

ABS Consulting

Workshop “Next Generation PSA Software, Declarative Modeling, and Model Representation Standards”

MARE
a Risk Monitor supported in
PSA Risk Spectrum code models

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Kernkraftwerk Gösgen-Daeniken - Switzerland



EMPRESARIOS AGRUPADOS

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MARE is a plant specific real-time risk analysis tool developed by Empresarios Agrupados (EA) mainly to support fulfilment of the Spanish Regulatory Authority (CSN) requirement to implement the USA Maintenance Rule (10 CFR 50.56). This tool supports the analysis and evaluation of risk level changes due to equipment unavailability during plant operation.



MARE GENERAL CHARACTERISTICS

- Monitoring of on-line plant configuration by means of direct connection to plant component outage management system
- Interface aimed at plant staff: operation, maintenance, technical , ..
- Same terminology and representation used by plant staff
- Complete PSA model calculations with powerful calculation algorithm
- No training in PSA techniques required



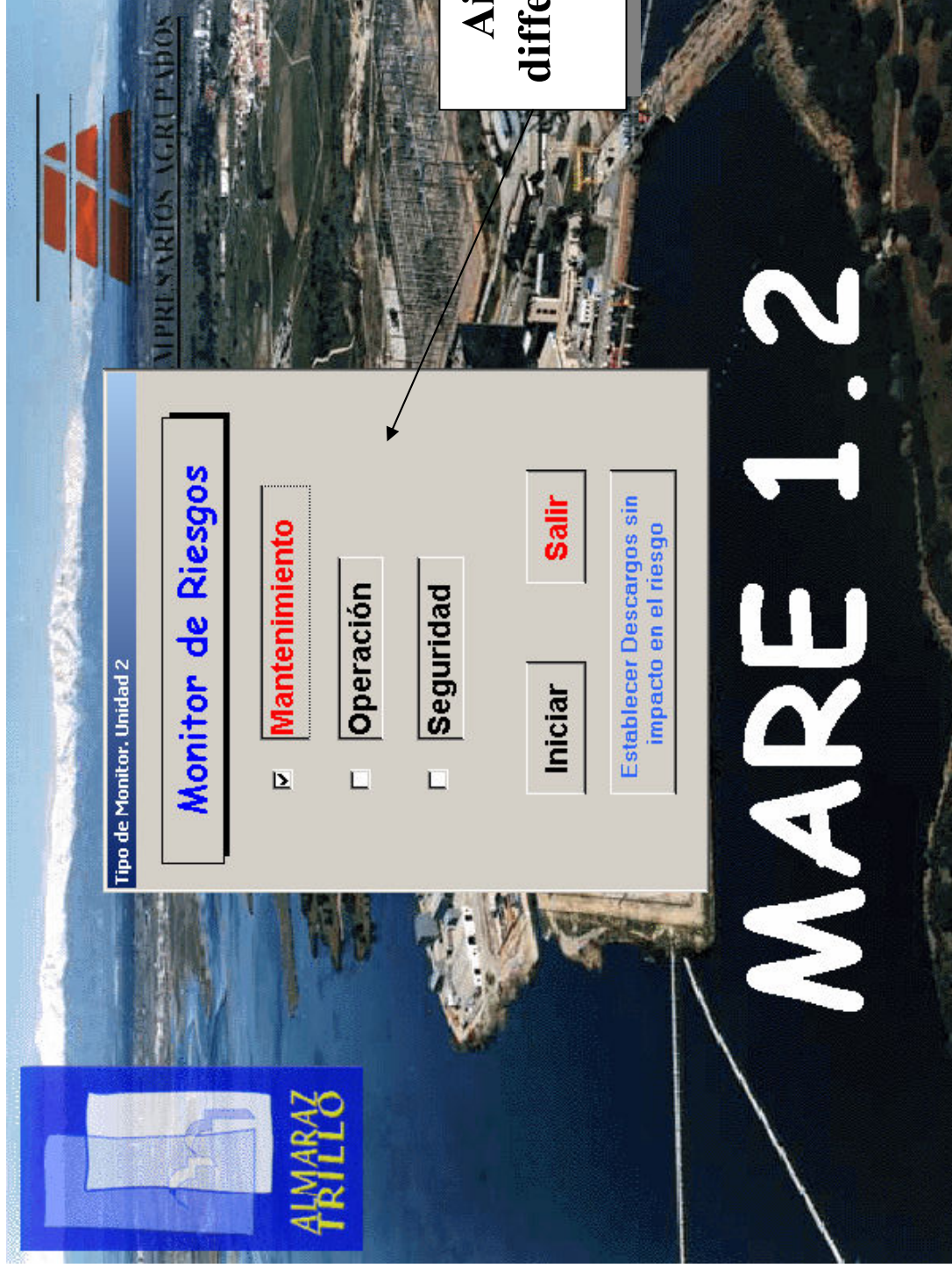
MARE GENERAL CHARACTERISTICS

- Works together with Risk-Spectrum-Windows computer program and PSA models handled by this computer code. Automatic interface without PSA analyst involvement in the **MARE** execution.
- Modular structure easily customised to user requirements (environmental factors, dynamic events,..)
- Display of historic, on-going and programmed outages as Gantt charts
- System configurations displayed as simplified diagrams, with different (six) colours for each possible situation
- Different displays for on-going and programmed outages



MARE GENERAL CHARACTERISTICS

- Online mode for actual point-in-time risk monitoring
- Importance of single outage components display for multiple-component outages
- Instantaneous recovery of previously stored analysis for outage scheduling or other analysis
- Different display for point-in-time and accumulated risk
- Calculates Maximum Allowed Configuration Times (ACT's)





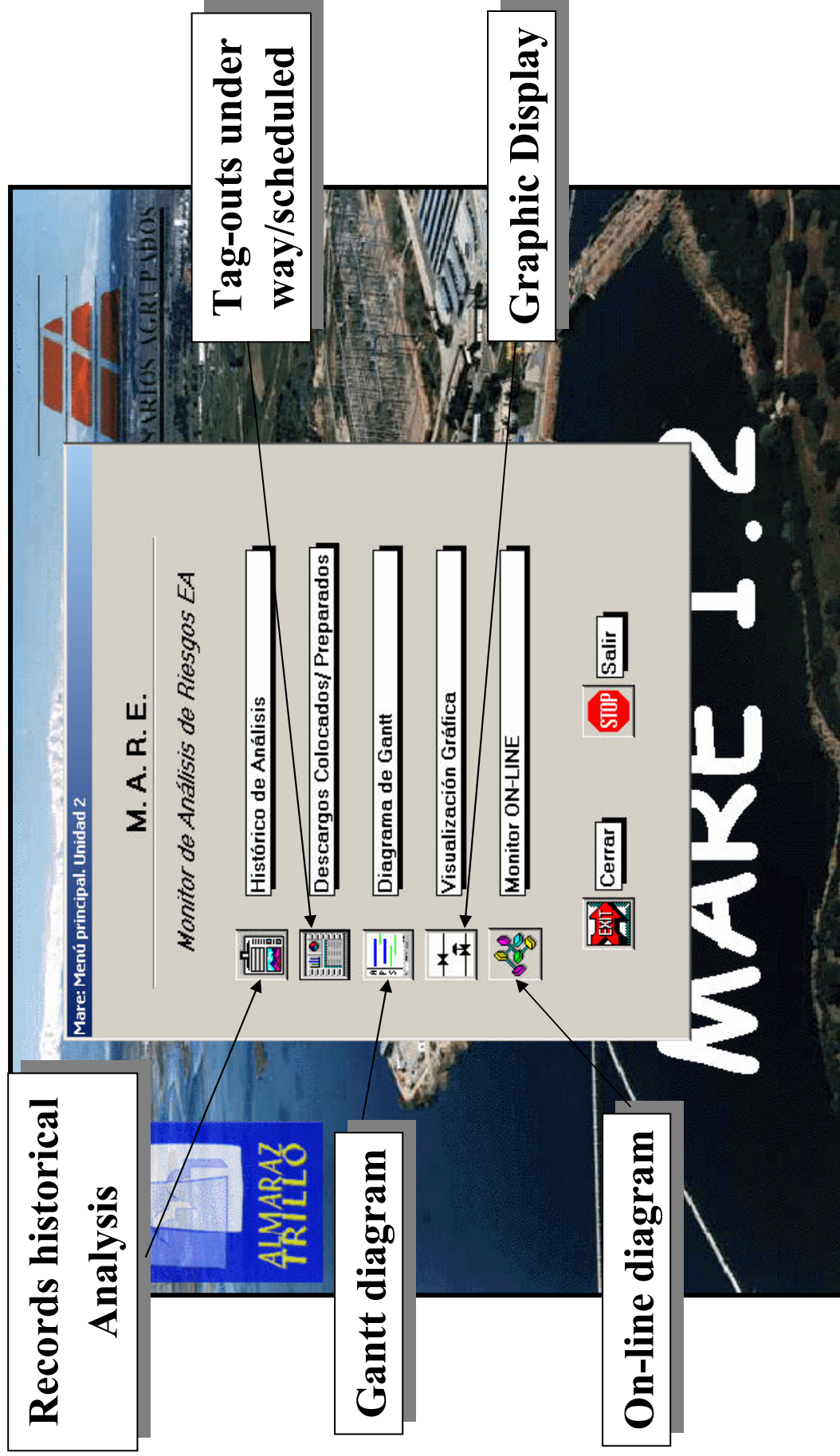
EMPRESARIOS AGRUPADOS

ACCESS TO THE MONITOR



**Modifications/
Updates of program
data allowed by
means of a
password**

**MARE
Main Menu**





TAG-OUT HISTORICAL RECORDS

Histórico de Análisis: Unidad 1

Informes

HISTORICO DE ANALISIS

Componente: CATCP01-SWXSMS01A

Descripción: REVISIÓN GENERAL COMPRESOR Y CALDERIN+COMPROBAR TENSION, NIVELACION Y ALINEACION

Descargo: 1-PRO-744/2003-X-PRO-751/2003

Fecha Inicio (DD/MM/AA hh:mm:ss): 21/05/2003 9:29:52

Fecha Final (DD/MM/AA hh:mm:ss): 21/05/2003 21:38:37

Duración del Descargo (horas): 12.15

Incremento Puntual del Riesgo: 4.57%

Incremento del Riesgo Anual: 0.01%

Margen de Seguridad durante el Descargo: 9.91

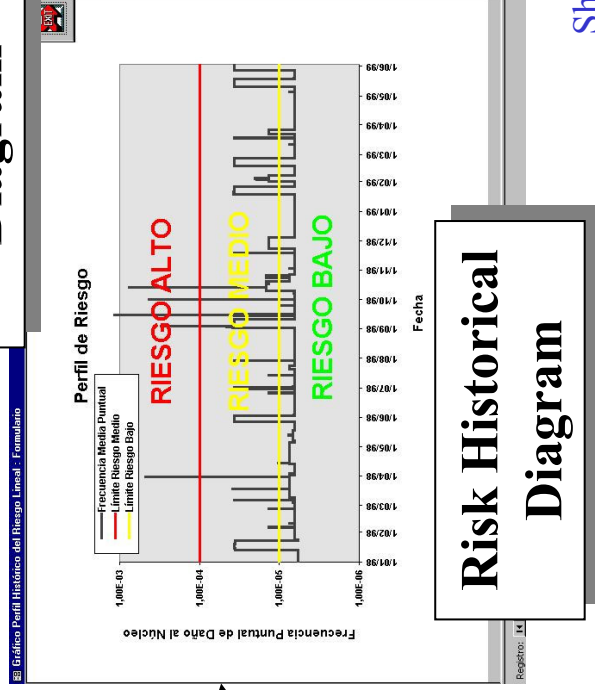
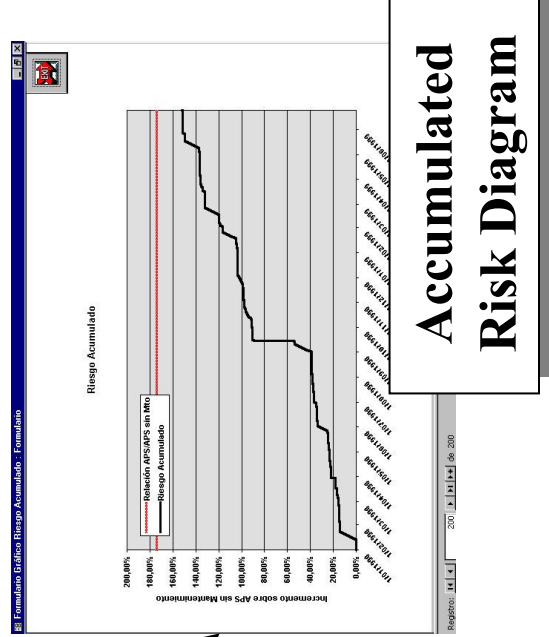
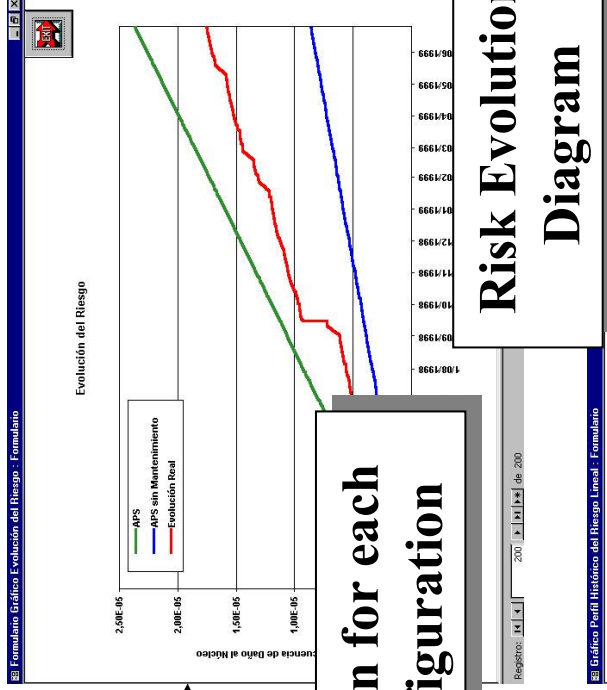
Riesgo Acumulado

Evolución del Riesgo

Perfil de Riesgo

Registro: 99 de 101

Safety margin for each tag-out configuration





TAG-OUT HISTORICAL RECORDS

Actual risk condition of the plant is evaluated, both regarding risk accumulated since the beginning of the cycle and by displaying its evolution

Recover of previous analysis

The screenshot displays the MAKE 1.2 software interface for tag-out records. The main window shows the following information:

- Tipo de Descargo:** PRO
- Componente:** SWXPP02A
- Descripción:** REVISION MOTOR Y REJILLA
- Fecha Inicio Real o Prevista (DD/MM/AA hh:mm:ss):** 23/10/2006 11:36:59
- Fecha Prevista de Finalización (DD/MM/AA hh:mm:ss):** [Empty field]
- Duración Prevista del Descargo (horas):** [Empty field]
- Fracción Anual de duración del Descargo:** [Empty field]
- Descargo:** X-PRO-1216/2006

At the bottom of the window, there are several buttons: **Analizar**, **Imprimir**, **Volver**, and **Recuperar**. The interface also includes a navigation bar at the top with 'Principal, Unidad 2' and 'dos. Unidad 2', and a status bar at the bottom showing '1 de 5'.

A Report is printout listing all historical component outages along the period



TAG-OUTS UNDER WAY/SCHEDULED

The screenshot displays the MARE 1.2 software interface. A window titled 'DESCARGOS COLOCADOS/PREPARADOS' is open, showing a list of discharges. A modal dialog box is overlaid on the window, displaying the message: 'No hay descargos significativos para el riesgo' (There are no significant discharges for the risk). The dialog box has an 'Aceptar' (Accept) button. The background window shows fields for 'Tipo de Descarga: PRO', 'Componente: SWX', and 'Descripción: REVI'. The interface also includes buttons for 'Analizar', 'Imprimir', 'Volver', and 'Recuperar'. The MARE 1.2 logo is visible in the bottom right corner of the screenshot.

Previously it is identified whether there are new component tag-outs with impact on risk



Checking of input data

Descargos Colocados/Preparados. Unidad 1

DESCARGOS COLOCADOS/PREPARADOS

Tipo de Descargo: **PRO**

Componente: C51HCV185 Descargo: 1-PRO-585/2006

Descripción: VALVUI

Fecha Inicio Real o Pre (DD/MM/AA hh:mm:ss):

Fecha Prevista de Finali (DD/MM/AA hh:mm:ss):

Duración Prevista del Descargo (horas):

Fracción Anual de duración del Descargo:

Registro: 1 de 8

Aviso

La Fecha debe ser superior a la del día de hoy

Aceptar

Selección de fecha

Día: Junio 1998

L	M	X	J	V	S	D
25	26	27	28	29	30	31
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	1	2	3	4	5

Hora: 11:20:00

Aceptar Cancelar

Dejar fecha en blanco



DESCARGOS EN CURSO/PROGRAMADOS

Componente: SW1PP

Fecha Inicio Real o Pre (DD/MM/AA hh:mm:ss): 1999/1080

Fracción Anual de duración del Descarga: 1.55%

Calcular

Additional calculations to be carried out

DESCARGOS EN CURSO/PROGRAMADOS

Componentes	Descargos
[IATCP01A-SW1PP01B]	1999/1080+1999/590

Tiempo Máximo Recomendado de duración del Descarga (horas): 37.33

Fracción Anual de duración del Descarga: 0.43%

Incremento Puntual del Riesgo: 531.23%

Incremento del Riesgo Anual: 3.10E-05



TAG-OUTS UNDER WAY/SCHEDULED

Descargos en Curso

DESCARGOS EN CURSO/ PROGRAMADOS

Componente: IAICP01A

Descripción: REVISION GENERAL COMPRESOR

Descargo: 1999/1080

Fecha Inicio Real o Prevista (DD/MM/AA hh:mm:ss): 2/06/99

Fecha Prevista de Finalización (DD/MM/AA hh:mm:ss): 3/06/99 11:30:00

Margen de Seguridad durante el Descargo: 9.69

Tiempo Máximo Recomendado de duración del Descargo (horas): 242

Duración Prevista del Descargo (horas): 35.50

Fracción Anual de duración del Descargo: 0.41%

Incremento Puntual del Riesgo: 519.86%

Incremento del Riesgo Anual: 3.04E+05

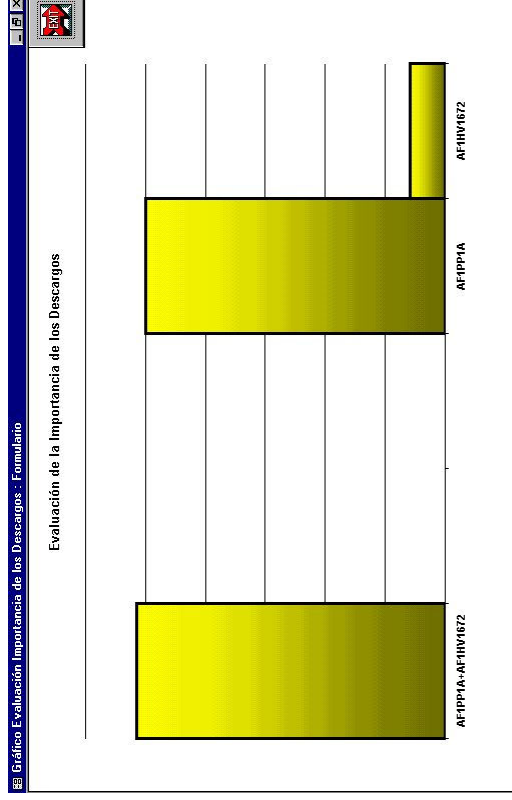
Riesgo Acumulado

Evolución del Riesgo

Perfil de Riesgo

Informe

Almacenar Análisis



Registro: 1 de 2

Mare: Menú principal, Unidad 2

DESCARGOS EN CURSO/ PROGRAMADOS

DESCARGOS EN CURSO

Nº de Análisis: 1

Descripción del Análisis: caso prueba...

Almacenar

Cancelar

Recuperar

Fracción Anual de duración del Descargo:

Registro: 1 de 145

Cerrar SUP Salir

ALMARA TRITON

MARK I.2

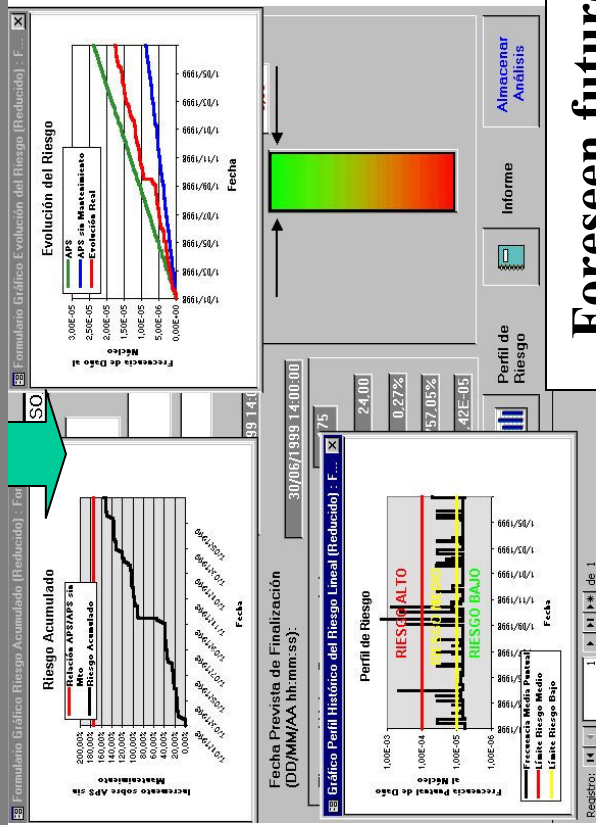
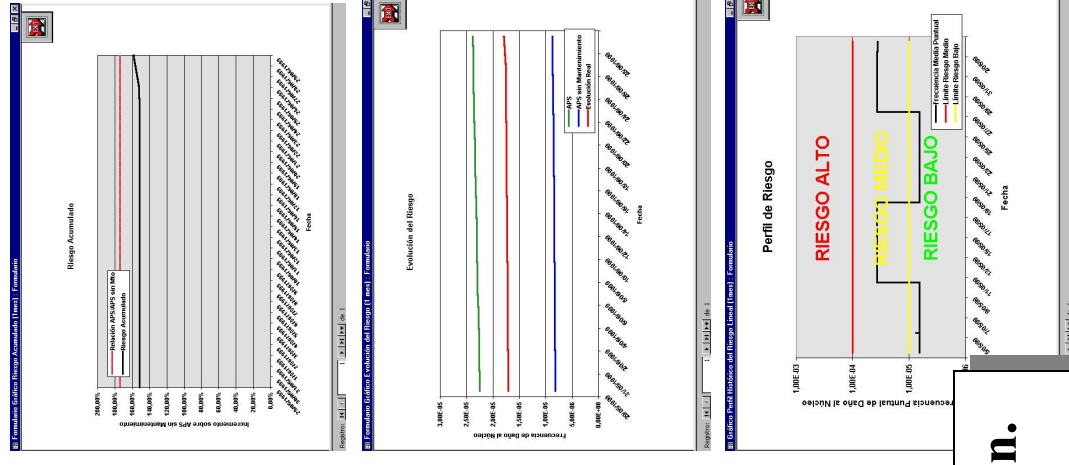
Filing of new hypothetical configuration analysed

Importance evaluation of single Tag-out components



Different views of the results are available

Joint display of results: safety margin and historical evolution along the period analysed



Foreseen future risk evolution. Next month is displayed



DESCARGOS EN CURSO/ PROGRAMADOS

Componente: [A1] Imprimir

Impresora: HP LaserJet 4

Nombre: HP LaserJet 4

Estado: Impresora predeterminada; Lista

Tipo: HP LaserJet 4

Dónde: \\Serverz\laser

Comentario:

Intervalo de impresión: Todo Páginas Desde: Desde: Hasta: Intercalar

Copias: 1 2 3 1 2 3 Intercalar

Configurar... Aceptar Cancelar

Imprimir en archivo

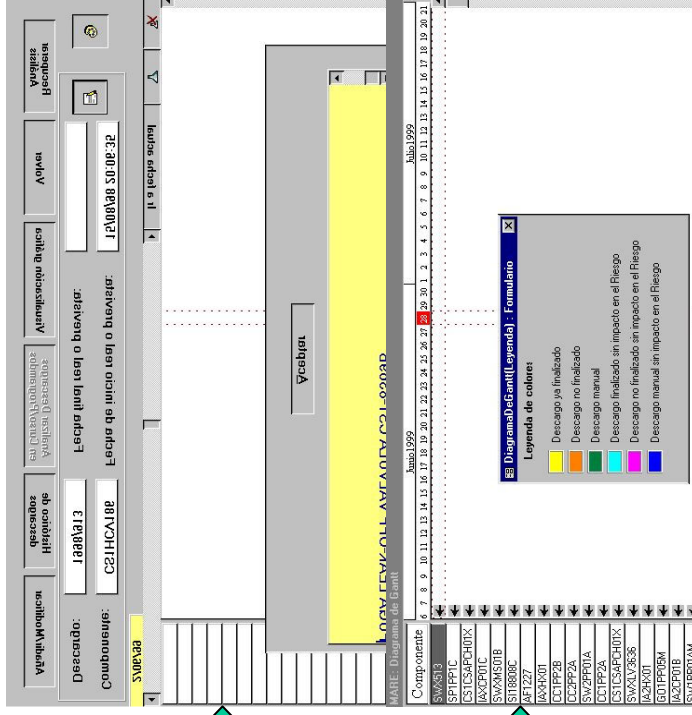
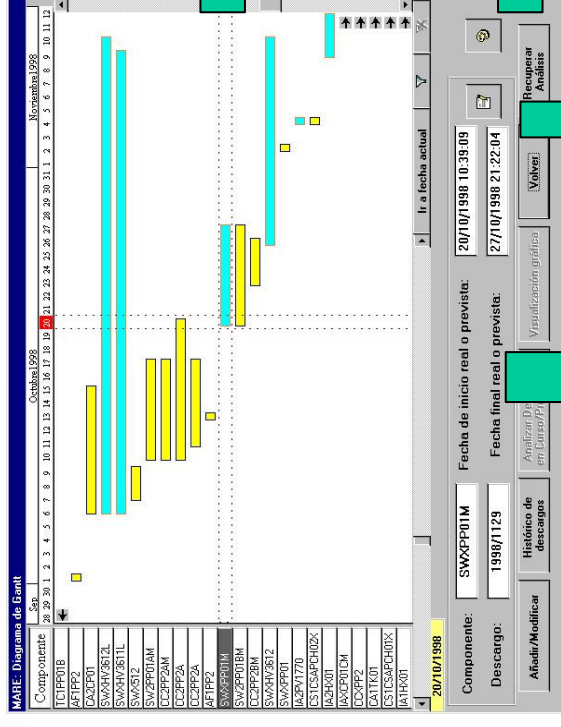
Duración Previsible: 9.69

Reportes printout

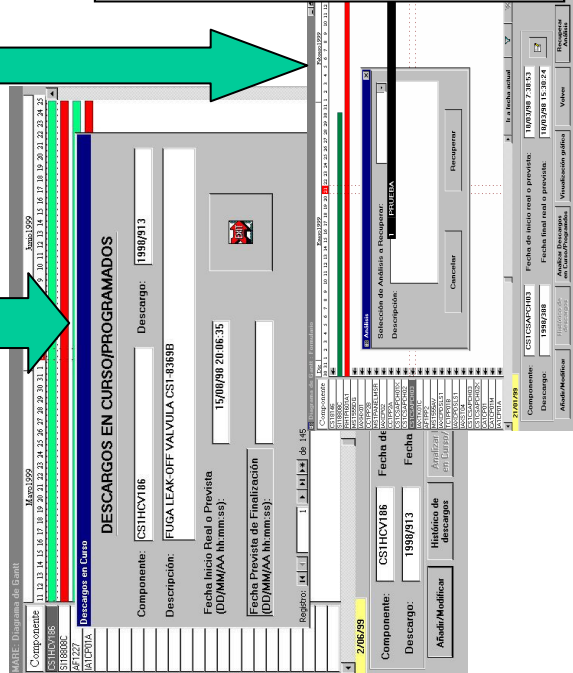
Reportes seleccionados

Región

Filing of analysed cases is possible. That permits future recovery or comparison with other analysis



Tag-out display in a Gantt Diagram:
Status of tag-outs: historical and under way
Input tag-out data
Scheduling of new Tag-outs
Recovery and modification of stored analysis cases





Añadir/Modificar Descargos Zoom x1 x2 x4 Colocar/Retirar Fecha visualizada: 2/06/99

Graphic representation of tag-out status: scheduled or actual

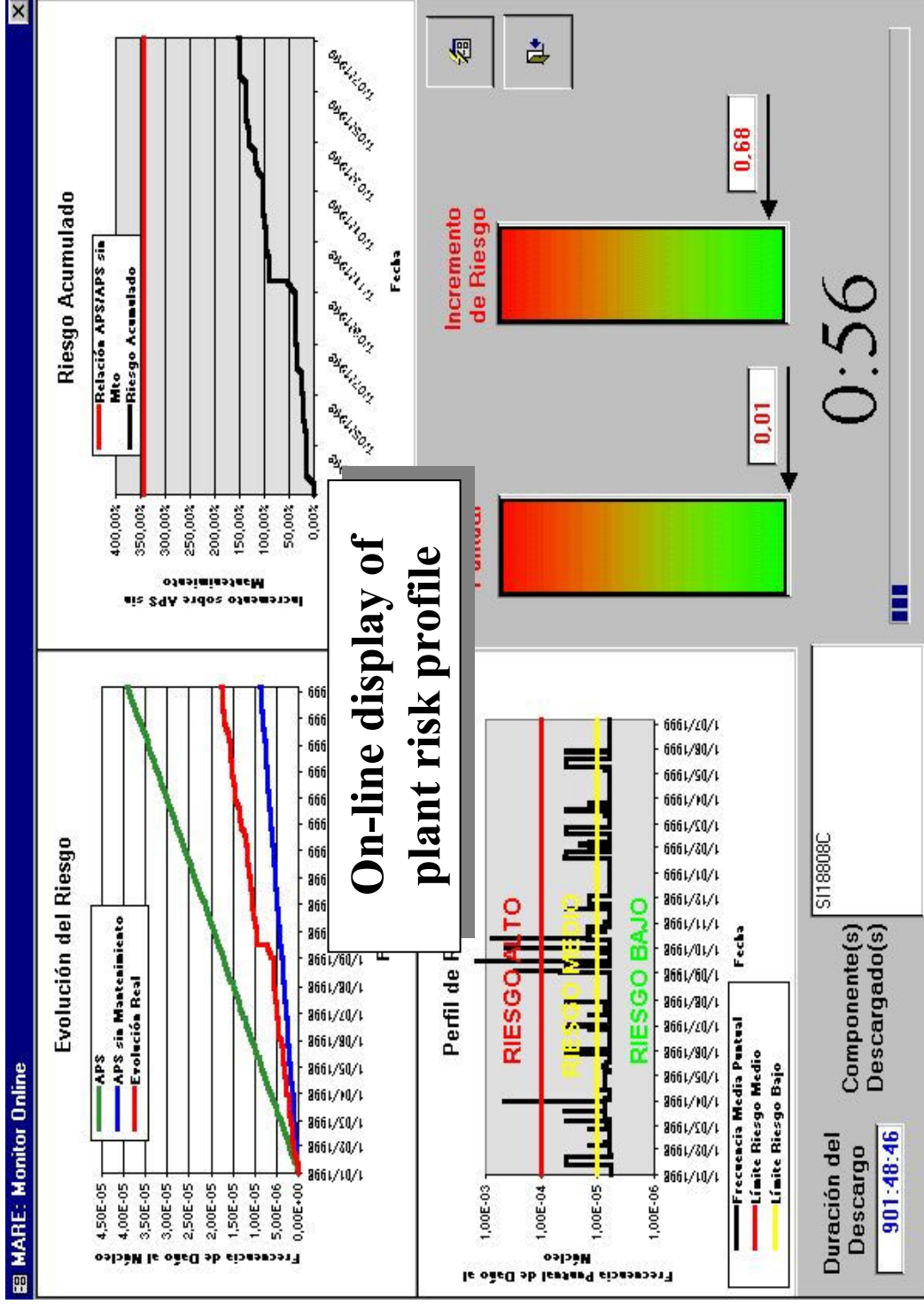
New components can be placed out of service for analysis

Información del descargo

Componente: CA2CP01
 Descargo: 2-PRO-1999/1721
 Descripción: REVISIÓN COMPRESOR Y CALDERIN
 Inicio: 25/10/1999 8:00:1 Final:

Tag-out data

- Descargo real sin fecha de finalización
- Descargo real con fecha de finalización
- Componentes relacionados con un descargo inicial
- Descargos temporales
- Descargos real sin impacto en el riesgo (sin final)
- Descargos real sin impacto en el riesgo (con final)



Data is automatically refreshed every X minutes



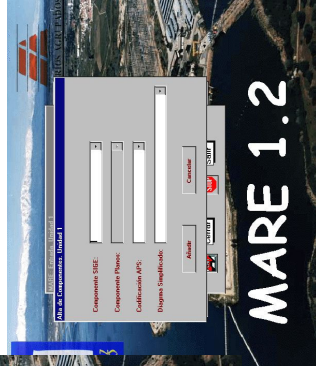
DATA MODIFICATION

All data used can be modified:

- Constants
- Input data
- Flow diagrams



MARE 1.2



MARE 1.2



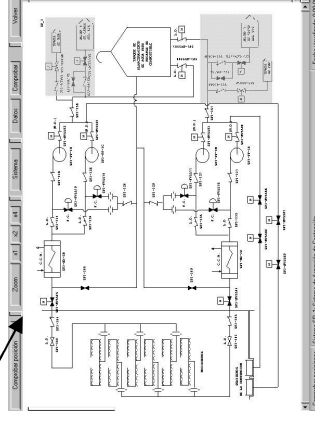
MARE 1.2



MARE 1.2



MARE 1.2



Modifications require a password to avoid mistakes



- Real time Risk Monitoring integrated with SIGE plant database
- Complete solution of each unit PSA model (no simplifications)
- Full power Level 1 PSA
- Automatic maintenance data plant inputs from SIGE database
- Updates of design modifications and reliability data each refuelling
- Useful reports and graphics capabilities for MR and others



- Three different user friendly interface displays for operation, maintenance and technical assistance staff.
- Simplified diagrams (same as used in PSA) and unfoldable menus with the same component representation and identification than in plant
- Special information for both units shared components
- Normal on-line risk calculations in less than few minutes