Smar International Corporation

# IndustrySolutions

Issue 001-06-03

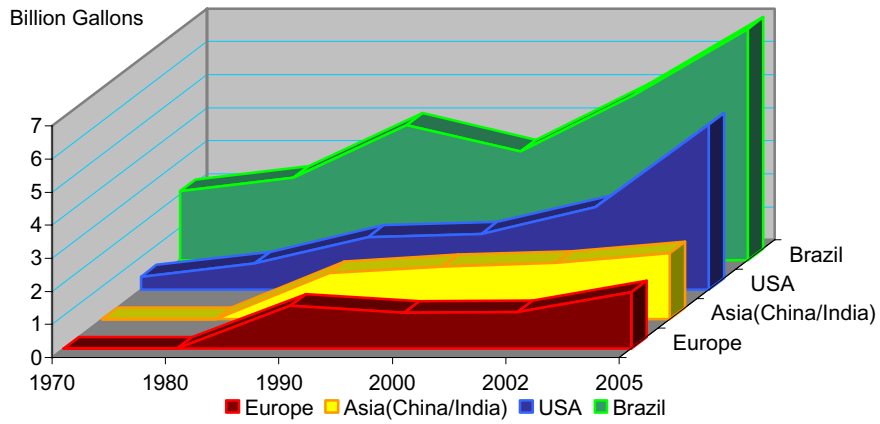
## ETHANOL INDUSTRY

North America is increasing the use of Ethanol as a substitute for the gasoline additive MTBE. As the cost effectiveness of this technology increases, industrial companies in the USA and Canada are becoming interested in commercializing the technology and producing ethanol from grain and/or biomass.

### World Ethanol Production and Growth

The Americas continue to be the world's leading ethanol production region, with no indication of change in the foreseeable future. Total production in 2003 is forecast to reach 8 billion gallons, which is 66% of the world output. The world leader in the past 30 years continues to be Brazil, with 5 billion gallons in the country's forecast for 2003. At the peak of ethanol production, Brazil had 40 to 60% of its vehicles fueled by ethanol (1984 to 2002). Total US production in 2003 is expected to reach 3 billion gallons, with projected spending of $4 billion.

During the rapid development of today's ethanol industry, Smar has established itself as a company that can provide a variety of automation and control solutions.




Forecast info: BBI-International/California Energy Commission/US. Department of Energy

***For over 30 years, Smar has developed products for the ethanol industry and has achieved the leadership position in this market. Smar is present in 85% of the South American alcohol plants, developing automation solutions for all stages of the production process.***

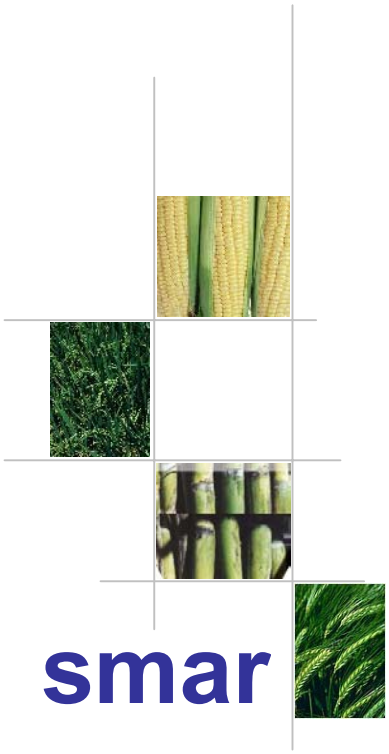
### FEEDSTOCK SOURCES

The majority of plants in the North American ethanol industry use corn as the feedstock for their production processes.

**All current plant expansions, plants under construction, and most plants in planning will use corn as the feedstock**.

Other alternative feedstock includes milo, cheese, whey, beverage and potato industry waste.

Some additional exceptions include projects planning to use barley and wheat, forestry and wood wastes, rice, straw and municipal wastes .



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# ETHANOL PLANT CONTROL SYSTEM DESIGN CONSIDERATIONS

There are presently 57 operating MFGE (motor fuel grade ethanol) plants in the US. By 2005 there will be 104 operating plants. The industry will need up to 2000 skilled employees to operate these 45 to 60 new ethanol plants. Most of these plants will be located in rural agricultural areas.

**The design of a successful MFGE facility requires a clear understanding of the economic sensitivities:**

- Feedstock costs comprise over 60% of total cost
- Energy consumption must be reduced to less than 40,000 BTUs per gallon of product

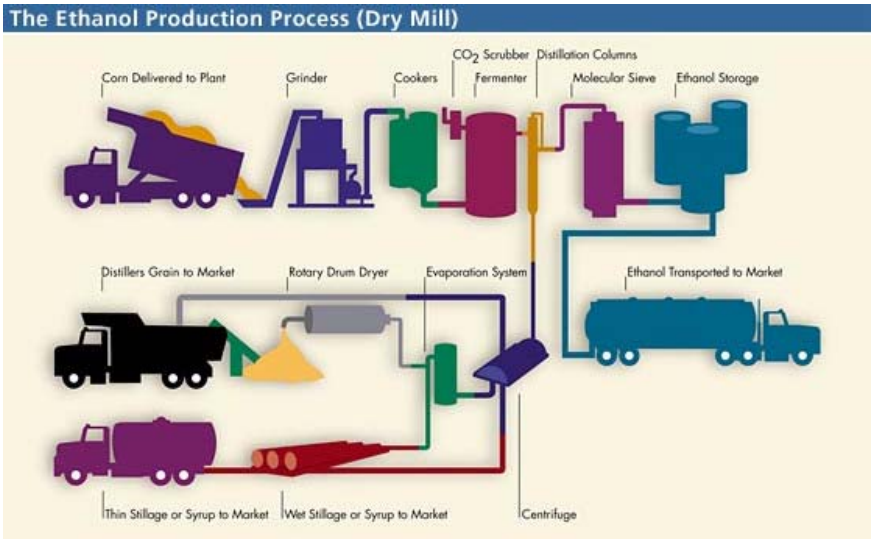



*Illustration from (Renewable Fuels Association – Ethanol Production Process)*

## THE KEY ISSUES ARE:

- ***Capital investment***
- ***Feedstock conversion efficiency***
- ***"On-stream" time***
- ***Labor costs***
- ***User-friendliness***

## FEEDSTOCK CONVERSION EFFICIENCY

The modularity of the Smar control system permits incremental implementation and provides an easy approach to modify and expand the individual control loop strategies in a simple and unprecedented manner to improve feedstock conversion efficiency.

Unique to SMAR is the DT302 concentration and density transmitter applied to determine:

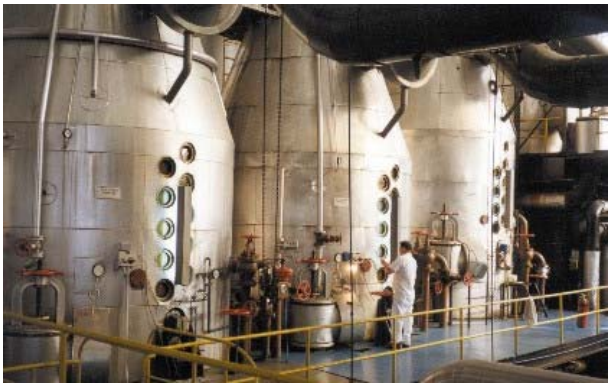
- Hydrous Alcohol degree – 90 to 100 °
- Anhydrous Alcohol degree - 90 to 100 °
- Level Interface – 560 to 1000 Kg/m$^3$

## "ON-STREAM" TIME

Control systems have, in existing facilities, been supplied and installed using conventional DCS (Distributed Control Systems) or PLCs (Programmable Logic Controllers) to satisfy the process control requirements.

These DCS and PLC systems address the total facility requirements. Unfortunately, they are global in concept and a malfunction of any aspect of these systems, even minor, can affect the total system operation and 'on-stream' available time.

Plant maintenance personnel must be extensively trained in many technologies to be qualified to quickly diagnose malfunctions and effectively perform necessary repairs to minimize the effect on production.

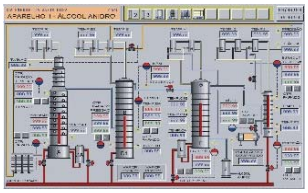
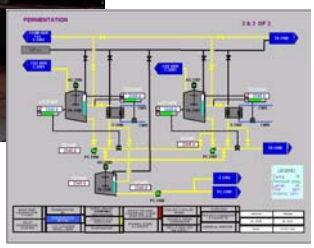


system 302 enterprise automation

- *Smar automation solutions allow for some key issues to be better addressed.*
- *System302 provides single loop integrity and redundancy can be provided to limit the effect of malfunction and permit restoring operability with minimal or no intervention from the operator.*
- *Because Smar provides open architecture solutions, operational staff can easily perform simple maintenance functions.*

## USER-FRIENDLINESS

The heart of the control system is the Operator Console. This is used extensively by users to monitor the operation of the facility and to maintain and improve feedstock conversion efficiency continuously and effectively. Casual users (management and support) also have access to relevant information for supervision and reporting purposes.


Characteristics of the Architecture, the Displays and the Navigation between displays can include:

- Panoramic Vision
- Progressive Exposure
- Pattern Recognition
- Intuitive Navigation
- Simplicity
- Alarm Management
- Operator Assistance

Effective use of graphic and tabular representation should be made to best satisfy the requirements of a given display.

Displays should take into account the requirements of all modes of operation including:

- Normal
- Process Upset
- Acknowledged Process Upset
- Recovery
- Shutdown

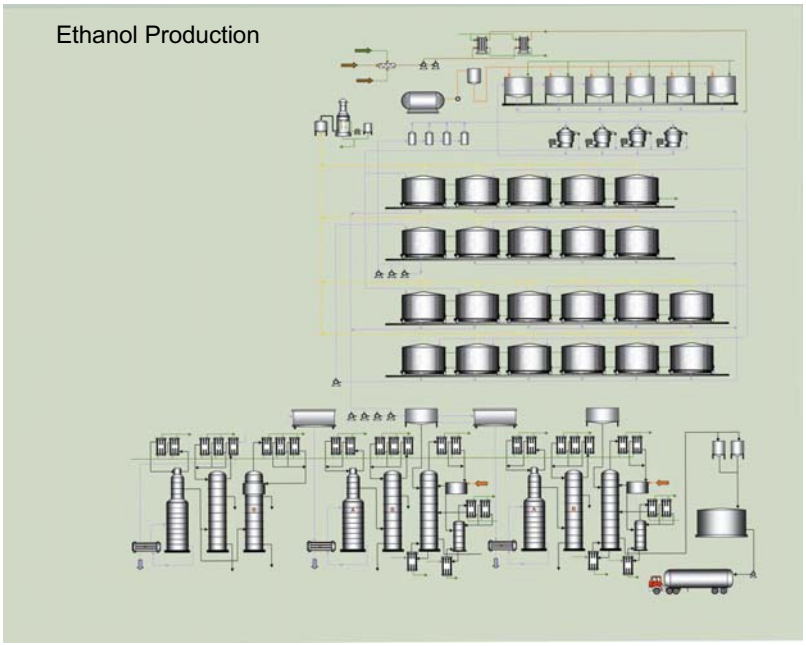
Insuring the Control System provides this common HMI (Human Machine Interface) will greatly simplify the training of new process operation personnel and shorten the learning procedure.

## Leading Automation & Control Development and Implementation

For over 30 years, Smar has been a leader in the process automation industry and were the first to develop and introduce key milestone elements that have, and continue to make **FOUNDATION™ Fieldbus** the digital technology of the future and the logical replacement of more conventional 4-20 mA analog systems.

# Ethanol Production, Automation, Hardware and Systems provided by Smar

- Must Brix
- Must Flow
- Fermentation Vat Level
- Fermentation Vat Temperature
- Water Flow to Cask
- Fermentation pH
- Fermentation Flow
- Centrifuge Motor Current
- Flying Vat Level
- Molasses Box Level
- Molasses Temperature
- Must Temperature
- Juice Temperature
- Cooling Water Temperature
- ABC&P Column Pressures
- Wine Feeding to Column A
- Column A Calander Level
- Alcohol Remotion
- Reflux Tank Level
- Hydrated Alcohol Acidity
- Dehydrator
- Molecular Sieve
- Column C Level
- Column C Ternary Extraction
- Ternary Flow to Cyclo-Hexane
- Decanter
- Recovered Dehydrator
- Extractor
- Condenser Temperature
- Beer Temperature
- Distillation Column Temperature
- Cyclo-Hexane Decanter Temperature
- Refrigeration Water Temperature
- Steam Temperature
- Steam Pressure
- Beer Pressure
- Beer Flow to Column A
- Beer Flow to the Distillation Column
- Ternary Reflux Flow
- Motor Command and Interlocking
- Flow Measurement




system 302 enterprise automation


Pressure Transmitter

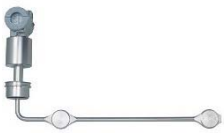

Fieldbus to Current Converter


Valve Positioner


Temperature Transmitter


Simple Action Valve Positioner


Operator Stations


Concentration/Density


Pressure Transmitters


Position Transmitter


Pneumatic Signal to Fieldbus Converter

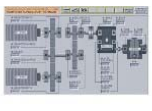
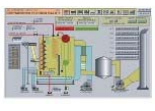

Current to Fieldbus Converter


Universal Bridge


Programmable Log.Controller


Multi Loop Controller


Fieldbus/USB Interface




Supervisory Screens – Configuration Software – Tag View

**Briefly describe your desired feedback:**

**Please send me the following information:**

- ☐ **HART PRODUCTS**
- ☐ **FIELDBUS PRODUCTS**
- ☐ **PROFIBUS PRODUCTS**

**I would like to have:**

- ☐ HART PRODUCTS
- ☐ FIELDBUS PRODUCTS
- ☐ PROFIBUS PRODUCTS
- ☐ QUOTATION
- ☐ TRAINING INFORMATION

**My next project/application will be in:**

- ☐ 0 – 30 days
- ☐ 30 – 90 days
- ☐ 90 – plus

**Please send me this information by:**

- ☐ E-mail/FTP (PDF files)
- ☐ CD
- ☐ Printed Catalog

**Additional Information:**

**Name:**

**Position:**

**Company:**

**Address:**

**City:**

**State:**

**Zip:**

**Tel:**

**Fax:**

**E-mail:**

**YOUR LOCAL REP:**