Guidebook to Energy-Related Resources for the Food Industry
Guidebook to Energy-Related Resources for the Food Industry

Coordinated by:

October 2005
ACKNOWLEDGEMENTS

Many people have contributed to the creation and publishing of this document. Special thanks are extended to the individuals and companies noted below.

- Iowa Energy Center, Ames, especially Bill Haman, P.E., Industrial Program Manager.
- Industrial Assessment Center at Iowa State University, Ames.
- Anderson Erickson, Des Moines, especially Norm Dostal, Frank McDowell, and Bruce Schultz for allowing the project team to visit their site while developing the refrigeration section.
- General Mills, Cedar Rapids, especially John Burgess, Paul Lemke, Greg Godsey, and Mark Hindman for allowing the project team to visit their site while developing the materials for the steam section.
- Tyson, Waterloo Complex especially Tim Schelle and Ed Albert (and Angela Wakeland in Madison, NE) for allowing the project team to visit their site while developing the steam and refrigeration sections.
- George Briley, Technicold Services, Inc., San Antonio, TX for his contributions to the refrigeration section.
- Kelly Paffel, Plant Support & Evaluation, Inc., Naples, FL for his contributions to the steam section.
- Ronald Cox, Director CIRAS, Iowa State University Extension
- Alexandre Kisslinger Rodrigues, CIRAS, Iowa State University Extension.
- Tim Sullivan, CIRAS, Iowa State University Extension.
1. Introduction

DEFINITION OF FOOD PROCESSING
Food processing is defined as converting edible raw materials into higher value consumer food products. The conversion process utilizes significant amounts of labor, machinery, and energy. In addition, it relies increasingly on scientific knowledge to both improve food quality and safety, and to reduce production costs.

ENERGY CONSUMPTION
Food processing is an energy intensive activity. In 1998, it consumed 7%—more than 213 trillion Btu—of the total electricity used nationwide by the manufacturing sector.

According to the American Council for an Energy Efficient Economy, less than 8% of the energy used by manufacturing is for non-process uses such as facility heating/cooling, lighting, ventilation, etc. Therefore, managers who want to reduce energy costs must focus on process-related uses.

PURPOSE OF THIS PUBLICATION
This Guidebook is an excerpt of a larger publication, Energy-Related Best Practices: A Sourcebook for the Food Industry, which was funded by a grant from the Iowa Energy Center. The purpose of that publication is to introduce food processors to money-saving best practices as well as to identify resources that can be of assistance in helping food processors manage their energy costs.

The Sourcebook contains nine chapters: Introduction; Energy Management; Energy Cost Structure; Mixing; Separation; Drying; Process Heating; Refrigeration; and Industrial Air Handling. There are also appendices that provide information on: Steam; Lighting; Compressed Air; and, Motors and Pumps/Fans. Each chapter and appendix concludes with a section that identifies resources for food processors. All of the resources are consolidated into a final appendix, which is reprinted here for easy dissemination to the Food Industry.

To obtain the publication, Energy-Related Best Practices: A Sourcebook for the Food Industry, visit the webpage www.ciras.iastate.edu/publications/EnergyBP-FoodIndustry/ or contact CIRAS office in Ames by phone at (515) 294.3420.


ASME B31.1, Power Piping.


The U.S. Department of Energy maintains an extensive listing of publications and articles that provide information on best practices and standards. These publications can be found in a publications library site (www.oit.doe.gov/bestpractices/library.shtml).
ON-LINE TOOLS
Alliance to Save Energy: www.ase.org
Bonneville Power Administration: www.bpa.gov
The Carbon Trust: www.thecarbontrust.co.uk
   Publications: www.thecarbontrust.co.uk/energy/pages/publication_search.asp
Compressed Air Challenge: www.compressedairchallenge.org
Earle, R.L., Unit Operations in Food Processing:
   www.nzifst.org.nz/unitoperations/index.htm
Energy Information Bridge: www.osti.gov/bridge
Energy Manager Training: www.energymanagertraining.com/new_index.php
Energy Services, Energy Solutions Database: www.energyexperts.org/energy_solutions
Food Engineering: The Magazine for Manufacturing Management:
   www.foodengineeringmag.com
Gartner Refrigeration and Manufacturing: www.gartner-refrig.com
   Tips and Tools: www.gartner-refrig.com/resources/tips.asp
   Downloads: www.irc.wisc.edu/software/downloads.php
   Publications: www.irc.wisc.edu/publications/
Ingersoll Rand, (2001), Air Solutions Group: Compressed Air Systems Energy Reduction
   Basics: www.air.ingersoll-rand.com/NEW/pedwards.htm
Lawrence Berkeley National Laboratory, The Energy Analysis Department:
   http://eetd.lbl.gov/EA.html
Oak Ridge National Laboratory (ORNL) – Buildings Technology Center:
   www.ornl.gov/sci/btc/apps
   Building Envelopes Program: www.ornl.gov/sci/roofs+walls/
      Insulation Fact Sheet: www.ornl.gov/sci/roofs+walls/insulation/ins_01.html
Online Chemical Engineering Information, Pinch Technology: Basics for Beginner:
   www.cheresources.com/pinchtech1.shtml
Singh, Paul, Teaching Resources: Animation:
   www.rpaulsingh.com/animated%20figures/animationlist.htm
Spirax Sarco Learning Center:
   www.spiraxsarco.com/learn/default.asp?redirect=html/3_13_01.htm
Steaming Ahead: www.steamingahead.org
www.eere.energy.gov
Building Technologies Program: www.eere.energy.gov/buildings
   Information Resources: www.eere.energy.gov/buildings/info/publications.html
Energy Savers: www.eere.energy.gov/consumerinfo
Energy Information Bridge: www.osti.gov/bridge
Industrial Technologies Program: www.eere.energy.gov/industry
   BestPractices: www.oit.doe.gov/bestpractices
      Compressed Air: www.oit.doe.gov/bestpractices/compressed_air
      Energy Matters:
         www.oit.doe.gov/bestpractices/energymatters/energy_matters.shtml
      Fact Sheets: www.oit.doe.gov/factsheets/fact_other.shtml
      Motors: www.oit.doe.gov/bestpractices/motors
      Plant-Wide Assessments: www.oit.doe.gov/bestpractices/assessments.shtml
      Process Heating: www.oit.doe.gov/bestpractices/process_heat
      Tools and Publications: www.oit.doe.gov/bestpractices/pubs.shtml
         EERE Information Center: 1-877-EERE-INF or eereic@ee.doe.gov
         Publications Library: www.oit.doe.gov/bestpractices/library.shtml
         • Technical Publications
         • Case Studies
         • Plant-Wide Assessment Summaries
         • Energy Matters
         • Training Materials
         • Library Links
   Software Tools: www.oit.doe.gov/bestpractices/software_tools.shtml
      • AIRMaster+
      • Fan System Assessment Tool (FAST)
      • MotorMaster+
      • MotorMaster+ International
      • NOx and Energy Assessment Tool (NxEAT)
      • Process Heating Assessment and Survey Tool (PHAST)
      • Pumping System Assessment Tool (PSAT)
      • Steam System Tool Suite
         - Steam System Scoping Tool (SSST)
         - Steam System Assessment Tool (SSAT)
         - 3EPlus
      • Decision Tools for Industry
      • ASDMaster: Adjustable Speed Drive Evaluation Methodology and Application
      Steam: www.oit.doe.gov/bestpractices/steam
Simply Insulate: www.simplyinsulate.com
ORGANIZATIONS
Alliance to Save Energy: www.ase.org
American Council for an Energy Efficient Economy: www.aceee.org
American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE): www.ashrae.org
Association of Energy Engineers: www.aeecenter.org
Boiler Efficiency Institute: www.boilerinstitute.com
British Compressed Air Society: www.britishcompressedairsociety.co.uk
The Carbon Trust: www.thecarbontrust.co.uk/energy
Centre for Analysis and Dissemination of Demonstrated Energy Technologies (CADDET): www.caddet.org
Council of Industrial Boiler Owners (CIBO): www.cibo.org
Energy User News: www.energyusernews.com
Food and Drink Federation, Voice of the UK Food and Drink Manufacturing Industry: www.fdf.org.uk/home.aspx
Gas Research Institute: www.gri.org
The Industrial Refrigeration Consortium: www.irc.wisc.edu
International Energy Agency: www.iea.org
International Institute of Ammonia Refrigeration: www.iiar.org
Iowa Energy Center: www.energy.iastate.edu
Iowa State University Industrial Assessment Center (IAC): (515) 294-3080 or www.me.iastate.edu/iac
Lawrence Berkeley National Laboratory, The Energy Analysis Department, National: http://eetd.lbl.gov/EA.html
National Electrical Manufacturers Association: www.nema.org
Sustainable by Design: www.susdesign.com
Technical Information Services: www.ntis.gov
United Kingdom Energy Efficiency: www.etsu.com
Coordinated by:

The Center for Industrial Research and Service (CIRAS) works with Iowa State University Extension and the College of Engineering to enhance the performance of Iowa industry. This is accomplished by providing research, education and technical assistance in the areas of engineering, management, procurement, productivity and quality.

Center for Industrial Research and Service (CIRAS)
2272 Howe Hall, Suite 2620
Ames, IA 50011

For questions regarding manufacturing and industry contact:
CIRAS
(515) 294-3420
www.ciras.iastate.edu

Sponsored by:

The Iowa Energy Center is dedicated to improving Iowa’s energy efficiency and use of renewable energy through research, demonstration, and education. The Energy Center develops in-house energy-related research and education programs and sponsors energy projects developed by other groups. The Energy Center also administers the Alternate Energy Revolving Loan Program.

2521 Elwood Drive, Suite 124
Ames, Iowa 50010
www.energy.iastate.edu