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# Using Windows Applications in Process Plants

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# Bonds Computer Systems Design

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- The company was established in 1990.
  - Specialising in :
    - » Real Time Software (Process Pascal)
    - » Real Time Software (Pulse Processor and Calculator Channel Language)
    - » Windows Software (Visual Basic)
    - » P-NET Fieldbus / P-NET Modules
  - Monitoring and Control Systems written using :
    - » PD3000 Controller
    - » PD4000 Controller
    - » PD5000 Controller
    - » IBM PC's (both DOS and Windows)
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# Running Windows Software in Process Plants

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- Why use Windows software in Process Plants
  - » Windows layout and technology has now become the industry standard for PC software.
  - » Windows technology makes it simple for integration with other applications.
  - » PC based software (running Windows) is better suited to information storage, than dedicated control equipment.
  
- Why not use Windows software in Process Plants
  - » The Windows Operating Platform is not as stable as it could be!
  - » Rugged PC's for harsh processing environments are expensive.
  - » Dedicated designed equipment is faster at Process Control.

# The Sample System

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- The Company

- » FSL Bells, part of the Tate and Lyle Group PLC, is a manufacturer specialising in liquid animal farm feeds. Depots placed throughout the UK make the final products for delivery to farms.
- » The products are mixed using liquid and powder ingredients in exact quantities, to ensure product consistency.
- » The products are mixed at time of delivery, introducing vitamins where necessary, and pumped onto the delivery vehicles.

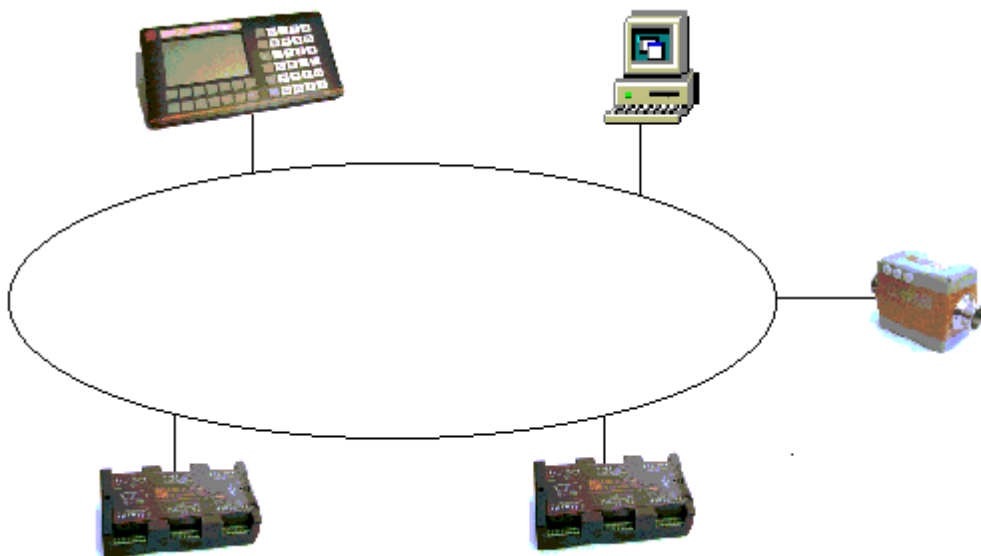
# The Sample System

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- System Control

- » A PD5015 controller, located in the process yard, controls the product and ingredient movement throughout the process plant.



# The Sample System

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- System Overview

- » The Plant Manager Collates sales orders to generate two production lists :-

- Premix List

- A 'Premix' is a blend of ingredients that are mixed together to create a new product. This new product is then used as an ingredient to make the final product.

- Tanker Load List

- A 'Tanker Load' is a list of products, and their recipes, that are to be made at time of delivery and pumped onto the delivery vehicles.

- » System Software

- PD5015 Process Control Software

- Flonet 4 for Windows 95

- Event Reporting for Windows 95

- Recipe Information for Windows 95

- Product Premix Information for Windows 95

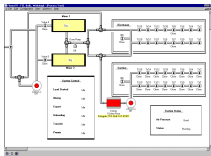
- Tanker Load Information for Windows 95

# Windows Applications

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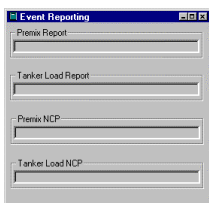
- General Packages

- » FLONET 4 for Windows 95



- Flonet 4 is a graphical SCADA package that allows the user to draw an image of the process plant.
- Flonet 4 monitors and logs events that occur in the process area.

- » Event Reporting for Windows 95



- The event reporting package reads information on the P-NET and stores this in an Access Database.

# Windows Applications

- Specific Packages

- » Recipe Information



→ Recipe Information detailing ingredients and quantities are downloaded to a remote PD5015 Controller.

- » Product Premix Information

Product/Production Number	Product Code	Product Name	Planned Production Volume	Volume/Remaining	Part/Mode	Recipe Code	Product
02 01435	LPO-AD00	SHEEP L P	3000	2500	Part/Mode	NSR02	SHEEP L
02 01435	LAE 01001	Sheepskin	1200	1200	Part/Mode	NSR02	NSR02
02 01434	LAE 01001	Nutric	1600	1600	Part/Mode	NUTR01	NUTR L
02 01500	848-01001	Stocking	500	500	Part/Mode	SHK02	STOCK
02 01507	LPO-BL001	B U P PREM	500	500	Part/Mode	BLUP02	B U P PH
02 01620	164-01001	Pronox PU	21493.49	1493.49	Part/Mode	PRN02	PRN00

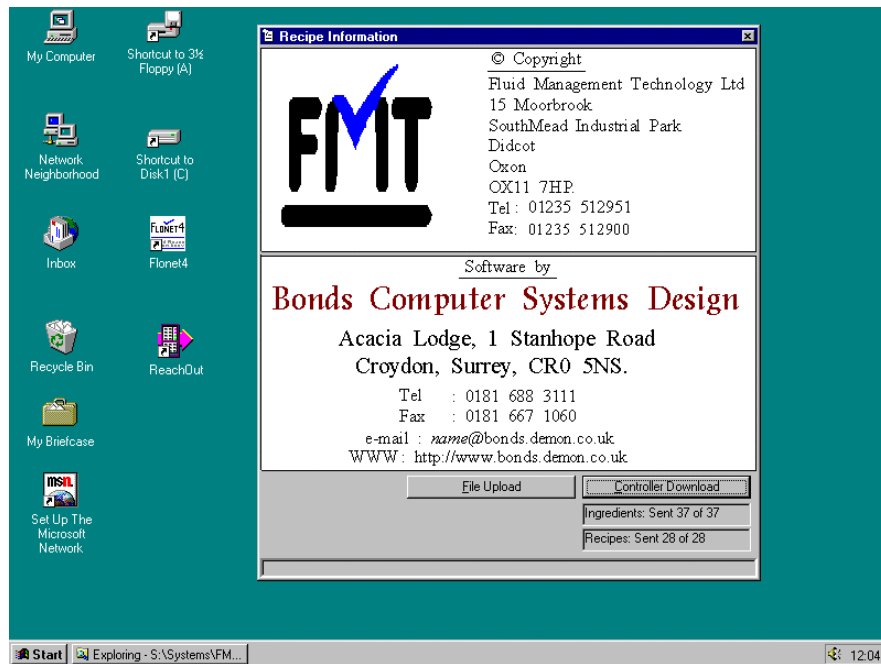
→ Pre - Mixed product ingredient details are downloaded to a remote PD5015 Controller and the premix sequence is automatically started.

- » Tanker Load Information

Load Number	Load Date
00001	2004/07
00002	2004/07
00003	2004/07
00010	2004/07
00011	2004/07
00012	2004/07
00013	2004/07
00014	2004/07

→ Individual Tanker Load information for export is downloaded to a remote PD5015 Controller, to enable the tanker driver to select 'his load'.

# Recipe Information Program



- A Sales and Production computer generates a text file detailing the following information about each recipe :-

## Recipe Header Details

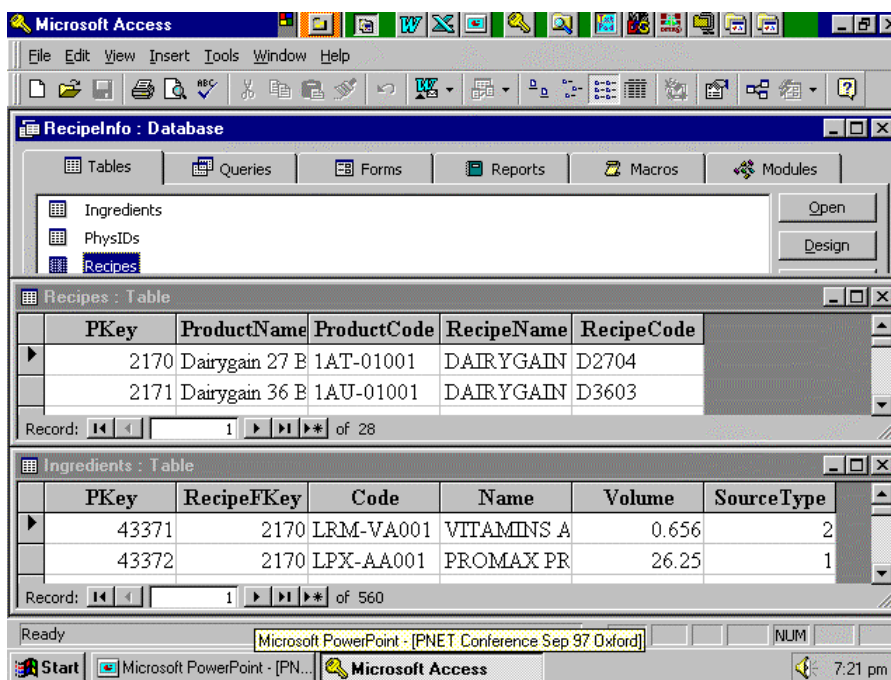
Product Name  
Product Code  
Recipe Name  
Recipe Code

## \* Recipe Body Details

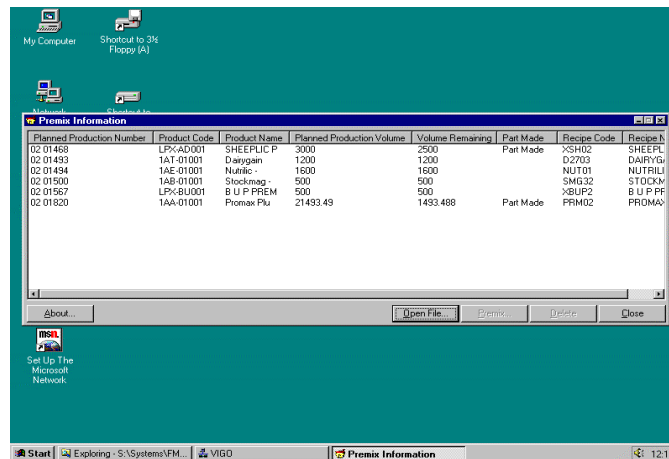
Ingredient Name  
Ingredient Code  
Ingredient Volume  
Ingredient Source

# Recipe Information Program

- This text file is then read into a normalised access database which stores the information in two data tables :-
  - » A Recipe List Table
  - » An Ingredients List Table
- The program generates queries from these data tables, which are then downloaded to the PD5015 Controller.



# Product Premix Information Program



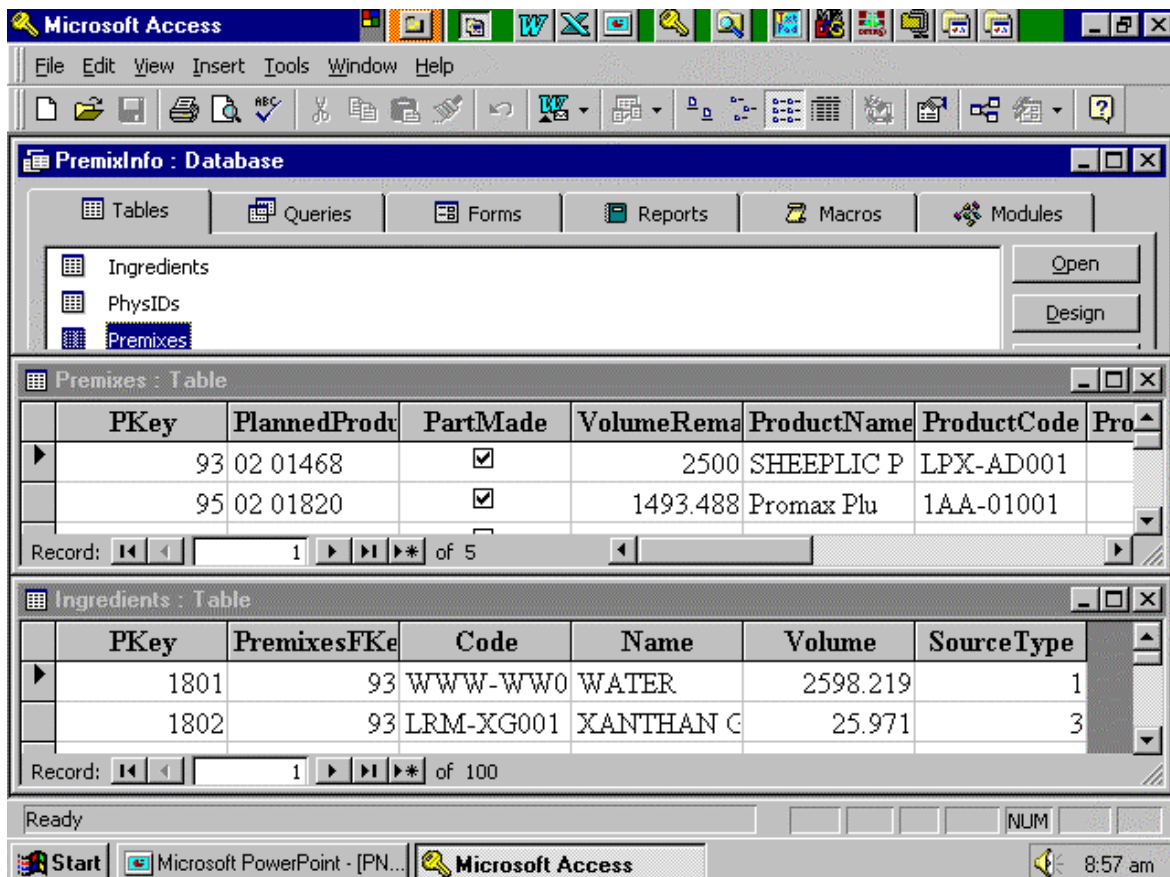
The screenshot shows a Windows desktop environment with a window titled 'Premix Information'. The window contains a table with the following data:

Planned Production Number	Product Code	Product Name	Planned Production Volume	Volume Remaining	Part Made	Recipe Code	Recipe Name
02 01488	LPK-AD-001	SHEEP LIP	3000	2500		XSH12	SHEEP L
02 01493	IAT-01001	Dairgain	1200	1200	Part Made	D2703	DAIRY G
02 01494	IAE-01001	Nutric	1600	1600		NUT01	NUTRI L
02 01500	IAB-01001	Stockmag	500	500		SMG32	STOCK M
02 01567	LPK-BU001	B U P PREM	500	500		XBUP2	B U P P
02 01820	IAA-01001	Promax Flu	21493.49	1493.488	Part Made	PRM02	PROMAX

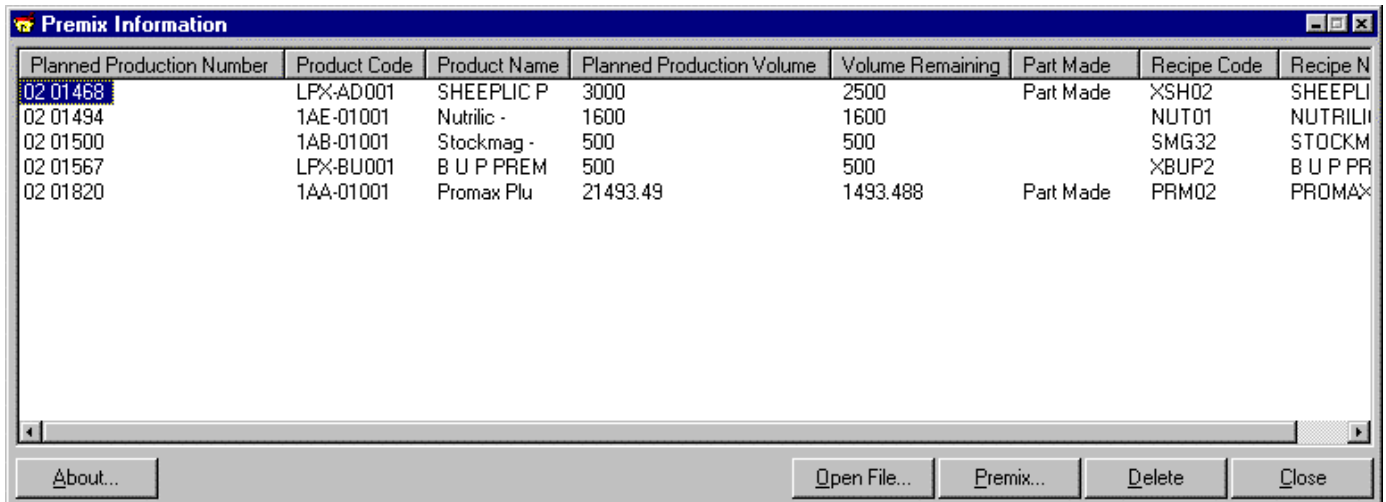
- A Sales and Production computer generates a text file detailing the Product Premixes to be made for the following days production.
- Each Premix is indexed using a unique 'Planned Production Number' and details the following information :-
  - » Product Code
  - » Product Name
  - » Planned Production Volume
  - » Recipe Code
  - » Recipe Name
  - » \* Ingredient Information

# Product Premix Information Program

- This text file is then read into a normalised access database which stores the information in two data tables :-
  - » The Premix List Table
  - » The Ingredients List Table



# Product Premix Information Program



The screenshot shows a window titled "Premix Information" with a table of data. The table has the following columns: Planned Production Number, Product Code, Product Name, Planned Production Volume, Volume Remaining, Part Made, Recipe Code, and Recipe Name. The data rows are:

Planned Production Number	Product Code	Product Name	Planned Production Volume	Volume Remaining	Part Made	Recipe Code	Recipe Name
02 01468	LFX-AD001	SHEEPLIC P	3000	2500	Part Made	XSH02	SHEEPLI
02 01494	1AE-01001	Nutrilic -	1600	1600		NUT01	NUTRILI
02 01500	1AB-01001	Stockmag -	500	500		SMG32	STOCKM
02 01567	LFX-BU001	B U P PREM	500	500		XBUP2	B U P PR
02 01820	1AA-01001	Promax Plu	21493.49	1493.488	Part Made	PRM02	PROMAX

At the bottom of the window, there are four buttons: "About...", "Open File...", "Premix...", and "Close".

- The premix information program displays a list of “Premixes” that are to be made or that have been part made. (Premixes may be part made due to a limitation in the size of the batching tanks).
- The operator will then select the Premix he / she wishes to make and clicks the Premix button.

# Product Premix Information Program

Planned Production Number: 02 01468

Select Destination tank:

Tank 08 ([--- EMPTY TANK ---, EMPTY-CODE])

Mixer Tank 1

Mixer Tank 2

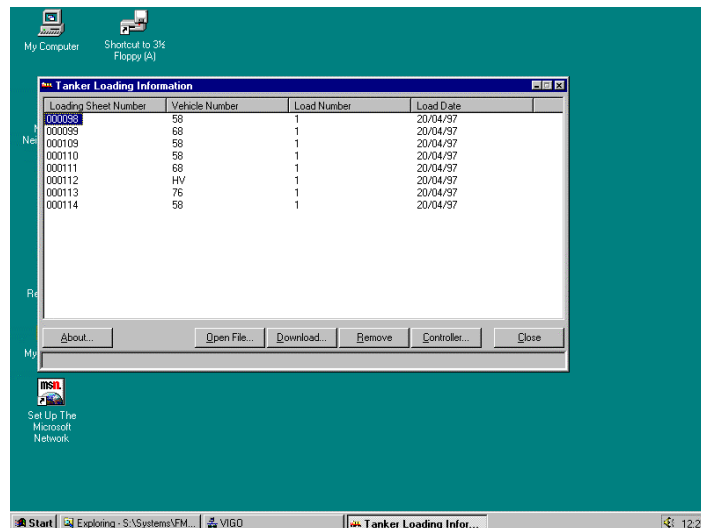
Please enter batch volume: 1500 Ltrs

Start Close

Total Planned Production Volume: 3000. Remaining Volume: 2500

- The program scans the PD5015 controller to allow the operator to select a valid destination tank for the Premix to be made. (A valid tank is any tank that is empty or currently holds the same Product as the Premix to be made).
- Once the destination tank has been selected and the operator has entered the volume to be made, the system will automatically initiate the 'Premix Sequence'.

# Tanker Load Information Program



- A Sales and Production computer generates a text file detailing a “Tanker Load’s” information.
- Each Tanker Load is indexed using a unique ‘Loading Sheet Number’ and details the following information :-
  - » Vehicle Number
  - » Load Number
  - » Load Date
  - » \* Product Information
    - \* Ingredient Information

# Tanker Load Information Program

- This text file is then read into a normalised access database which stores the information in three data tables :-
  - » The Load Sheet Table
  - » The Product Table
  - » The Ingredients table

The screenshot displays the Microsoft Access interface with three data tables open in Datasheet View. The top table is 'Ingredients : Table', the middle is 'Products : Table', and the bottom is 'LoadSheets : Table'. Each table has a set of columns and a record indicator at the bottom.

PKey	ProductFKKey	Code	Name	Volume	Source Type
20163	1011	1AK-01001	Stockgain 10 -	500	1
20164	1011			0	0

Record: 1 of 720

PKey	LoadSheetFK	Code	Name	VolumeRequired
1011	115	1AK-01001	Stockgain 10 -	500
1012	115			0

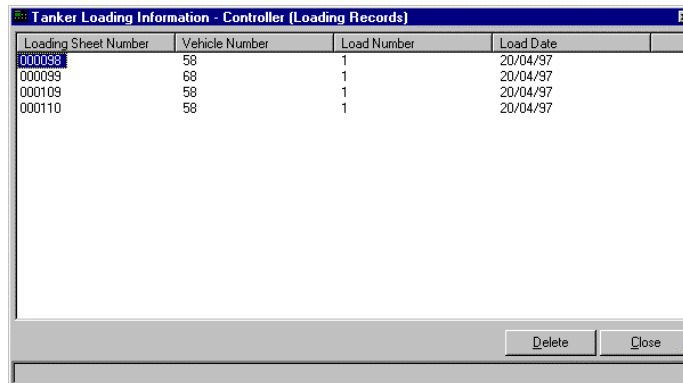
Record: 1 of 36

PKey	VehicleNumb	LoadingSheet	LoadNumber	LoadDate	DuplicationV
115	68	000111	1	200497	0
116	HV	000112	1	200497	0

Record: 1 of 4

TankerInfo ... NUM

# Tanker Load Information Program



The screenshot shows a window titled "Tanker Loading Information - Controller (Loading Records)". It contains a table with the following data:

Loading Sheet Number	Vehicle Number	Load Number	Load Date
000098	58	1	20/04/97
000099	68	1	20/04/97
000109	58	1	20/04/97
000110	58	1	20/04/97

At the bottom right of the window, there are two buttons: "Delete" and "Close".

- The Tanker Load Information Program displays a list of “Tanker Loads” that have not yet been downloaded to the PD5015 Controller.
- The program allows the operator to perform the following functions :-
  - » Select a ‘Tanker Load’ to be downloaded the PD5015 Controller.
  - » Remove a ‘Tanker Load’ from the current ‘Tanker Load List’.
  - » View the ‘Tanker Loads’ that are currently held in the PD5015 Controller.
  - » Remove ‘Tanker Loads’ that are currently held in the PD5015 Controller.

# Event Reporting Program

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- The Event Reporting program, although specifically works in conjunction with the FSL Bells PD5015 Software, is a general Windows 95 P-NET reporting program to read Buffer type variables on the P-NET.
- This software detects whether there are any elements in a predefined buffer and if so, reads and stores them in an access database.
- Once the database tables have been updated the 'Event Reporting' program then runs an Access Macro, which is user defined. This allows the user to produce reports, charts etc on the information that has been read from the P-NET.

# Event Reporting Program

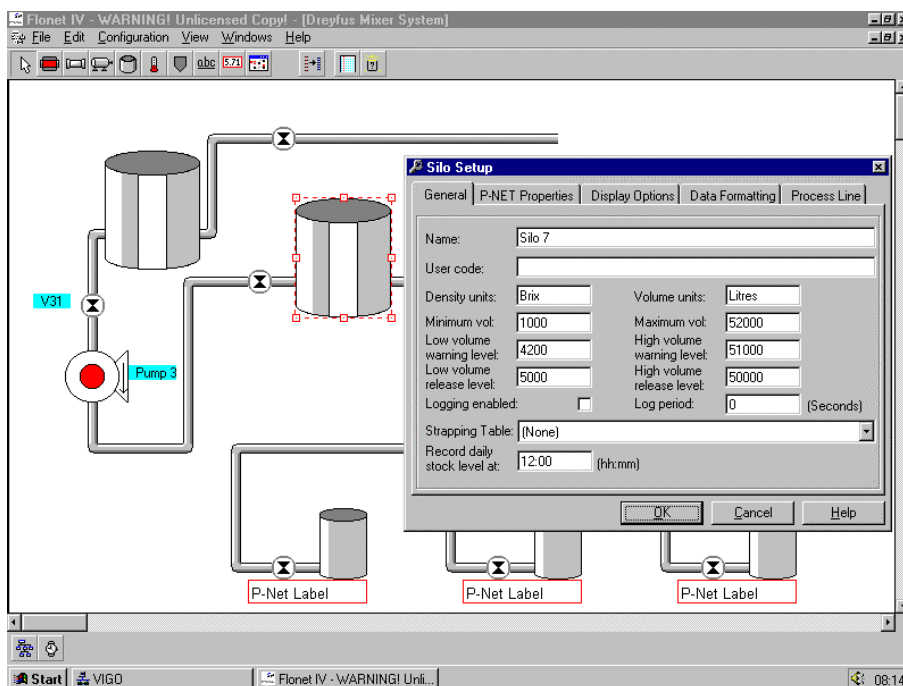
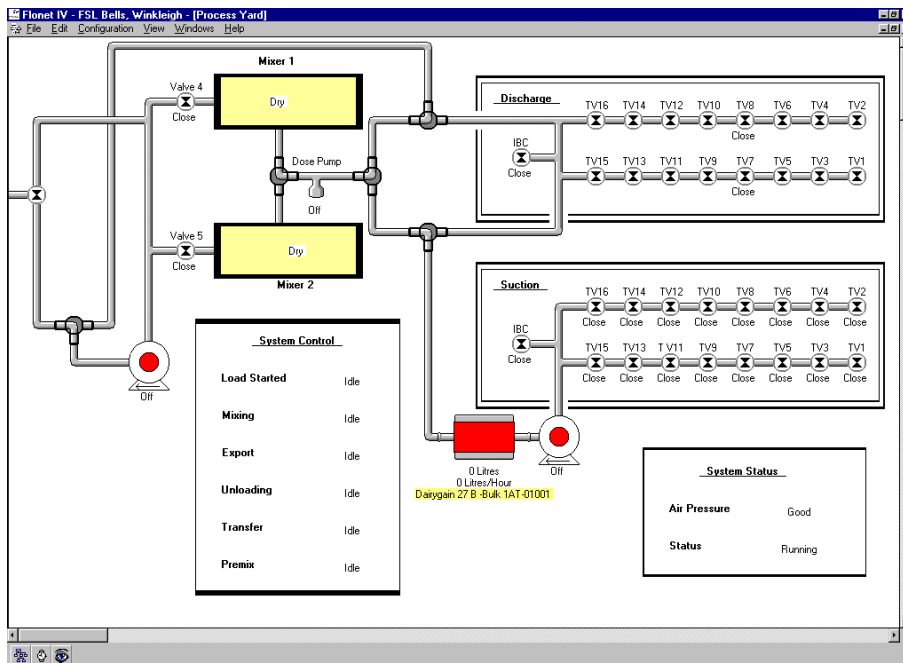
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- The FSL Bells Event Reporting software reads information detailing the following events :-
  - » Premix Information
    - This details actual production information that is then used for stock control.
  - » Tanker Load Information
    - This details actual product information that when used in conjunction with the 'Tanker Delivery System - Reports' on the Tankers, will give stock holding information.
  - » Premix - Non Conforming Product
    - This details the ingredient quantities that make up an incomplete batch, when making a 'Premixed' product.
  - » Tanker Load - Non Conforming Product
    - This details the ingredient quantities that make up an incomplete batch, when making a product that was to be batched onto a tanker.

# Flonet 4 for Windows 95

- Example system layout



# Flonet 4 for Windows 95

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- Flonet 4 is a graphical SCADA package that offers the user the facility to display the area which needs to be controlled and monitored, either by using icons or images / photographs.
- P-NET information is then associated with elements in the users screens and logged to appropriate access database tables.
- User defined Reports / Charts can then be designed, using Office features such as Reporting and Chart wizards, based on the information logged by Flonet 4.
- Database Information can be sent to other Microsoft Office Products for further Analysis. (i.e. Excel ...)

# Flonet 4 for Windows 95

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- Flonet 4 features :-

- » Process Line Monitoring including Product Movement
- » Strapping Tables.
- » Auto detection of Flow Meter events (start / stop of flow and volume capture).
- » Stock take of silo volumes at set times per day.
- » Logging of P-NET values at timed intervals (useful for trending).
- » Logging of Plant Warning Messages. i.e.
  - Silo Volume High
  - Maximum flowrate exceeded
  - Temperature low
  - P-NET communication error
- » Firing Access Macros on a daily timed basis.
- » Automatic database backup.