ad
- Suggestions?
Manufacturing Education at ASU

We’re developing a new undergraduate certificate in Clean Energy Manufacturing:

- Energy Management Course offered Fall 2017
  - Undergraduate/Graduate
  - ISO 50001 Energy Management Standard
- Joint applied project class between engineering/business
- New MS in Manufacturing Engineering

Are there other educational programs that ASU can develop that would help you?
New Proposed Effort with Communities


Recently submitted proposal to US National Science Foundation ($1M total for 3 years)

Goal: develop online platform to report/predict electricity consumption at block, neighborhood, and city scale

Current partner communities: Tempe, Mesa, Avondale, Boston, Washington DC
Integrated Strategies to Eliminate Food, Energy, and Water Waste in the Supply Chain of Fresh Agricultural Products

Recently submitted proposal to US National Science Foundation ($2.5M total for 3 years)

Goal: reduce waste for fresh fruits and vegetables, thereby reducing energy & water consumption

Principal Investigator: Professor Rene Villalobos, ASU Industrial Engineering
Current IAC Staff

Director: Professor Rene Villalobos, ASU Industrial Engineering

Assistant Director: Professor Pat Phelan, ASU Mech & Aero. Engineering

Manager: Jon Sherbeck, P.E.

Lead Student: Nick Fette, PhD student in mechanical engineering

Plus a team of undergraduate and graduate engineering students, and an undergraduate marketing student

For more information please contact Pat Phelan at phelan@asu.edu, call the IAC at (480)727-6098, or fill out the online form at https://iac.engineering.asu.edu/.