Milk Transport Security Project
"The Tanker of Tomorrow"
AL Food Safety & Defense Conference
May 13, 2008

Chris Thompson, Milk Coordinator, Regulatory Services
University of Kentucky, College of Agriculture

Homeland Security Project

- **National Institute for Hometown Security**
  - **Non-profit R & D organization**
- **Kentucky Homeland Security Consortium**
  - **Kentucky's public and private universities**
  - **Call for proposals Spring of 2005**

Desirable Projects

- **Multiple KY universities**
- **Collaborate with KY companies**
- **Not** "invent" **but** "develop"
- **Impact the lives of "real people"**
- **Positively impact security**

A Wireless Electronic System for Securing Milk from Farm to Processor

Dr. Fred Payne – Professor, BAE, University of Kentucky
Mr. Chris Thompson – Milk Coordinator, UK Regulatory Services
Dr. Tim Stombaugh – Professor, BAE, University of Kentucky
Dr. Phil Womble – Professor, API, Western Kentucky University
Dr. Suraj Alexander – Professor, Industrial Engr., University of Louisville

Project: $1,500,000 (UK ~1.0; WKU ~0.3; UL ~0.2)
Duration: 3 years (2006, 2007, 2008)

The National Infrastructure Protection Plan (NIPP) Identifies 17 Sectors That Will Be Protected

- **Agriculture, Food**
- Public Health, Healthcare
- Drinking Water, Wastewater Treatment Systems
- Energy
- Banking and Finance
- National Monuments, Icons
- Defense Industrial Base
- Information Technology
- Telecommunications
- Chemical
- **Transportation Systems**
- Emergency Services
- Postal and Shipping
- Dams
- Government Facilities
- **Commercial Facilities**
- Nuclear reactors, materials, waste

Most of the U.S. Infrastructure is privately owned

Why Bulk Food? Why Dairy?

- U.S. Department of Homeland Security (DHS) has targeted bulk food contamination because it poses a high consequence health threat

- The four features of milk that pose concerns:
  - Bulk milk's large batch size
  - Accessibility
  - Thorough mixing during processing
  - Rapid turnaround at retail and
  - Rapid consumption

Security of Milk Transport in the U.S.

John A. Volpe National Transportation Systems Center

Summer of 2004 Report

Security of Milk Transport in the U.S.

John A. Volpe National Transportation Systems Center

Volpe identified security concerns

- Labor intensive
- Paper intensive
- Prone to errors
- Security??
- Accountability??

Terminology

- **Security:** something not only *is secure* but that it *has been secured*. Includes measures that prevent or deter unauthorized individuals from accessing a facility, resource or vessel.
- **Accountability:** the traceability of actions performed on a system i.e. the use of unique identifiers and authentications supports accountability.
- **Surveillance:** the monitoring of activities or behavior… verification, identification…

Project Objective

- **Develop a Milk Transport Security System that will provide assurance that the milk, milk samples and security data are securely transported between the dairy farm and milk plant**
- **Demonstrate a wireless electronic security system at two milk plants and multiple dairy farms**

Project Objective

- **Deliver the technology to the national community through collaborations, technical conferences, publications and standards**

Functional Requirements

- **Provide "Secure Transport" of milk**
- **Operate with the current U.S. milk transport infrastructure**
- **Physically store the milk data and security data with the milk transport tank**
- **Provide redundant milk data and security data storage**
- **Adaptable to "differences" in bulk milk marketing and transportation systems**

Other Bulk Food Transport Applications

- **Fruit juices and concentrates**
- **High Fructose Corn Syrup**
- **Food grade oils**
- **Others…**

A Wireless Electronic System for Securing Milk from Farm to Processor

Security Protocol's attributes

- Who
- What
- Why
- When
- Where

What Are the Drivers for This Type of System?

- Food Safety, food defense
- Economic concerns
- Corporate demands

The Public Has a Great Deal of Interest!

Will There Be More Stringent Security Requirements in the Future?

HHS Deputy Secretary Tevi Troy; FDA Commissioner Andrew C. von Eschenbach & FDA Assistant Commissioner for Food Protection, David Acheson, M.D. announce FDA's integrated strategy for protecting the food supply.

November 6, 2007

Security System Challenges

- Adaptable
  - Tanker designs
  - Farm and plant systems
  - Environmental stress
- Compliant with current requirements
- User friendly
- Cost effective

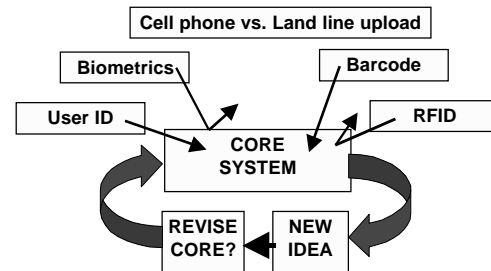## A Wireless Electronic System for Securing Milk from Farm to Processor

- Industry input
  - A. Wilson Trucking
  - Bluegrass Tank and Equipment
  - DFA Mideast
  - KY Dept. Public Health

A Wireless Electronic System for Securing Milk from Farm to Processor

  - Slayback Milk Transport
  - Southern Belle Dairy
  - Starr Stainless
  - Winchester Farms Dairy

The horrible truth behind whipped cream

System Development

Cell phone vs. Land line upload

Biometrics

Barcode

User ID

RFID

CORE SYSTEM

REVISE CORE? ◄ NEW IDEA

Approach Has Been Broad…

- Success means
  - Enhanced security
  - Adoption
- Business rationale for adoption
  - Deter pushback
  - Added value
  - Provide means to measure value
  - Provide enhanced value, time savings, cost avoidance
  - Provide all users with more information

Our Vision of the System Operations

Milk Transport Security System Design
Three Processors (computers)

PRINTER

DATA:
- DRIVERS
- DAIRY FARMS
- MILK PLANTS
- WASH STATIONS

DRIVER

WIRELESS BLUETOOTH

BARCODE

WIRELESS

WIRELESS

SECURITY MONITORING SYSTEM (SMS)

WIFI

HAND HELD DEVICE

CELLULAR

DATA SERVER

LOCKS
GPS
TEMPERATURE
USER INTERFACE

DRIVER

DATA USERS:
- MARKETING AGENCIES
- TRANSPORTATION CO.
- MILK PLANTS
- DAIRY PRODUCERS

Data entered by the Transportation Company

TABLES:
- Route
- Truck
- Hauler/Sampler
- Transport Tank
- Transport Company

Data entered by the Milk Marketing Agency

TABLES:
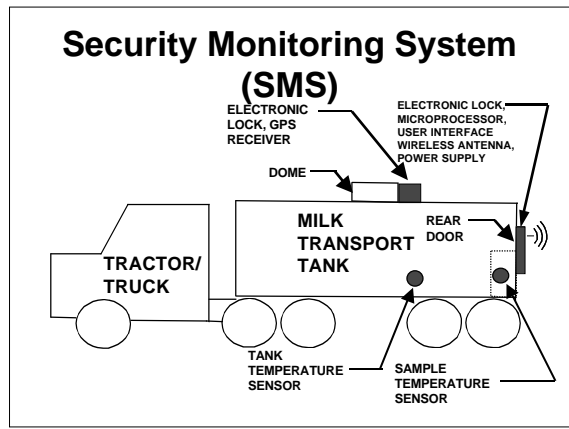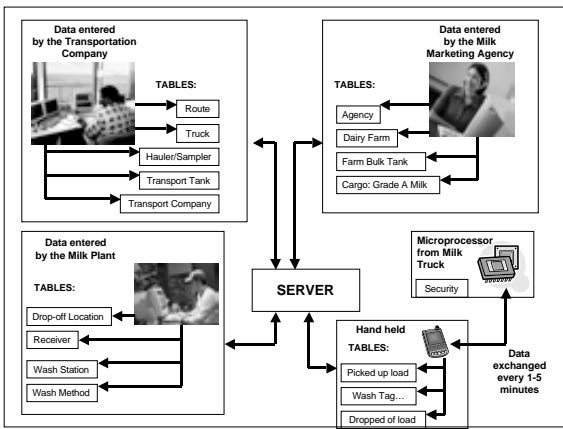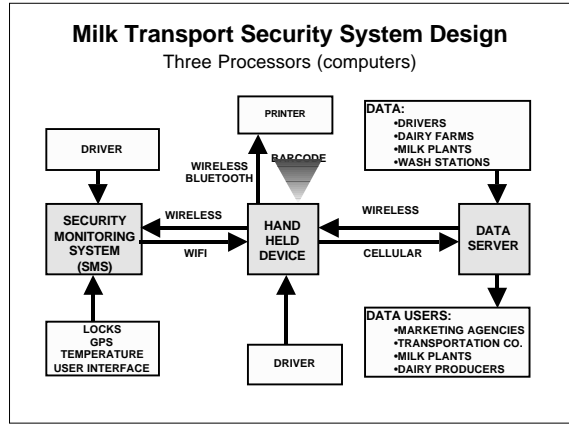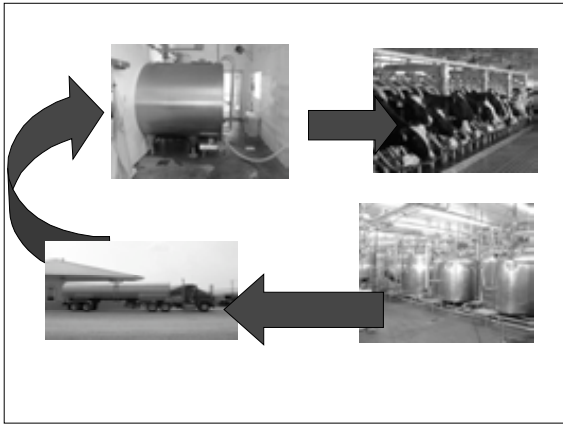- Agency
- Dairy Farm
- Farm Bulk Tank
- Cargo: Grade A Milk

SERVER

Data entered by the Milk Plant

TABLES:
- Drop-off Location
- Receiver
- Wash Station
- Wash Method

Microprocessor from Milk Truck

Security

Hand held
TABLES:
- Picked up load
- Wash Tag…
- Dropped of load

Data exchanged every 1-5 minutes

Security Monitoring System (SMS)

ELECTRONIC LOCK, GPS RECEIVER

ELECTRONIC LOCK, MICROPROCESSOR, USER INTERFACE WIRELESS ANTENNA, POWER SUPPLY

DOME

TRACTOR/ TRUCK

MILK TRANSPORT TANK

REAR DOOR

TANK TEMPERATURE SENSOR

SAMPLE TEMPERATURE SENSOR

Hand Held Device and Printer

Intermec CN3   **Zebra QL 220**

MILK TRANSPORT SECURITY SYSTEM DESIGN

WIRELESS (Bluetooth) COMMUNICATION

CELL PHONE COMMUNICATION

BARCODE READER

DATA SERVER

PRINTERS FOR SAMPLE LABELS AND MILK TICKET

MANUAL ENTRY OF MILK DATA

WIRELESS (WiFi)

HAND HELD DEVICE

BARCODE

MILK HAULER/ SAMPLER

BARCODE

TRACTOR/ TRUCK

BARCODE

MILK TRANSPORT TANK

SECURITY MONITORING SYSTEM

BARCODE

FARM BULK MILK TANK

September 12, 2007 Demonstration

Antenna
Screen
Keypad
Lock

SMS Dome Lock

WING NUT
GPS
LATCH DOG
LOCK
ELECTRONICS
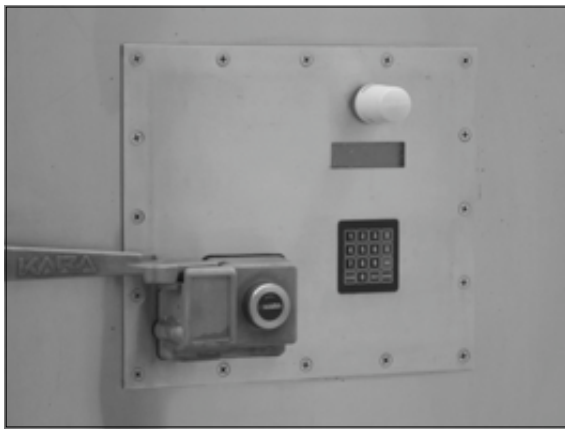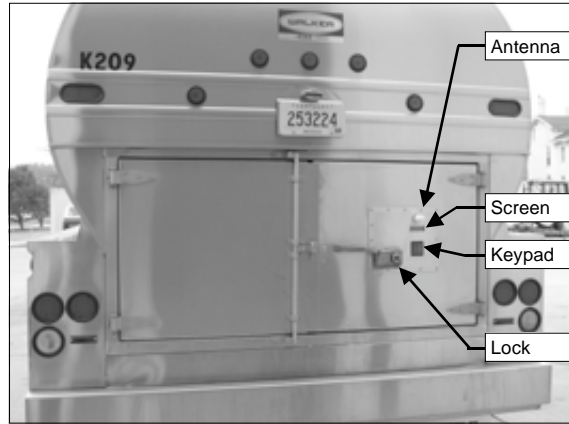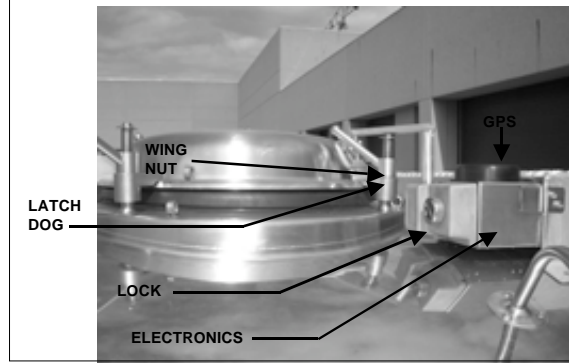
Handheld Device Screens

User friendly and intuitive…

Handheld Device Screens

TANK WASH CYCLE MONITORING

Quarantine Area for FMD

Project Schedule
- **Collaborators Meeting, January 26, 2006**
- **Collaborators Meeting, September 9, 2006**
- **System Defined, January 1, 2007**
- **Bench Scale System, May 26, 2007**
- **Prototype Installed August 4, 2007**
- **Prototype Demonstration, September 12-13, 2007**
- **Field Test 1 October/November 2007**
- **Field Test 2 February/May 2008**
- **Testing Complete June/July 2008**
- *The Demonstration Meeting October 9, 2008*
- **Project Completion December 31, 2008**

Demonstration Meeting
Thursday, October 9, 2008
Lexington, Kentucky

KEENELAND

Chris Thompson
Email: chris.thompson@uky.edu

Division of Regulatory Services
University of Kentucky
College of Agriculture
103 Regulatory Services Building
Lexington, KY 40546-0275

Phone: (859) 257-2785
Fax: (859) 323-9931
Web: www.rs.uky.edu