

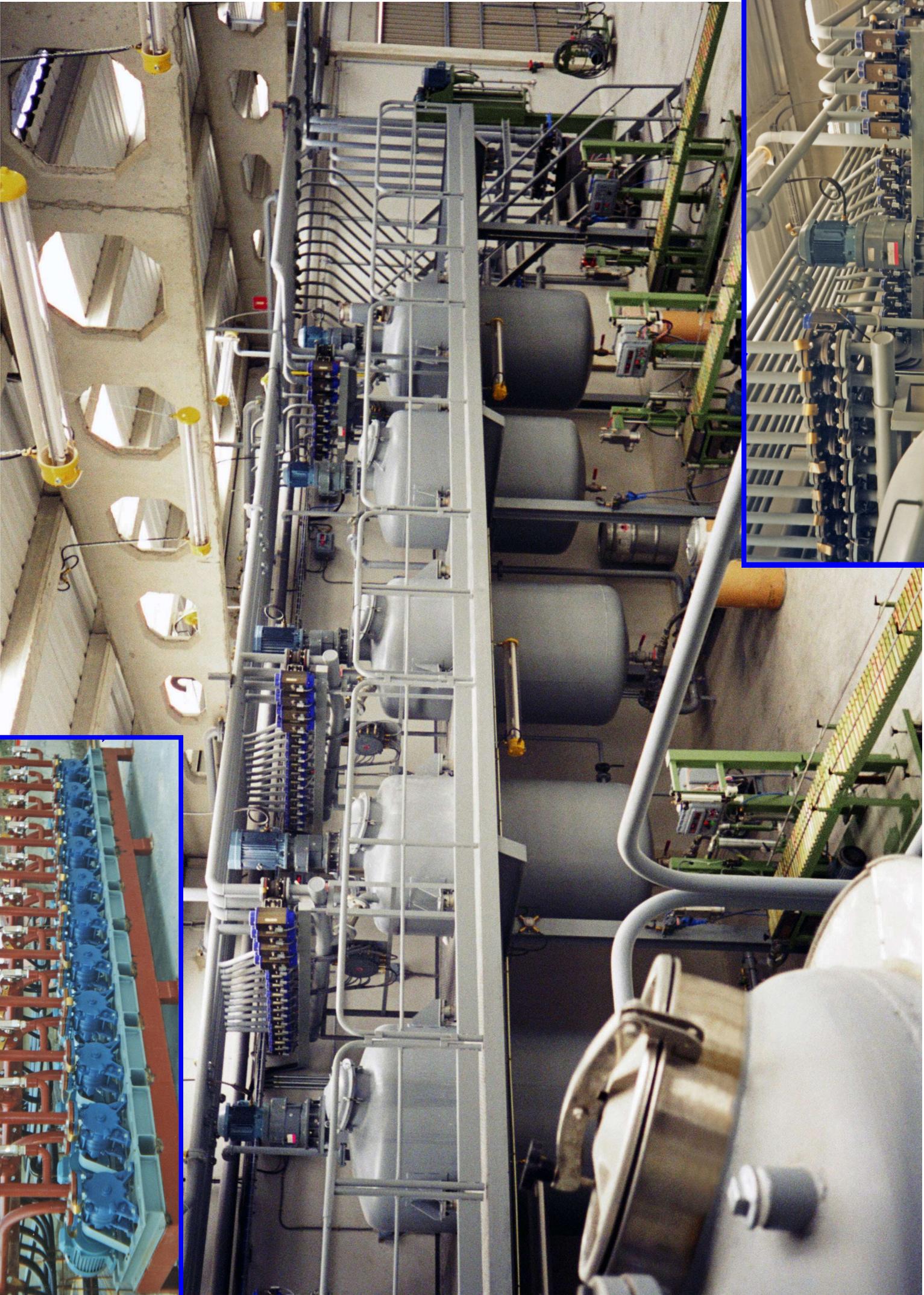
Automatic Formulation Systems



NTD can supply to his clients, in turn-key installations or in existing installations, Automatic Formulation Systems. An example is described below::

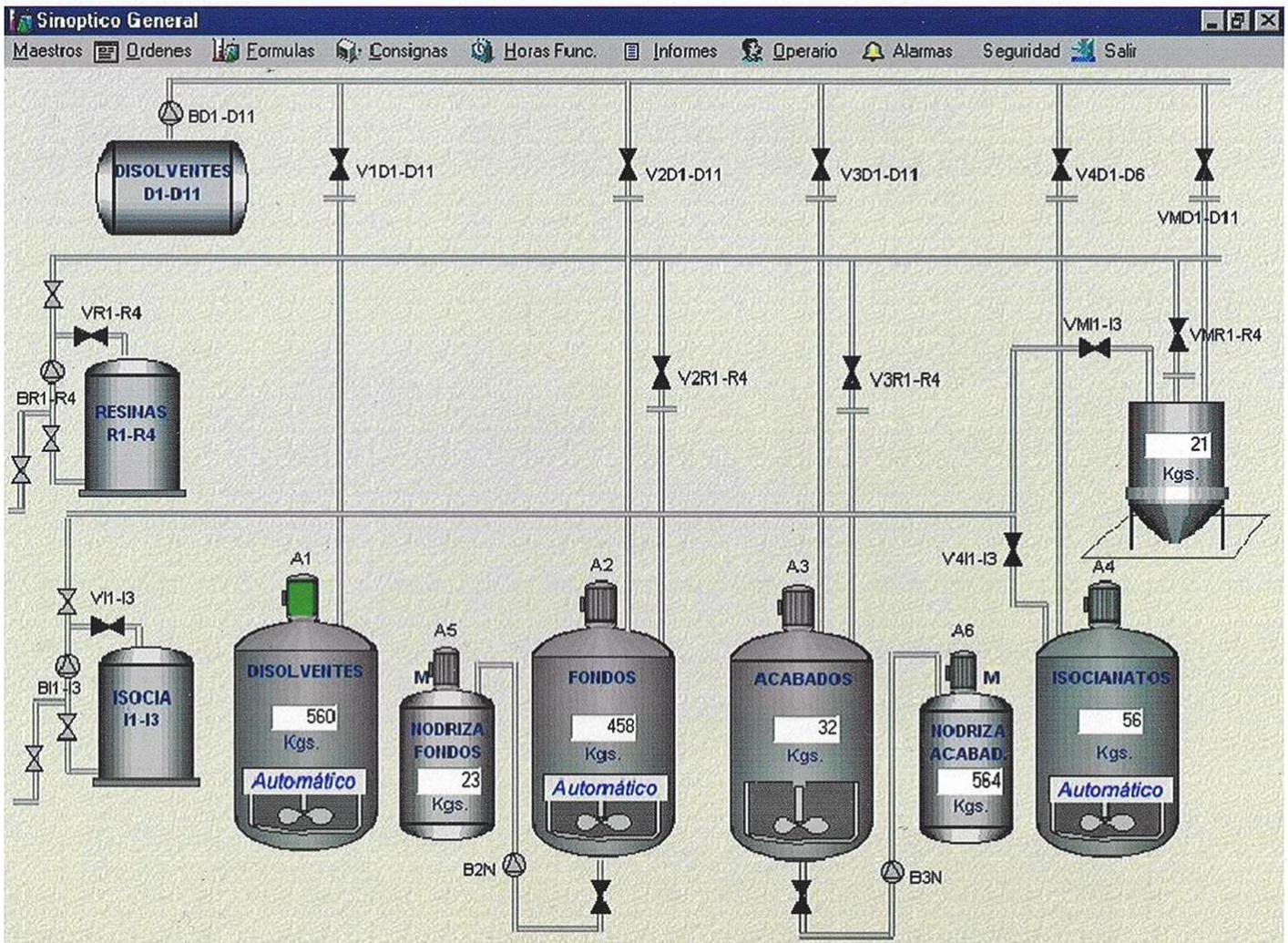
§ Solvent, Varnishes and Isocyanates Production Plant: with automatic Control System, Manufacturing, Formulation and Dosing.

Facilities with EExd protection (flameproof).



Control System of Processes and Production in Industrial Plants

General Screen



Control system supplied by NTD is a data base developed in Windows environment with the following features:

- § General screen. It shows a diagram of all different processes of the plant. It gives a dynamic view of all control devices.
- § Possibility of action over components (motors, pumps, valves, etc).
- § Setting-up of masters: products, lines, workers, etc.
- § Starting and monitoring processes (M.O.)
- § Alarm management and setting.
- § User management (workers).
- § Reporting: formulas, consumption of products, alarms, etc.

This system eases an absolute control over processes, not only operational, but also over production.

Link with other management systems (AS-400, BAAN, SAP, etc.) is also possible.

Easy use. Only basic knowledge of computers is required to work with the program.

SUPERVISION AND CONTROL SYSTEM FOR PRODUCTION OF SOLVENTS, VARNISHES AND ISOCYANATES

Control system consists of one electrical panel, a programmable logic controller (PLC) and a computer with integrated supervision and control program.

Items under control:

- 11 Solvent lines with pumps included.
- 4 resin lines with pumps included.
- 3 Isocyanate lines with pumps included.
- 1 Solvents agitator: 1 agitator with speed controller, 11 automatic valves and weight indicator.
- 1 Paint primer agitator: 1 agitator with speed controller, 15 automatic valves and weigh indicator.
- 1 Paint primer agitator auxiliary deposit: 1 motor agitator, 1 charging pump, weight indicator.
- 1 Finishing agitator: 1 agitator with speed controller, 15 automatic valves, weigh indicator.
- 1 Finishing agitator auxiliary deposit: 1 motor agitator, 1 charging pump, weight indicator.
- 1 Isocyanate agitator: 1 agitator with speed controller, 9 automatic valves, weigh signal indicator.
- 1 Manual agitator: 18 manual valves with limit detection device.
- 1 Nitrogen unit

Computer is the tool to control the system. It provides all information and controls the components.

Weighing system, installed on 5 agitators and 2 auxiliary tanks, consists of scales and RS485 communications connected to PLC.

Solvent, paint primer, finishing and isocyanate agitators are controlled by means of frequency controller to obtain different rpm in manufacturing processes.

Use the computer and electrical panel to make actions on control system devices. For that purpose, different selectors are installed to enable the control from one or another spot. Priorities and conditions must be taken into account.

Selector in electrical panel has 3 positions:

Pumps. Selector with 3 positions:

- **A** – Automatic (control from computer)
- **0** – Stop in manual mode (local control). Pump do not start
- **M** – Start in manual mode (local control). Pump will start if a valve is been opened.

You can activate agitators from them and from computer. There are 4 Local/Remote selectors in electrical panel to operate in one way or another. If we want to operate in local mode, selector must be in local position.

Screen shows selected mode (Local/Automatic) next to the components.

In pumps, L indicates local control, and A automatic control. Same legend will appear next to agitators **Automatic/Local**, according to selector position in electrical panel.

SUPERVISION AND CONTROL SYSTEM

MANUAL OF OPERATION

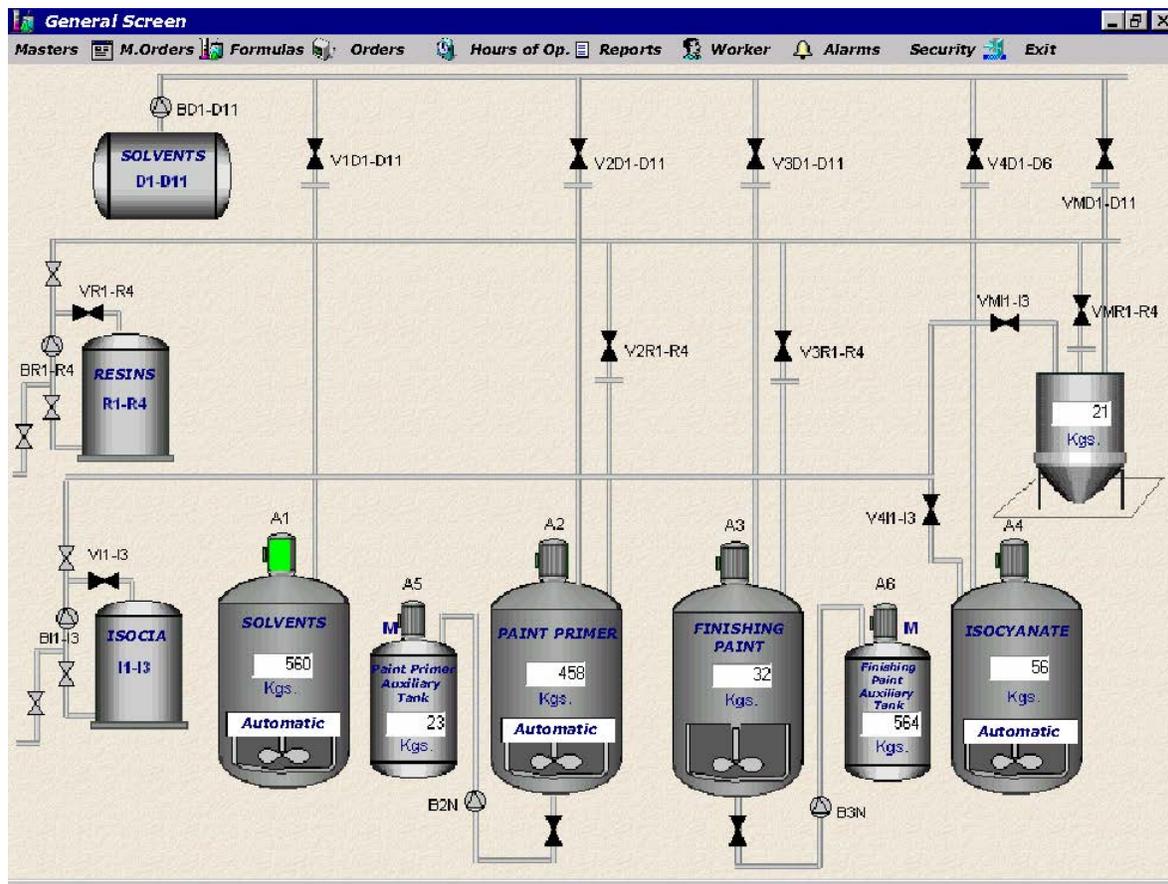
Screenplays containing options that are described in following pages, constitutes integrated Control and Supervision Program.

The Program is developed in WindowsNT environment, therefore, the appropriate icon must be clicked from desktop to start the program.

Name of icon in this guide is “NTD”.

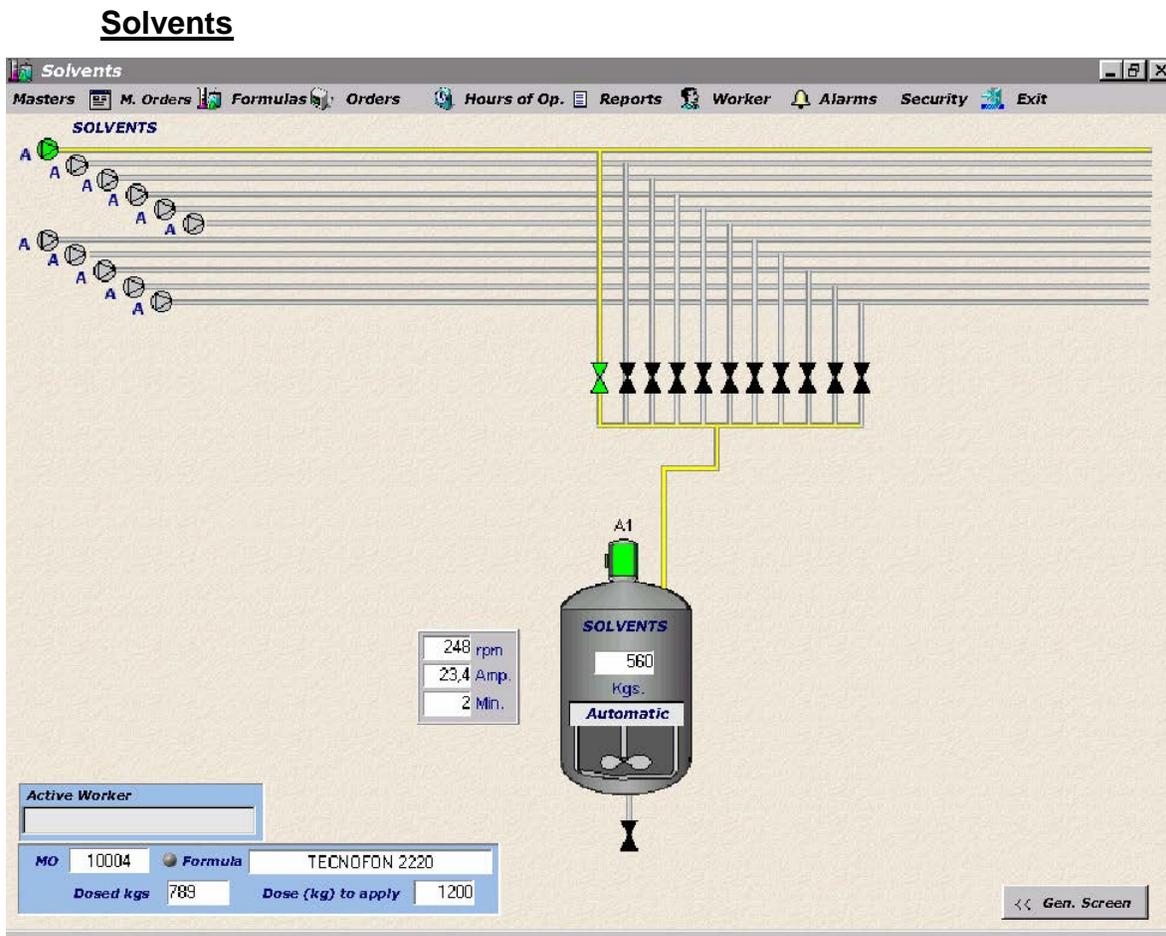
Mouse double click on the icon executes the program, coming out the general screen. This is the centre of operations and the access to detailed screens and Menu options, which links with the operations.

GENERAL SCREEN

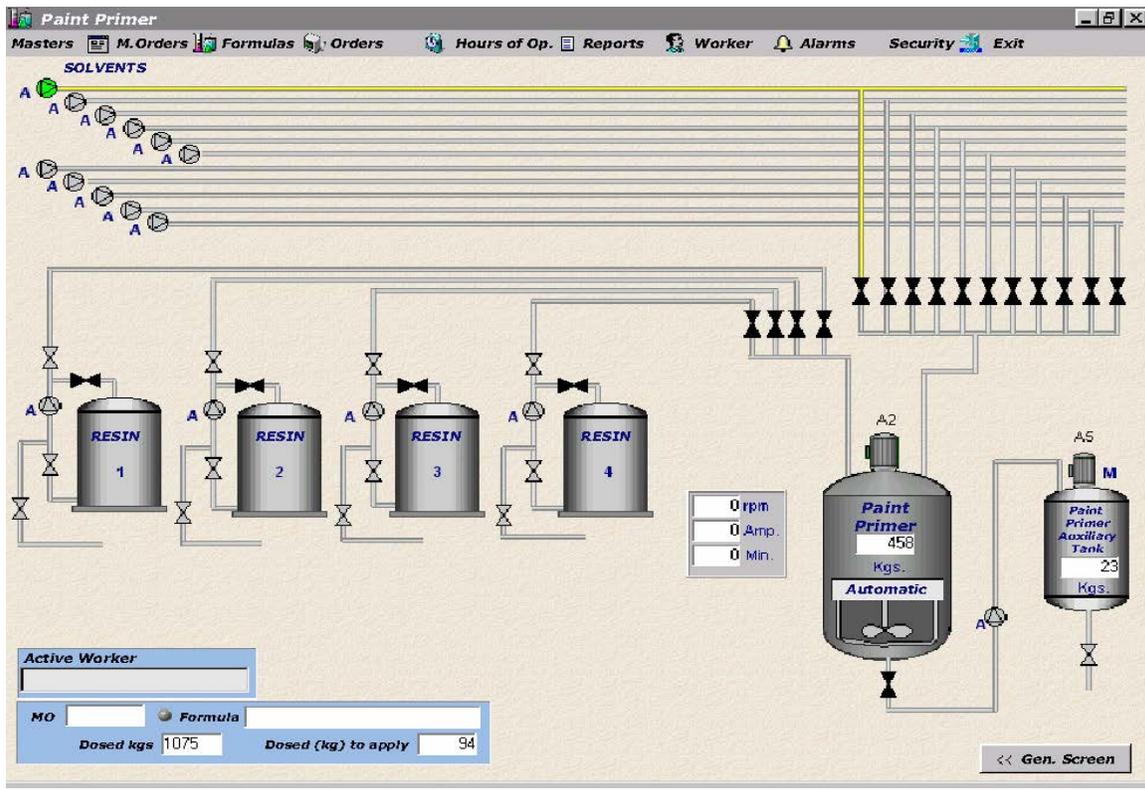


This screen provides a general view and indicates the state of agitators. For product lines (solvents, resins and isocyanates), circuits to agitators are depicted with one valve and one pump with the following criterion: if valves have irregularities, the group will be coloured in red, if a valve is open, in green and when all are closed in black. The same criterion is used in pumps. Agitator follows the same criterion on general screen.

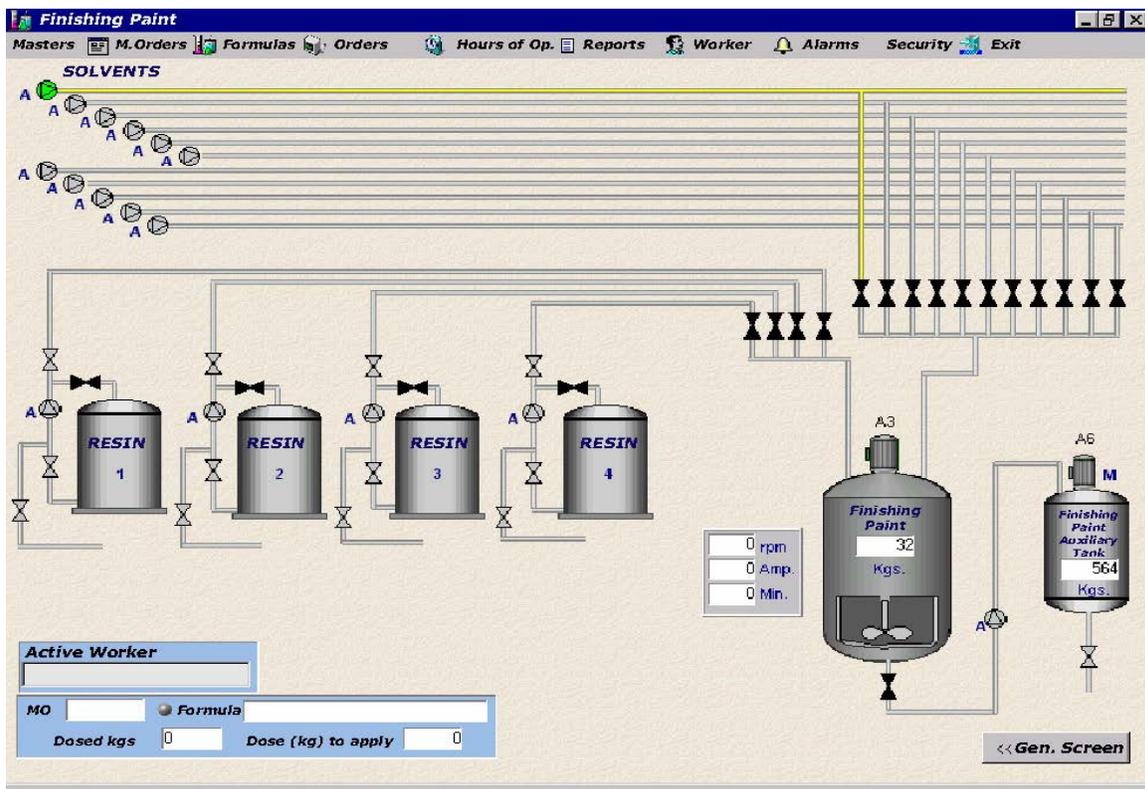
Single mouse click on agitators opens a detailed screen where pipes and circuits are depicted. The screens are:



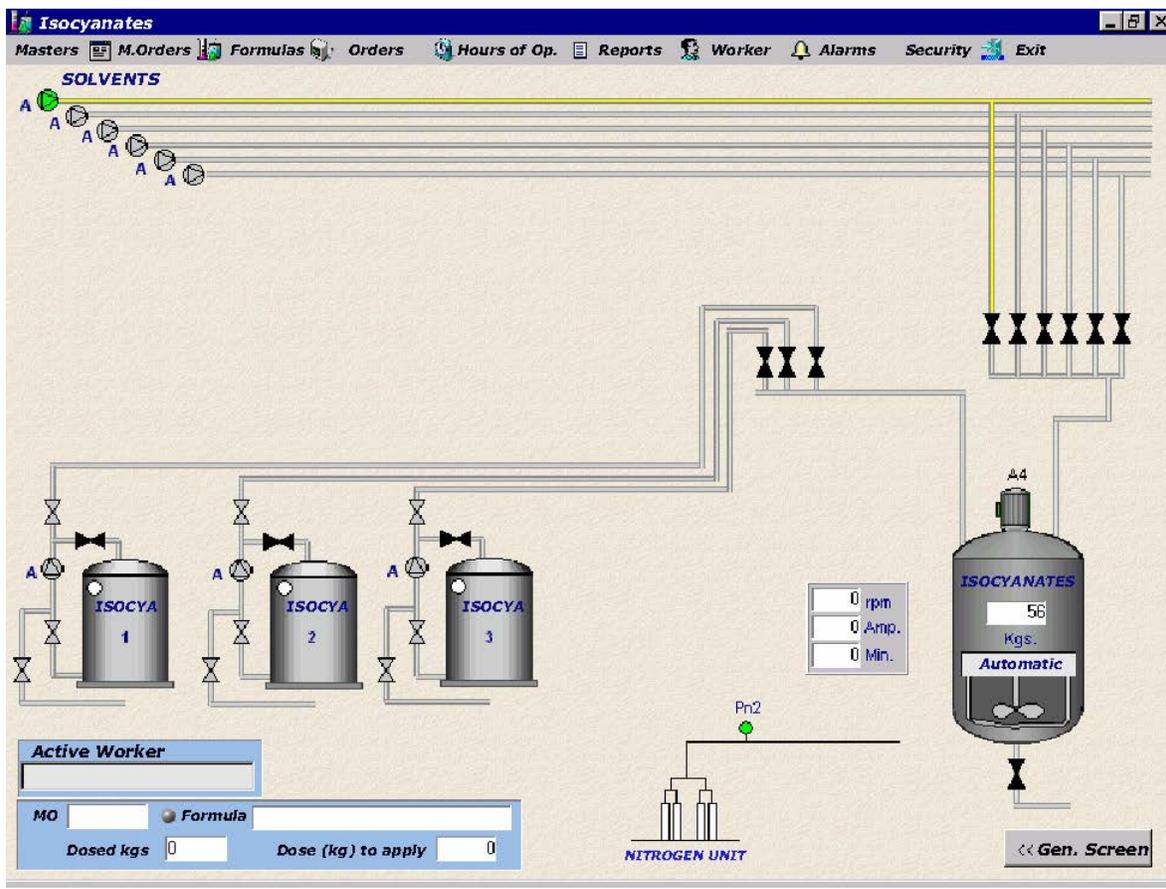
Paint primer



Finishing paint

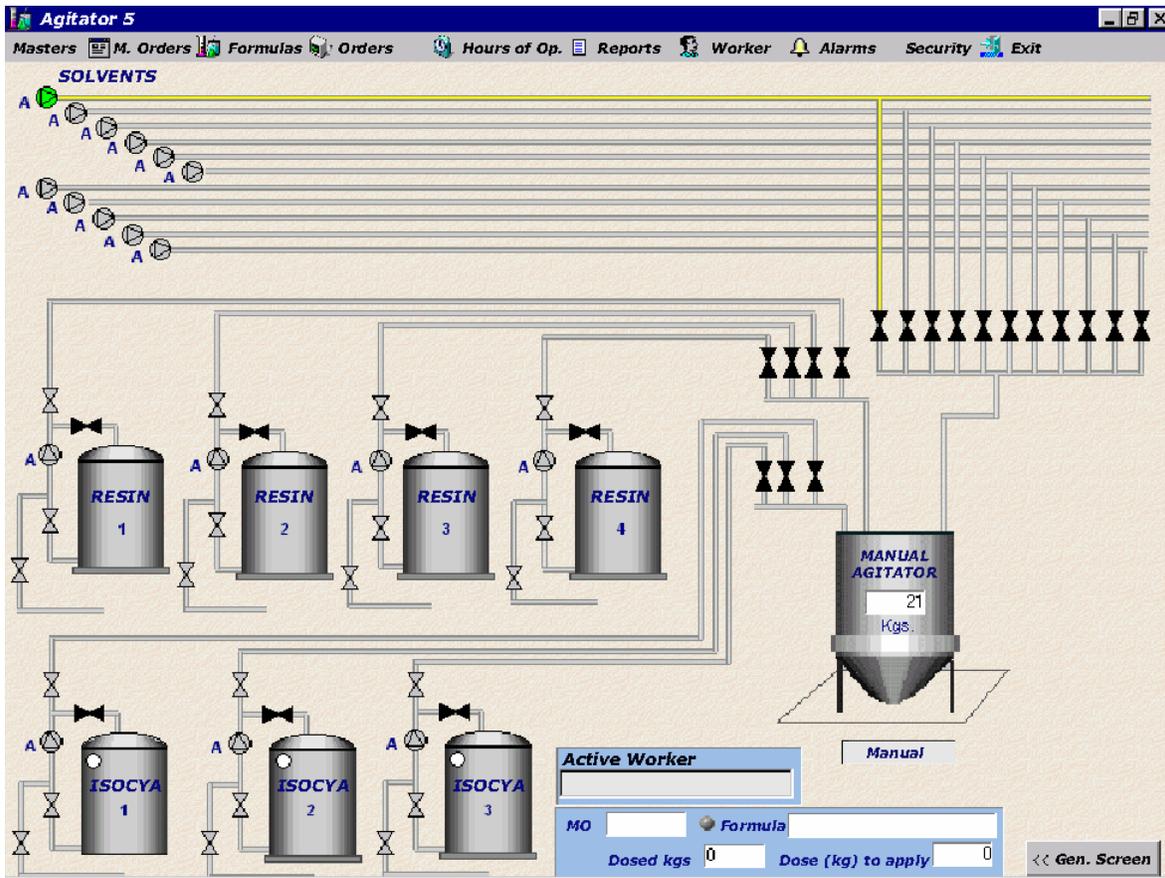


Isocyanates



This detailed screen shows state of circuits and nitrogen group. The screen indicates in green if there is N₂ pressure (Pn2) and in red if there is not. Also indicates the replacement of gas cylinder with legend “group replacement”.

Manual

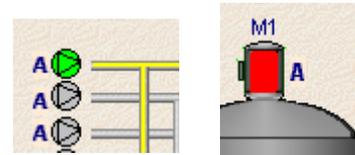


Click General screen to return from any of the previous screens to general screen.

As you can see on pictures below, there is a general view of all components of installation. State of control elements are classified with different colours:

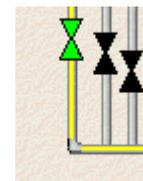
Pumps, motors:

- Green – In Process
- Grey – Stop
- Red – Termal difference (motor protection)
-



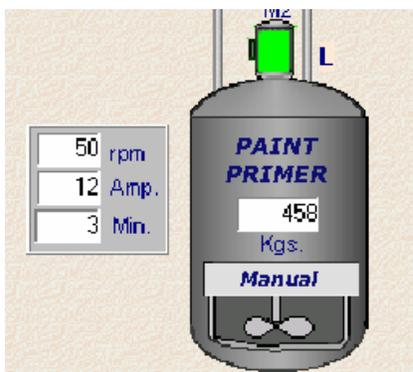
Válves:

- Green – Opened
- Grey – Closed
- Red – Irregularity: after request of open, the valve remains closed.



Besides, when product is circulating (valve opened and pump in operation) the line is coloured. Solvents, resins and isocyanates lines are painted in different colours.

System analogue variables (rpm, amperes, weight) appear in digital values on the body of respective components.



Besides, letter indicates on control components their operation mode:

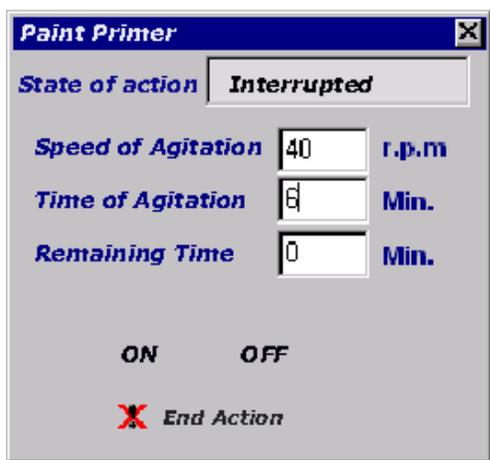
- A – Automatic
- M – Manual
- L – Local

A legend indicates also on body of reactor, its operation mode: Manual or Automatic.

Click on line pumps to open a display which indicates the product in circulation.

Motor-Agitator

Click on motor and enter on a pop-up window speed and time of agitation. It shows the remaining minutes to finish the process. If user wants to keep the agitator working (non-stop), “0” must be written on time field.



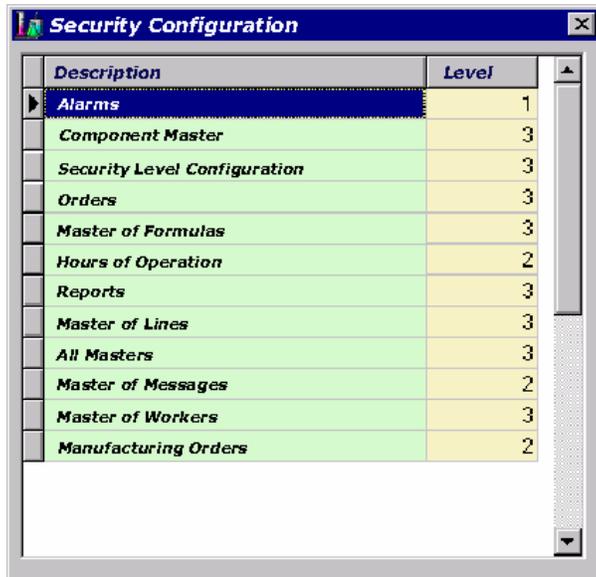
State of action field indicates state of agitation process: In process, Interrupted or Finished. Action must be finished to change rpm and time of agitation.

Apart from showing state and actions of different components, on the upper side of general screen, there is a general menu, which gives access to different options of the program. They are described below.

MENÚ

The program has three access levels with their respective passwords. Number 3 means maximum priority and 1 minimum priority.

Set up the access level on menu option “Security Level Setting”.



Description	Level
Alarms	1
Component Master	3
Security Level Configuration	3
Orders	3
Master of Formulas	3
Hours of Operation	2
Reports	3
Master of Lines	3
All Masters	3
Master of Messages	2
Master of Workers	3
Manufacturing Orders	2

According to the configuration, we have access to some of the functions after clicking on enable options and enter the appropriate password.

Masters

Masters are described below.



Components

Set up products used in the processes in this master.

Comp.	Description
D002	SOLVENT 2
D003	SOLVENT 3
D004	SOLVENT 4
D005	SOLVENT 5
R001	RESIN 1
R002	RESIN 2
R003	RESIN 3
S001	SOLID 1
S002	SOLID 2
S01	SOLID 1
S02	SOLID 2

Component: D002 Description: SOLVENT 2

Registration Date: 16/01/19

Buttons: New, Edit, Delete, Save, Cancel, Print, Exit

Data fields are Component, Description, Registration date.

Action buttons in all masters have the same meaning:

New. Create new register

Edit. Allow to modify registered data

Delete. Eliminate a register

Save. Record new data

Cancel. Modifications are not saved.

Print. Print data from master.

Exit. Close the window and return to general diagram

Workers

Set Workers in this master assigning them Code, Name, Security Level and Password.

When we click on option “Enable Options”, depending on security levels and passwords, there is access to some menu options according to parameters entered in Security configuration.

Code	Name
1	WORKER 1
10	ARIS
3	WORKER 3
4	Worker 4

Code: 1
Name: WORKER 1
Security Level: 1
Password: 1

New Edit Delete
Save Cancel Exit

Lines

Line	Product	Inertia
D13	SOLVENT 10	8
D2	SOLVENT 2	8
D3	SOLVENT 3	8
D4	SOLVENT 4	8
D5	SOLVENT 5	8
D6	SOLVENT 6	8
D7	SOLVENT 7	8
D8	SOLVENT 8	8
D9	SOLVENT 9	12
R1	RESIN 1	0
R2	RESIN 2	12

Line: D9 Product: D009 Inertia: 12
Product Description: SOLVENT 9

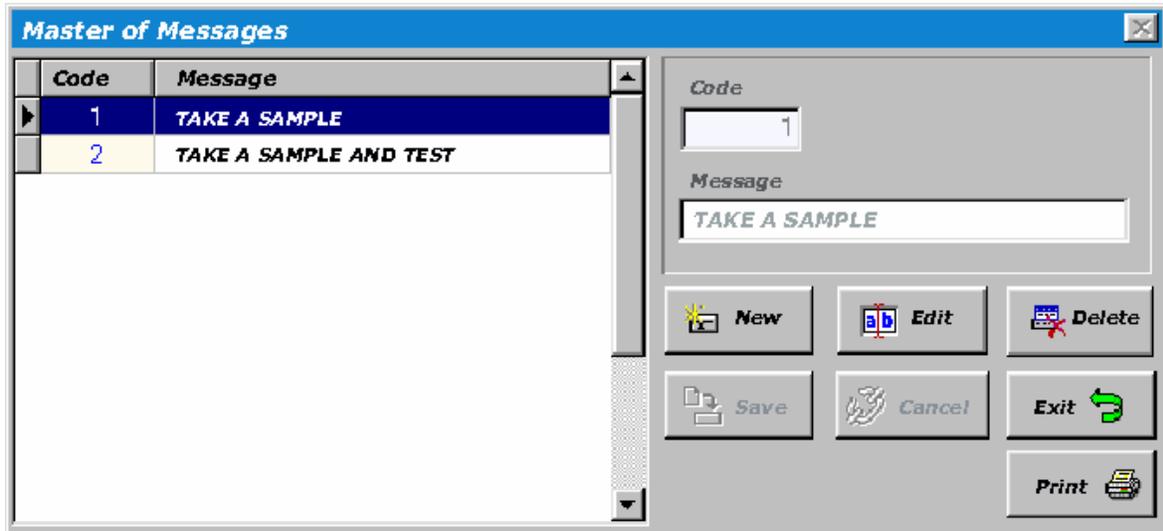
Edit Save Cancel
Exit

Assign products to automatic lines

In this master, you can also enter inertia data in kg. used to close the valve in order to compensate pipe inertia and time of reaction.

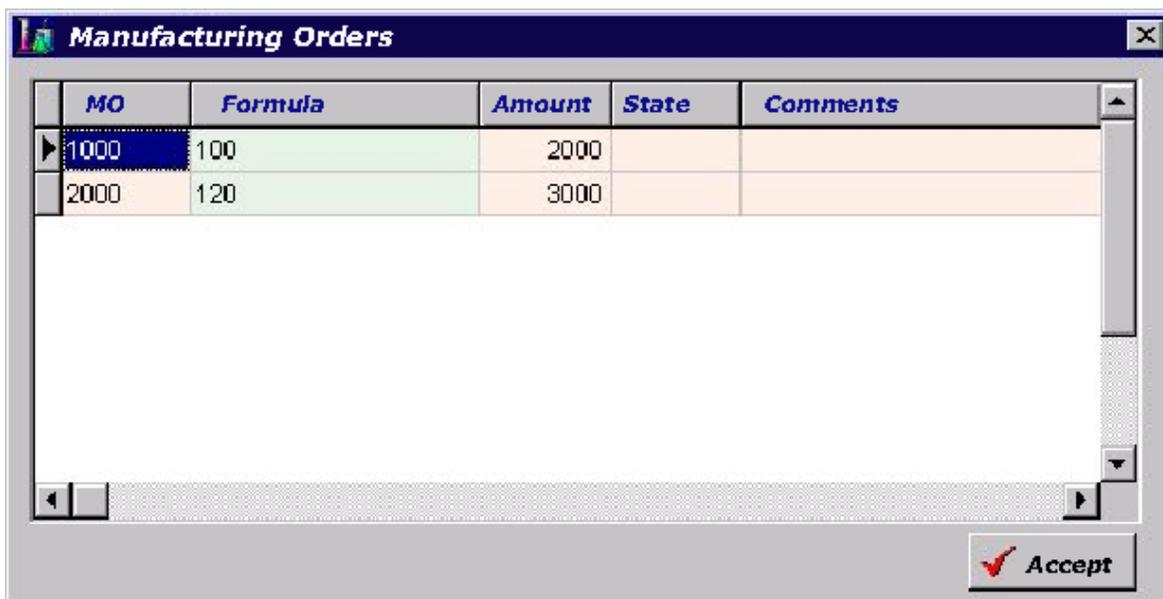
Messages

Set any possible messages that will pop up during automatic execution of formulas.



Orders

Click on this menu option to open manufacturing orders tab. You can create or assign new orders.



Go to the last line and enter No. of M.O (Manufacturing Order), formula and amount. There is a field to add comments.

Formulas

You can set up formulas for different manufacturing processes.

Seq.	Process	Product	Batch	Mes. 1	Mes. 2	%kgs	rpm	Min.Ag
10	1	SOLVENT	D003	SOLVENT 3		1	10	
20	1	SOLVENT	D006	SOLVENT 6			30	
30	1	SOLVENT	D010	SOLVENT 10			10	
40	1	SOLVENT	D003	SOLVENT 3			45	
50	4	ADD SOLID	S01	SOLID 1			5	
60	2	AGITATE				10	45	10

On the lower side of the screen, there are buttons to **Create** new formulas, **Edit** formulas, **Delete**, **Delete line**, **Print** and **Save as**. You can create a new formula making changes on an existing one and changing the name clicking on **Save as**.

On top of screen, formula contains code and description fields.

Set the formula entering parameters of action and sequence of execution.

Enter data as follows:

Sequence No: Better, enter from 10 to 10 to enable the addition of steps between sequences.

Process: Go to this field and press Enter. An info window drops down a list with all possible actions. Go to the wanted option and press Enter to select it.

Code	Description
1	SOLVENT
2	AGITATE
4	ADD SOLID
5	ADD ADDITIVE
10	RESINS
11	ISOCYANATES

Product. Double click on this field or press Enter. An info window appears with a list of products. Go to the product required and press Enter for selection.

Batch. Enter the No of batch

Message 1. This messages appear before starting an action. Press Enter to open master of messages and select the messages. The message has these features:

Click on Accept to start the action.



Message 2. This message pops up when an action is finished. Click on Accept to execute next action.

%Kg. Kg percentage of product to be dosed.

Rpm. This parameter shows agitation speed.

Min Agit .Set time of agitation in minutes. To keep agitator working without stop, write “0”.

Orders

Set security orders to control kg of product in agitators. This way, disk agitator is not damaged as it is always submerged.

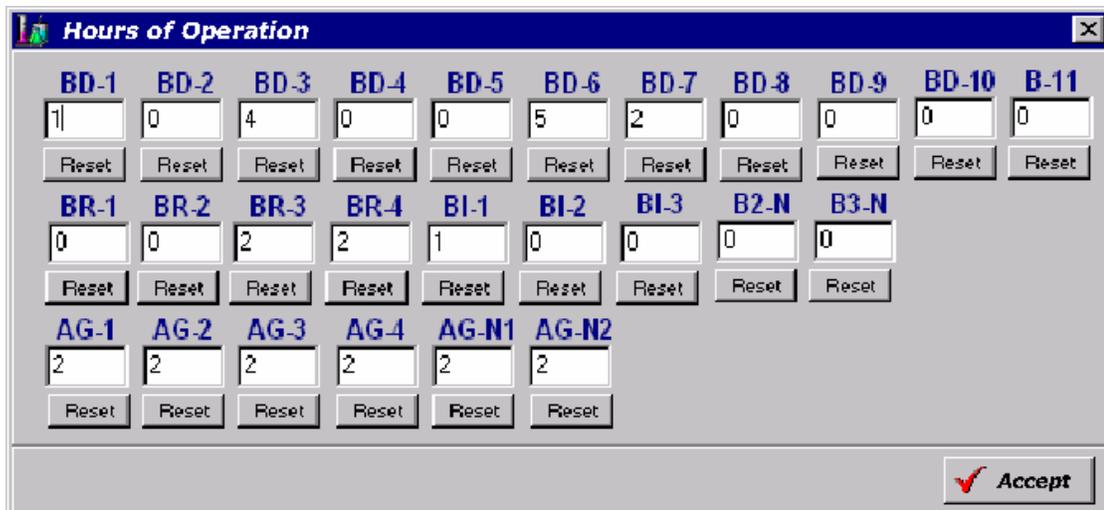


Agitator 1	Agitator 2	Agitator 3	Agitator 4	Tank 1	Tank 2
1000	1000	1000	1000	800	800

Accept

Hours of operation

Click on this menu option to enter in a new window, data of hours of operation and control elements (pumps and motor). You can reset separately each element. This is a helpful option in maintenance of components.

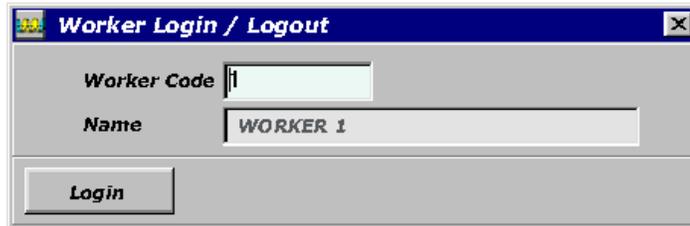


BD-1	BD-2	BD-3	BD-4	BD-5	BD-6	BD-7	BD-8	BD-9	BD-10	B-11
7	0	4	0	0	5	2	0	0	0	0
Reset										
BR-1	BR-2	BR-3	BR-4	BI-1	BI-2	BI-3	B2-N	B3-N		
0	0	2	2	1	0	0	0	0		
Reset										
AG-1	AG-2	AG-3	AG-4	AG-N1	AG-N2					
2	2	2	2	2	2					
Reset	Reset	Reset	Reset	Reset	Reset					

Accept

Worker

Click on this option to enter the worker code that works on the process. This data is important as data processed is assigned to one worker.



A dialog box titled "Worker Login / Logout" with a close button (X) in the top right corner. It contains two input fields: "Worker Code" with the value "1" and "Name" with the value "WORKER 1". Below the fields is a "Login" button.

Alarm indicator

Alarms

When an alarm goes off during the process, a window comes out (alarm indicator). It indicates in red date and time of the alarm.



Double left click to open an alarm indicator tab which has a button to register alarms. You can access to the tab also from Menu.



An "Alarm Indicator" window with a table of alarm records. The table has columns for "Alarm", "Start", "End", and "Registered". The records are color-coded: green for "SOLVENT GROUP EMERGENCY STOP ACTIVATED" and "SOLVENT WEIGHT DOES NOT CHANGE", red for "FAULT ON PUMP DIFFERENTIAL", and yellow for another "FAULT ON PUMP DIFFERENTIAL". Below the table is a "Group" dropdown menu and buttons for "Register All" and "Close".

Alarm	Start	End	Registered
SOLVENT GROUP EMERGENCY STOP ACTIVATED	02/03/99 18:00:27		02/03/99 18:02:21
SOLVENT WEIGHT DOES NOT CHANGE	02/03/99 18:00:27		02/03/99 18:02:21
FAULT ON PUMP DIFFERENTIAL	03/03/99 17:55:17		
FAULT ON PUMP DIFFERENTIAL	03/03/99 17:55:22	03/03/99 17:55:27	

When alarm is registered and is still active you will get a green indication. If the alarm is no longer active and nobody has registered it, the indication is yellow.

Likewise, if an alarm is registered and after that, it loses the “alarm condition”, the alarm is deleted automatically from the window and registered in Alarm history.

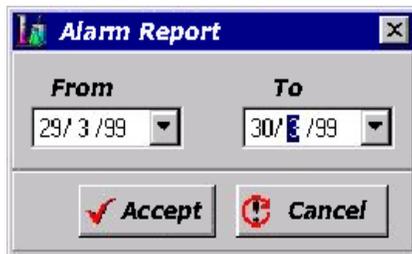
Reports

This option gives access to all processed and stored data. Data is stored in different reports that are described below:



Alarm report

Order the report within dates.



The report opened is below:

Data included in the report are alarm occurred, date/time of start, End date/time, date/time of registration, duration and worker. On top of screen, there are buttons for different actions: zoom report, go to next / previous page, set printer, print the report and exit (Close).

Alarm Report

Alarm Log
From 29/3/99 to 30/3/99

Alarm	Date of Start	Date of End	Registered	Duration	Worker
General emergency stop activated	29/03/99 09:55	29/03/99 12:29	29/03/99 09:55	02:33:47	
No Connection to paint primer scale	23/03/99 18:28	29/03/99 18:28	29/03/99 18:28	00:00:03	
No Connection to Isocyanate 4 scale	30/03/99 08:55	30/03/99 08:55	30/03/99 08:55	00:00:06	
Irregular Connection to PLC	30/03/99 09:41	30/03/99 09:42	30/12/99 00:00	00:00:09	
Fault on pump differential	30/03/99 10:30	30/03/99 10:30	30/03/99 10:31	00:00:02	
Fault on pump differential	30/03/99 10:31	30/03/99 10:31	30/03/99 10:31	00:00:01	
Irregular Connection to PLC	30/03/99 11:20	30/03/99 11:21	30/12/99 00:00	00:00:09	
Irregular Connection to PLC	30/03/99 11:46	30/03/99 11:46	30/12/99 00:00	00:00:10	
Minimum security weight aux. tank1	30/03/99 12:30	30/03/99 12:31	30/03/99 12:31	00:00:15	
Minimum security weight aux. tank1	30/03/99 14:30	30/03/99 14:45	30/03/99 14:45	00:14:26	
Irregular Connection to PLC	30/03/99 14:43	30/03/99 14:43	30/12/99 00:00	00:00:10	
Irregular Connection to PLC	30/03/99 16:43	30/03/99 16:43	30/12/99 00:00	00:00:00	
Irregular Connection to PLC	30/03/99 16:49	30/03/99 16:50	30/12/99 00:00	00:00:10	

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Production Report

Automatic production report is ordered between dates or by manufacturing order or agitator. To get all reports, leave fields empty. If you want specific report, fill data field required. The report can be summarized or detailed.

The screen shows the report and can be also printed.

Production Report

From: 15/03/1999 To: 25/03/1999

MO: Batch: Agitator:

Type of Report:

Summarized Detailed

Summarized

As you can see in detailed report below, following fields are filled: MO, reactor, formula, batch, D/T start, D/T end, kg,

Page 1
Date 17/10/2000

Summarized Formulation Report
From 23/03/1999 to

MO	Reactor	Formula	Batch	Date of Start	Date of End	Programmed Kgs.	Real Amount Kgs.	
10003	Paint Primer	2400	GENERIC PRODUCT	10003	23/03/1999	23/03/1999	2.500	2.505
Total Kgs. Manufactured						2.500	2.505	

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Detailed

The report below details all formulation steps and indicates D/T start, D/T end, and planned and real quantity.

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Date 17/10/2000

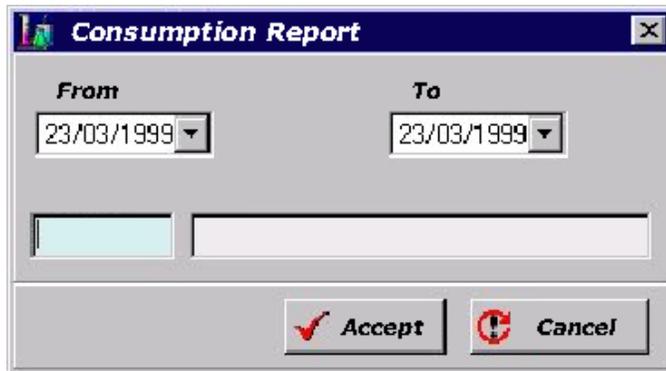
Detailed Formulation Report
From 23/03/1999 to

Date of Start	Date of End	Action	Tank	Component	Batch	Programmed Kgs.	Real Amount Kgs.	rpm	Min. Ag.	Worker
23/03/1999	23/03/1999	SOLVENT	D1	D001 SOLVENT 1		731.3	733			
23/03/1999	23/03/1999	SOLVENT	D4	D002 SOLVENT 2		156.3	157			
23/03/1999	23/03/1999	ADD SOLID	B2	S002 SOLID 2		18.6	15			
23/03/1999	23/03/1999	SOLVENT	D6	D006 SOLVENT 6		131	132			
23/03/1999	23/03/1999	SOLVENT	D2	D004 SOLVENT 4		62.5	61			
23/03/1999	23/03/1999	SOLVENT	D3	D110 SOLVENT 10		93.8	94			
23/03/1999	23/03/1999	SOLVENT	D11	D009 SOLVENT 9		457.0	457			
23/03/1999	23/03/1999	RESIN	R1	R003 RESIN 3		706	707			
23/03/1999	23/03/1999	AGITATE	B2					200	5	
23/03/1999	23/03/1999	ADD SOLID	B2	S001 SOLID 1		58.1	58			
23/03/1999	23/03/1999	ADD SOLID	B2	S003 SOLID 3		82	85			
23/03/1999	23/03/1999	ADD ADDITIVE	B2	A001 ADDITIVE 1		5.6	6			
23/03/1999	23/03/1999	AGITATE	B2					100	15	
23/03/1999	23/03/1999	AGITATE	B2					125	5	
Total Kgs. Manufactured						2.505				

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Consumption report

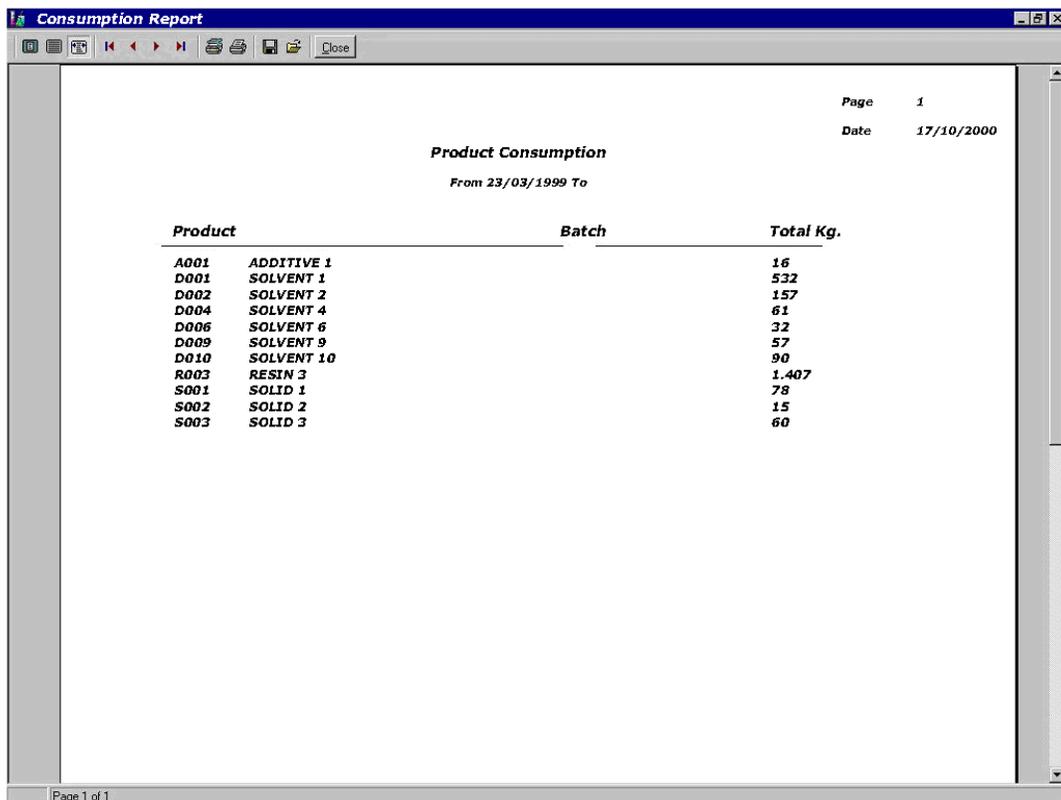
This report details product consumption data. Range of data is selected between dates, which are entered in the appropriate fields. You can request consumption of only one product or consumption of all of them leaving the field empty (blank).



The dialog box titled "Consumption Report" contains the following elements:

- From:** 23/03/1999
- To:** 23/03/1999
- Two empty text input fields.
- Accept** button (with a checkmark icon).
- Cancel** button (with a red exclamation mark icon).

The resulting report is below:



The window title is "Consumption Report". The report content is as follows:

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Date 17/10/2000

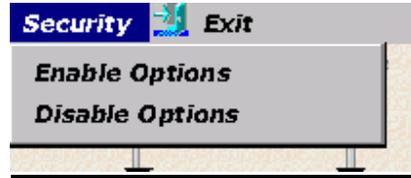
Product Consumption
From 23/03/1999 To

Product	Batch	Total Kg.
A001	ADDITIVE 1	16
D001	SOLVENT 1	532
D002	SOLVENT 2	157
D004	SOLVENT 4	61
D006	SOLVENT 6	32
D009	SOLVENT 9	57
D010	SOLVENT 10	90
R003	RESIN 3	1.407
S001	SOLID 1	78
S002	SOLID 2	15
S003	SOLID 3	60

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Security

Enabled and disabled menu options according to passwords and security levels (from 1 to 3).



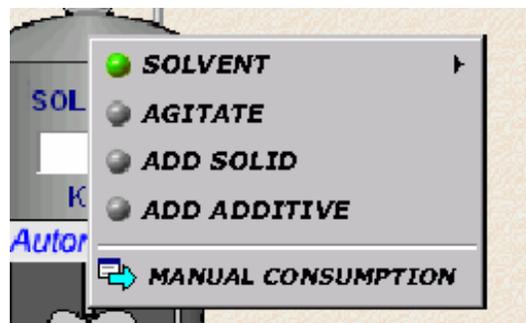
Exit

Click on **exit** to leave the application. Before, the program displays a dialogue box to confirm the action.

WAY OF OPERATION

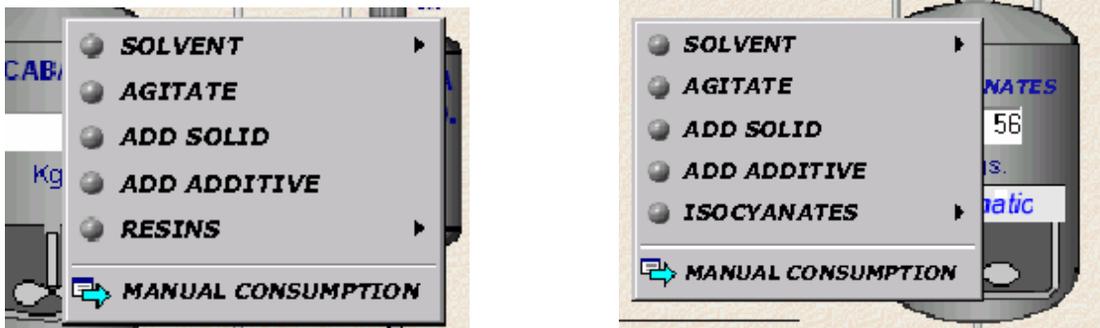
The system has been developed to execute control actions individually or linked with execution sequences, according to settled formulas.

The selector on electrical panel must be in “automatic position”.



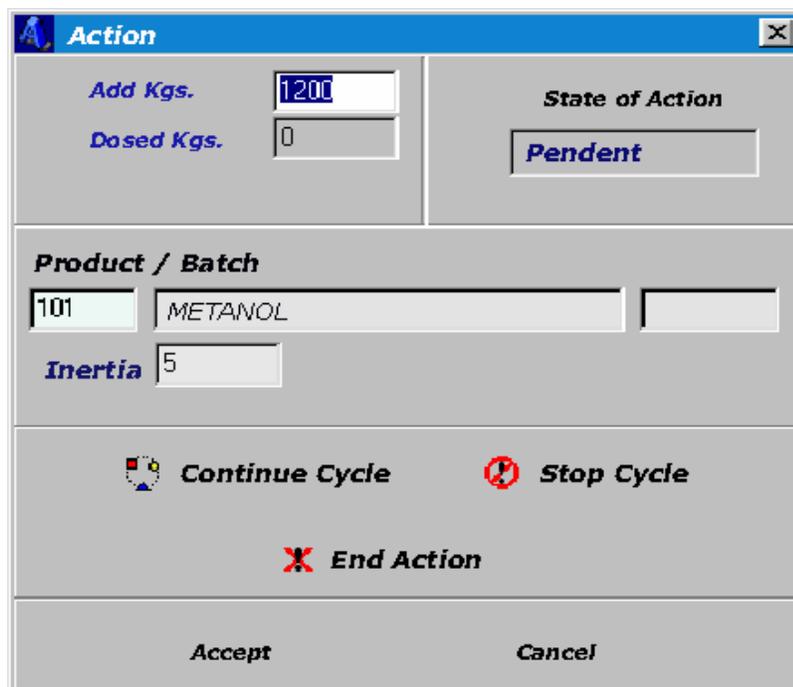
Reactor determines which actions can be executed. For example, when reactor works with solvents, actions are SOLVENT, AGITATE, ADD ADDITIVE AND ADD SOLID.

If it works with Primer and Finishing paints it also appears RESINS and in ISOCYANATES appears ISOCYANATES instead of Resins.



To make an action, right click on Reactor opens a window with different options. Click on action desired to open a new pop-up window to enter conditions of action.

For example, clicking on “Add solvent”, opens a window where amount of product and product data (component, batch, inertia) can be selected. State of action is also indicated: done, in process, interrupted. Likewise, other actions can be selected: Continue process, Stop process, End action.



Action	
Add Kgs.	1200
Dosed Kgs.	0
State of Action	
Pendent	
Product / Batch	
101	METANOL
Inertia	5
Continue Cycle	Stop Cycle
End Action	
Accept	Cancel

In actions menu there is another option: *Manual consumption*. Click on this option to open a tab and enter product and kg. This option is helpful to enter data of products consumed in the process. This way you can control consumption as negative data is also entered.

If you have a manufacturing order linked to an agitator, the manual consumption will be associated with the said manufacturing order and will be registered as another step in formulas, as Add Additive action with the appropriate kgs.

The screenshot shows a dialog box titled "Manual Consumption". It has a blue header bar with the title and standard window controls. Below the header, there are two rows of input fields. The first row has "Component" with the value "1107" and "Batch" with the value "ETHYL ACETATE". The second row has "Dosed Kgs." (empty), "Source" with the value "ALM", and "Destination" with the value "DISOL". At the bottom of the dialog, there are two buttons: "Accept" with a red checkmark icon and "Cancel" with a red 'X' icon.

Agitation action

Set time of agitation and agitation order in rpm. If you want unlimited agitation period, write "0" in the appropriate field.

The screenshot shows a dialog box titled "Action". It has a blue header bar with the title and a close button. The main area is divided into several sections. On the left, there are two input fields: "Rpm/°C Min" with the value "300" and "Time Min." with the value "0". On the right, there is a "State of Action" field with the value "Pendent". Below these fields, there are three buttons: "Continue Cycle" with a circular arrow icon, "Stop Cycle" with a circular arrow icon and a red 'X', and "End Action" with a red 'X'. At the bottom of the dialog, there are two buttons: "Accept" and "Cancel".

FORMULATION

Set formulas automatically following the process described below:

Left mouse click on reactor opens formulation window.

The screenshot shows the 'Formulation' window with the following fields and controls:

- MO: 11000, Batch: 12345, Progr. Amount: 2000
- Formula: 100, GENERIC FORMULA
- Com.: (empty)
- State: Stopped
- Kgs. Com: 0
- Time: 0
- Active Worker: (empty)

Seq.	Reac		Process	Sour.	Dest.	Product	Batch	Am.Kgs.	rpm	M.Ag	R.Amo.	State
10	1	1	SOLVENT	D1	B1	D001	SOLVENT 1	123	200			Pendent
20	1	1	SOLVENT	D2	B1	D002	SOLVENT 2	200	400			Pendent
30	1	1	SOLVENT	D8	B1	D008	SOLVENT 8	203	600			Pendent
40	1	2	AGITATE	B1	B1					50	10	Pendent
50	1	10	RESINS			R002	RESIN 2	300	400			Pendent
60	1	4	ADD SOLID	B1	B1	S002	SOLID 2	400	100			Pendent
70	1	10	RESINS			R003	RESIN 3	401	260			Pendent
80	1	5	ADD ADDITIVE	B1	B1	A005	ADDITIVE 5	502	40			Pendent
90	1	2	AGITATE	B1	B1					40	15	Pendent

Buttons at the bottom: Modify Step, Continue Cycle, Start Formula, Enter MO, >H Prod<, End Step, Stop Cycle, Stop Formula, End Formula, >H Prod MO<, Print, Exit.

This window shows detailed information about process and many actions can be executed.

When no formula is registered, formulation window appears empty. Therefore, the first action is *Enter M.O.* clicking on the appropriate button.

After clicking, the window above comes out. Go to MO field and press enter or double click to access to Master of Manufacturing Order. Select the manufacturing order and upload indicating Batch No. and pressing Enter. In this moment, the tab is filled with formula data and a calculation in Kg for each product.

On top of the tab, there are other fields:

State. Shows state of formula: stop or executing

Kgs. Indicates the amount in kg of dosage product.

Time. Indicates the remaining time in agitation processes.

At the right end of every line, there is a description of states:

Pending. Not executed yet

In process. Executing

Interrupted. The step is interrupted

Finished. The step is already done

Likewise, at the lower side of the tab there are different buttons for different actions:

Step Modification. Modify a step, select the step and then click button “Order modification”. A display comes out to change data.

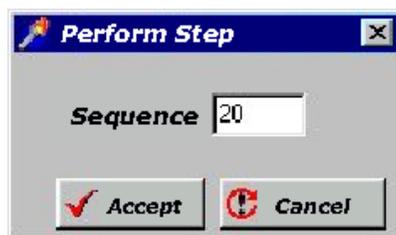
End. Finish a step in process.

Continue. Continue the formula after an interruption (voluntary interruption or due to safety conditions)

Stop. Interrupt the process.

Stop Formula. Interrupt the formula. Finish step in process and do not start the following step.

Start Formula. This option starts the execution of a formula from beginning or after another step if the process was stopped.



End Formula. This option ends formula in process. Clicking this button, data disappear from the screen and is registered in database of process history.

Print. Print formulation tab.

Exit. Close the window

On bottom of reactor detailed screen, appears data involved in the process: worker, manufacturing order, formula, dosed kgs and kgs to be dosed. Circuit is coloured in green when formula is in process; red when process is stopped. During the process, some messages or alarms may pop up.

If an action has a message assigned, you may be prompted with it. To continue the process press Accept.



Alarms can also come out. Some of them inform and others stop or act over the process.

When an alarm goes off visual and acoustic signal are activated. You can stop them either pressing reset at electrical panel or clicking on “register” button on computer.

When a formula is in execution and the process stops –it stops when reaches a step when worker must perform an action (unload product)-, the step is marked like “In process”. It will not continue until worker gives the order.

Actions to add products manually are divided in two types:

- ADD SOLIDS
- ADD ADDITIVES

At one side of each reactor, there are electrical panels with green pilot light and push button.

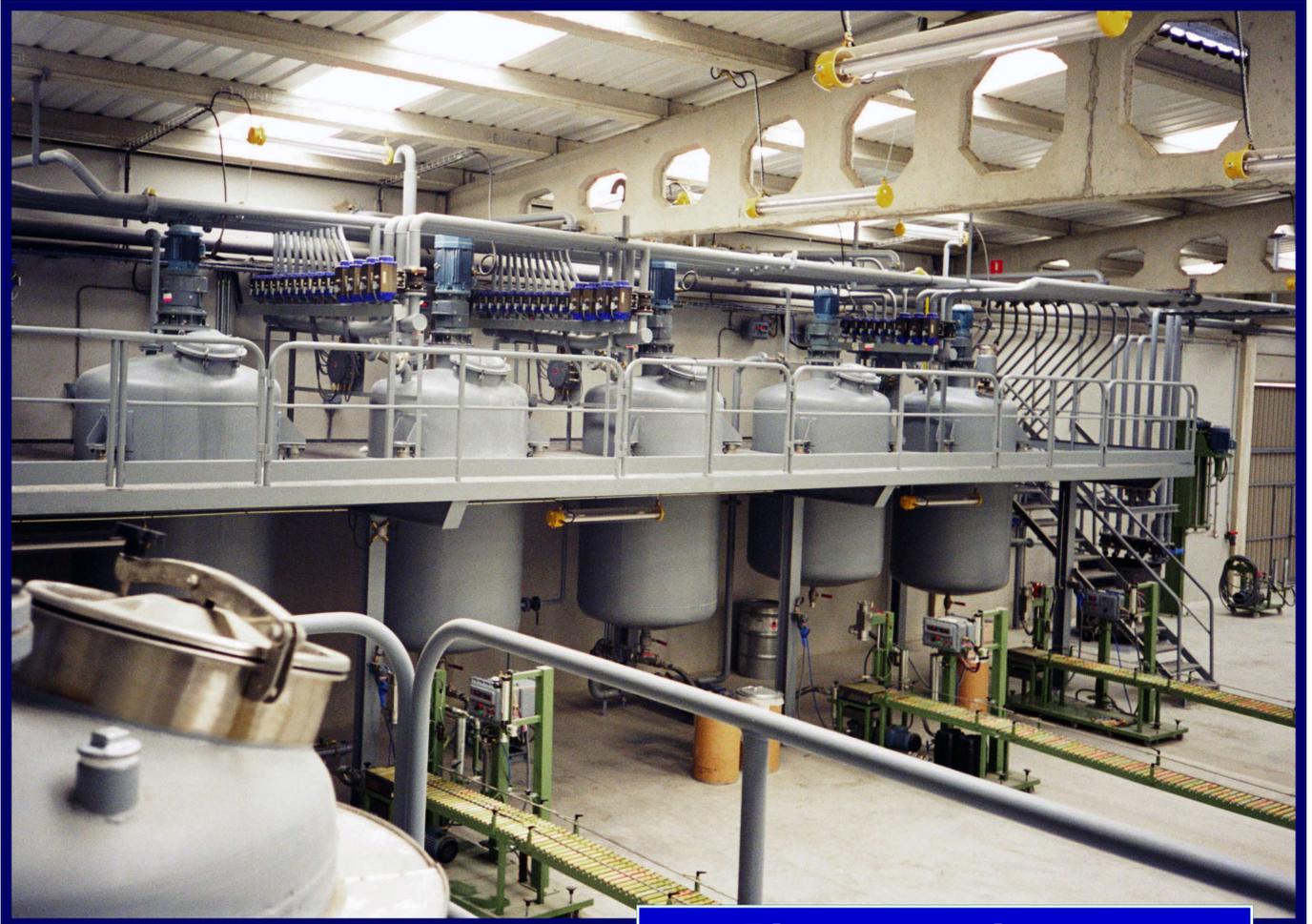
When process reaches a manual step, pilot light is switched on to indicate a worker must perform the unloading of product. As it is done, the worker must indicate it to the system. To do it, press push-button or finish the process from computer.

The criterion to register dosed kgs is:

- ADD SOLID. Kgs recorded are those the scale registers by difference of weight
- ADD ADDITIVE. “Planned” kgs are registered by default. This data can be changed in “step modification” option in formulation tab.

To make an action (dosing) during an automatic formula, the formula must be stopped. Right click opens a window with different options; when the formula is in process, you cannot click on any options. However, you can choose any option when the formula is stopped.

You can only act over agitation process in automatic formulations. You can stop or start an agitation process clicking on motor (on computer screen) or pressing button located at one side of reactors.



Plant general view





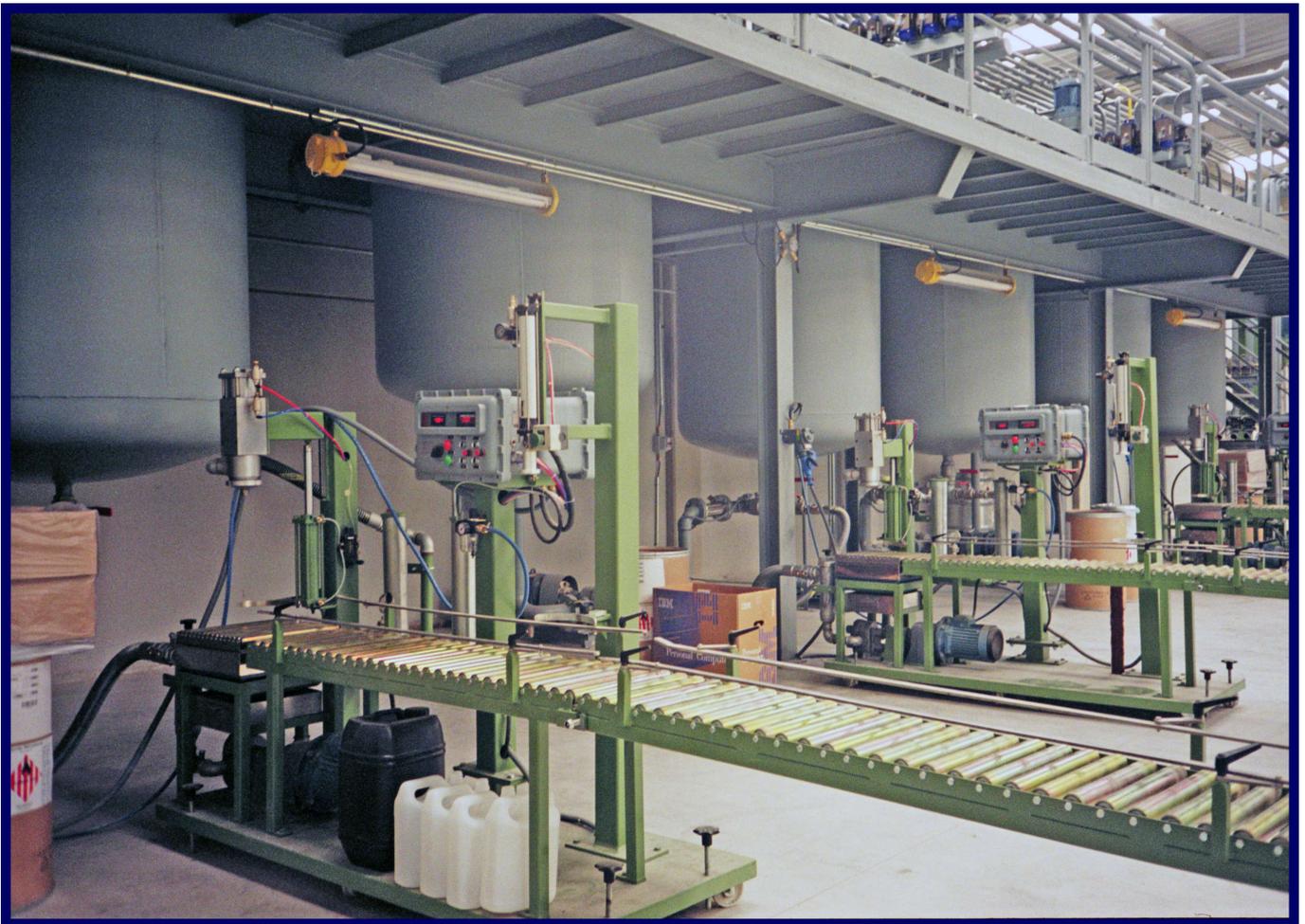
Installation detail





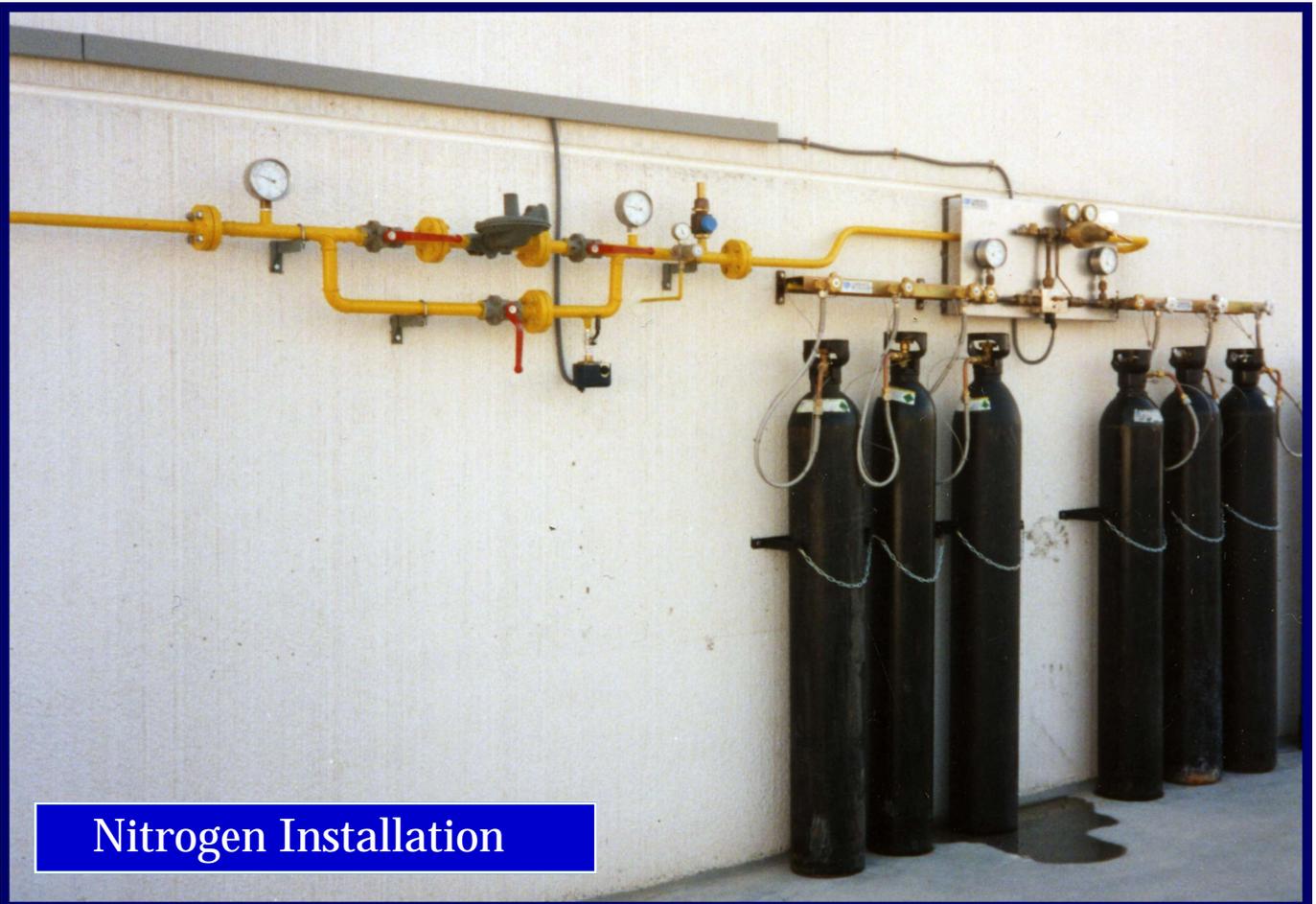


Packaging detail





Manual manufacturing detail



Nitrogen Installation