Welcome to the Dairy Energy Symposium

March 2-5, 2005

Sponsored By:
The Midwest Rural Energy Council
Hoard's Dairyman
Wisconsin Focus on Energy
University of Wisconsin, University of Minnesota and Iowa State Cooperative Extension

Modernizing your Dairy

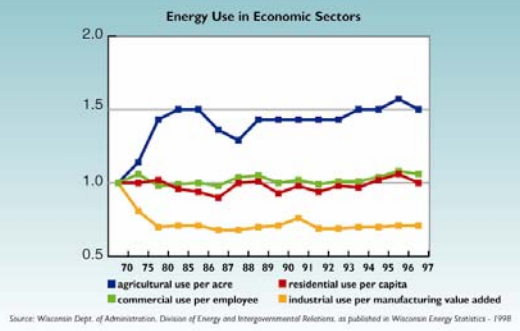
The Dairy Farm Of The 21st Century
Electrical And Information Technologies
The Dairy Farm As Electrical Energy Generator

Douglas J. Reinemann
Professor of Biological Systems Engineering
University of Wisconsin-Madison
Milking Research and Instruction Laboratory

Electrical Technologies

- Improved Control Systems
- Improved Energy Efficiency
- Monitoring Electrical Devices

Wisconsin Energy Efficiency, 70-97



Source: Wisconsin Dept. of Administration, Division of Energy and Intergovernmental Relations, as published in Wisconsin Energy Statistics - 1998

Information Technologies

- Cost of Data Collection will go down
- Ability to process data will improve
- Improved Monitoring of
  - Cows
  - People
  - Equipment

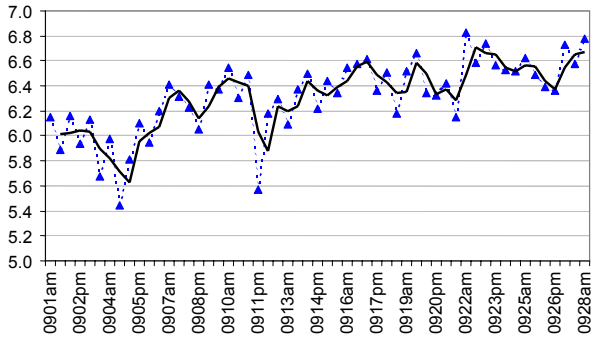
Cow ID

- Animal Identification Required
  - Implantable?
- Know Where Every Cow Is All Times
  - RF Cow Location
  - GPS Locators
- Enormous Data Streams
  - Feeding Behavior/production
  - Estrus
  - Lameness
  - Animal Health

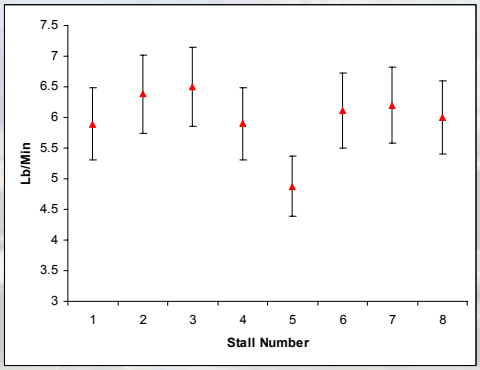
Monitoring Milking Performance

- The Machine
  - Vacuum Level
  - Pulsators
  - Milk meters
  - Conductivity Probes
- The Operators
  - Cow Prep
  - Prep / Lag
  - Attachment Routine
  - Manual Detach
  - Reattachment
  - Slips and Falloffs

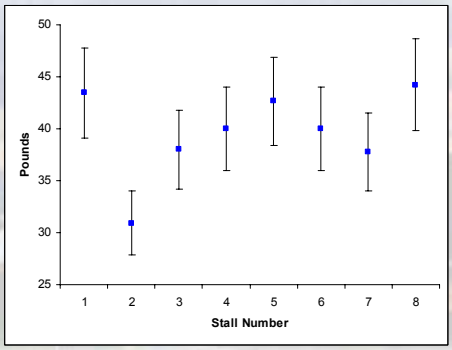
Assessing Pre-Milking Stimulation
Average Milk / Time (Lb/min)



Low Flow Rate at One Stall:
Detacher setting, Bad Pulsator, Pinched Hose, etc.…



Low Milk Yield at one stall:
1. Bad Meter 2: Other machine problem



Cow Behavior, Milk Flow, and Milk Production

- AMS user survey says that farmers use:
  - Deviation in daily milk yield (compared to a rolling average for individual cows)
  - Deviation in milking interval (time since last successful milking)
  - as much or more than milk conductivity as a flag for visual inspection of cows
- Monitoring quarter milk flow is an aid to detecting udder health problems
  - Quarters with a high maximum milk flow had a greater risk of infection

On-Line Milk Quality Sensors HACCP monitoring of the food supply

- Automated SCC sensors
  - Cow-side automatic CMT
  - Cow-Side SCC counter
- Hormone, antibiotic, pathogen detectors
- Milk components for nutritional management

The Future
Smart Software

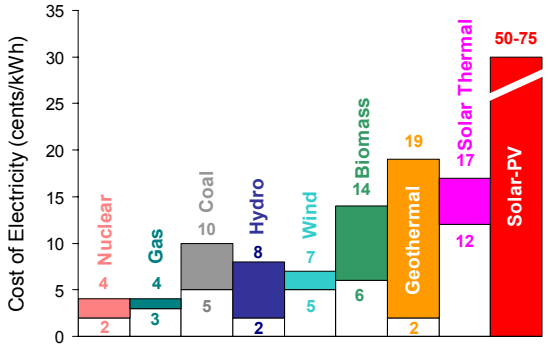
- Process Multiple Data streams
- Milk yield
- Milk Composition
- Animal Behavior
- Milking Machine Performance
- Monitor Energy use
- other Equipment performance

Opportunities for Production Ag as Energy Producer

- The Farm Bill is really the Farm Security and rural investment act
  - Repopulation of "rural" communities
- Rural location advantages
  - Transportation of biomass puts plants in rural communities
  - Anaerobic Digestion with combined feed streams
- Biodiesel, ethanol and liquid fuels and energy crops
  - New/expanding markets is the driver for traditional commodities
  - Grain and oil seed byproducts from energy production goes into animal agriculture
- Wind and solar
  - Favorable sites with minimal public opposition

Cost of Electricity

(Global Average) (¢/kWh)



Environmental Impacts: Area Requirements

(km^2 / MW)