



*Setting the Standard for Automation™*

# Solução Integrada para SCADA, PIMS e MES

Standards  
Certification  
Education & Training  
Publishing  
Conferences & Exhibits

São Paulo, agosto de 2013

25  ANOS  
AQUARIUS



# Nosso modelo

- GE Intelligent Platforms:
  - fabricante do software **Proficy**
- Aquarius Software:
  - distribuidor em território brasileiro
- Você:
  - Representante/ Solution Provider/ Integrador



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# Agenda

**Arquitetura de Software**

**Sistema SCADA**

**Sistema PIMS**

**Sistema MES**

**Exemplo**



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# Agenda

**Arquitetura de Software**

**Sistema SCADA**

**Sistema PIMS**

**Sistema MES**

**Exemplo**

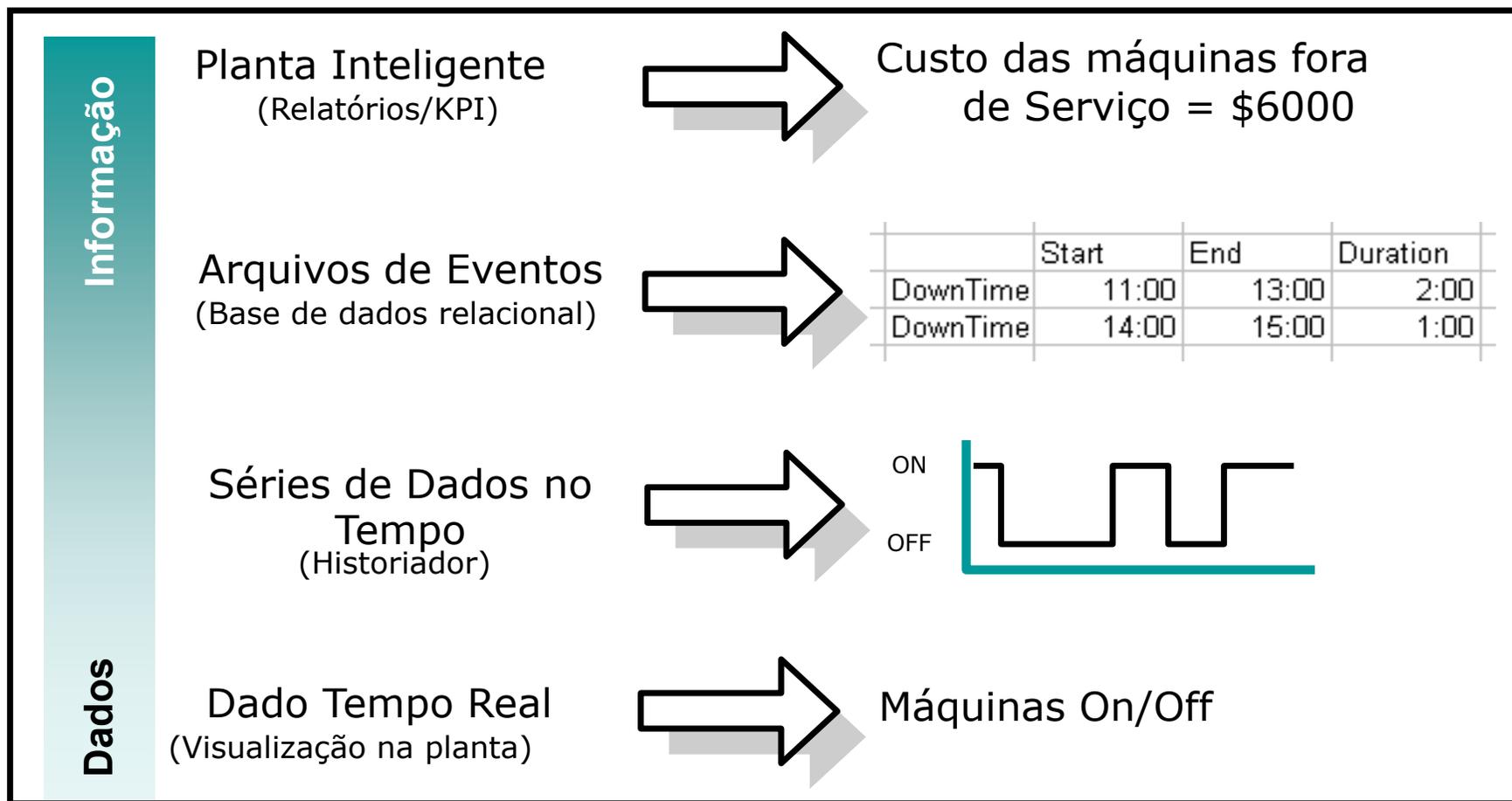


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# Planta Inteligente

## Transformando Dados em Informação



# Objetivos da Integração de Sistemas

- Confiabilidade dos Dados do Chão de Fábrica
- Redução dos Erros de Digitação
- Documentação do Processo
- Facilidade de Acesso à Informação
- Obtenção de Resultados de Análise
- Conhecimento e Melhoria do Processo



# 80s

## Computer-Integrated Manufacturing



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# 90s AMR Research



Transação

ERP

Evento

MES

Tempo

Sistema de Controle



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# Agenda

## Arquitetura de Software

**Sistema SCADA**

**Sistema PIMS**

**Sistema MES**

**Exemplo**



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# Sistema SCADA

Supervisory  
Control  
And  
Data  
Aquisition



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# Objetivos do SCADA

- Operação do Sistema de Controle
- Visualização de Dados em Tempo Real
- Gerenciamento de Alarmes
- Relatórios de Operação



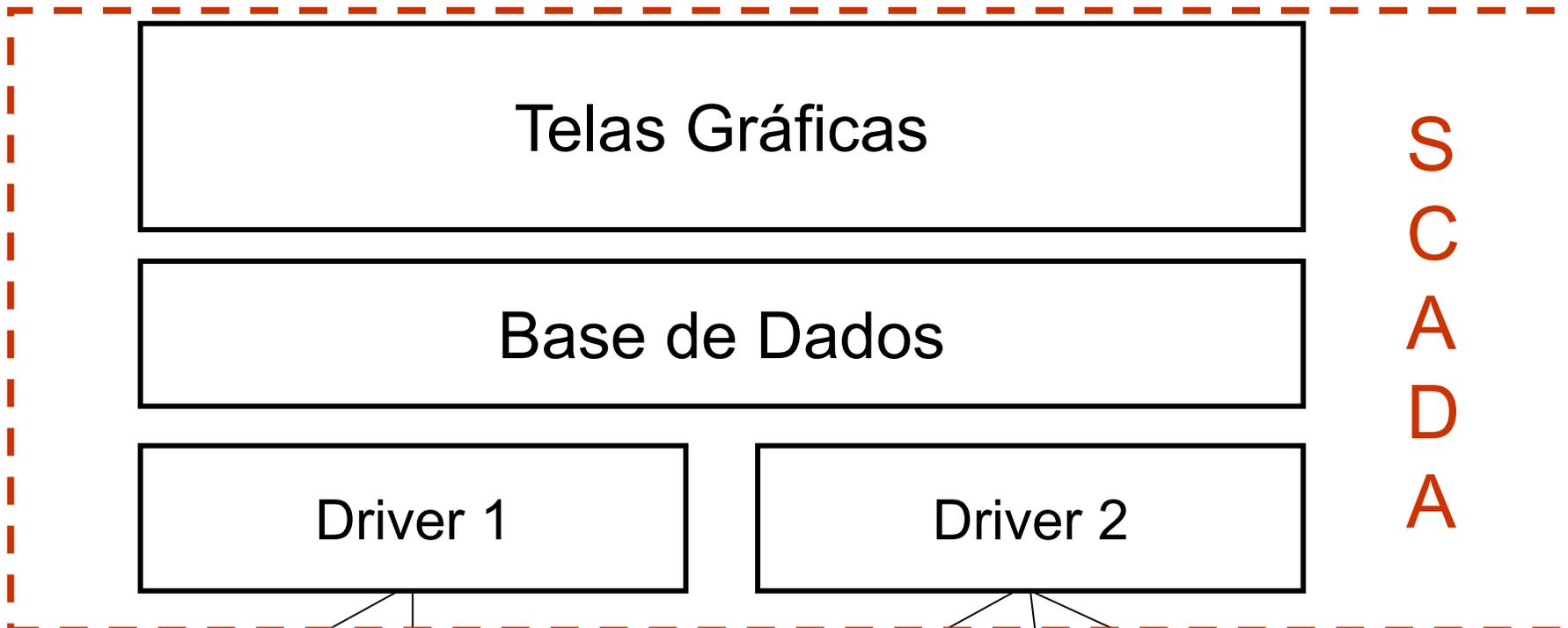
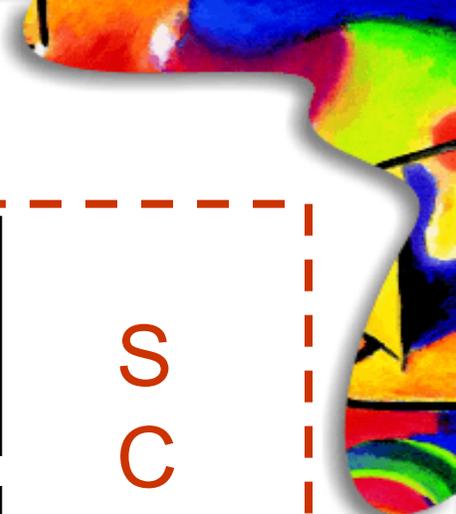
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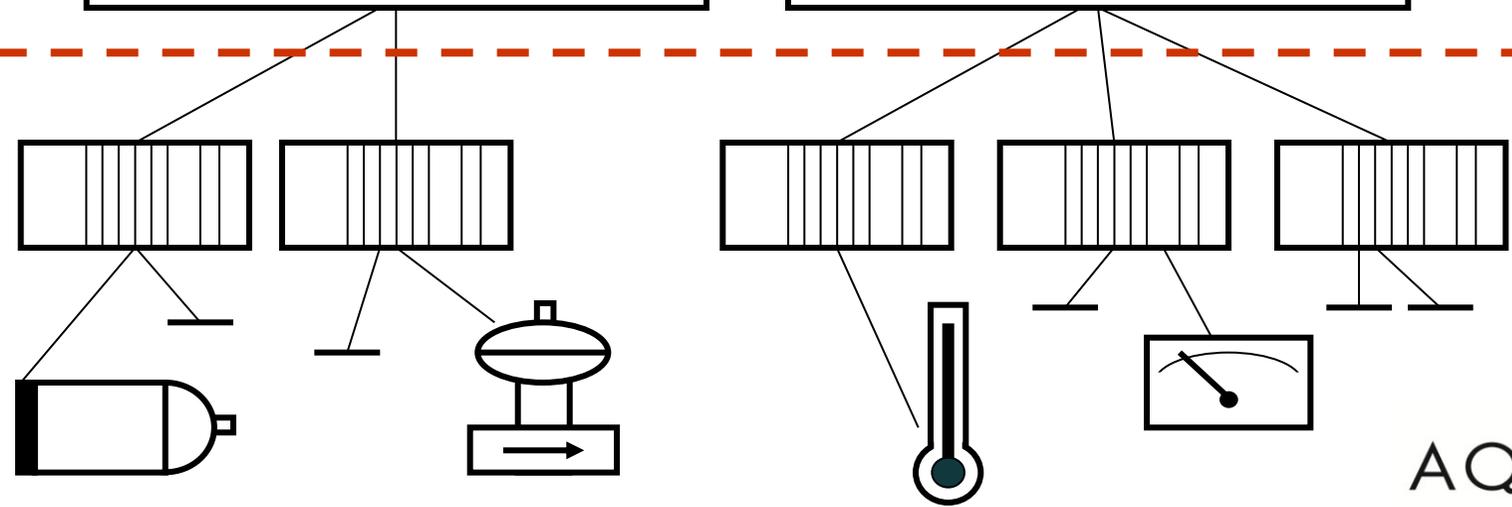


# Sistema SCADA

## Funcionamento



S  
C  
A  
D  
A



# Sistema SCADA

## Arquitetura Típica





# Agenda

**Arquitetura de Software**

**Sistema SCADA**

**Sistema PIMS**

**Sistema MES**

**Exemplo**



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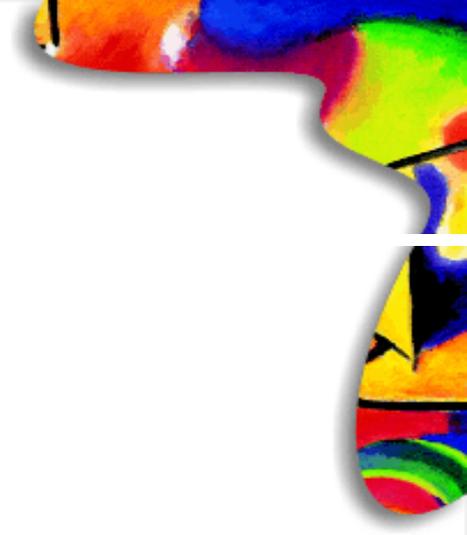
# Sistema PIMS

# Plant Information Management System



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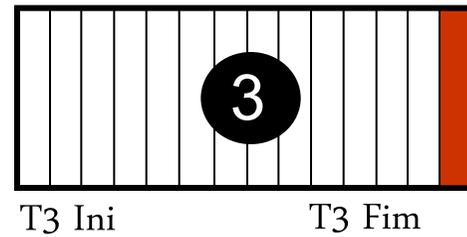
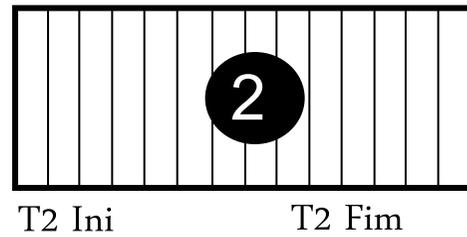
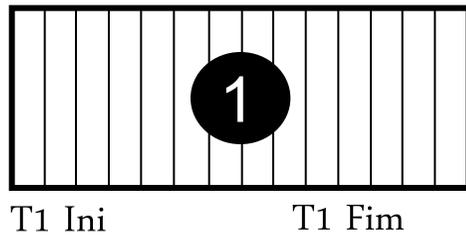
# Objetivos do PIMS

- Armazenamento de Grandes Volumes de Dados
- Armazenamento de Dados em Alta Frequência
- Relatórios de Longos Períodos
- Relatórios Globais do Processo
- Cálculos Temporais



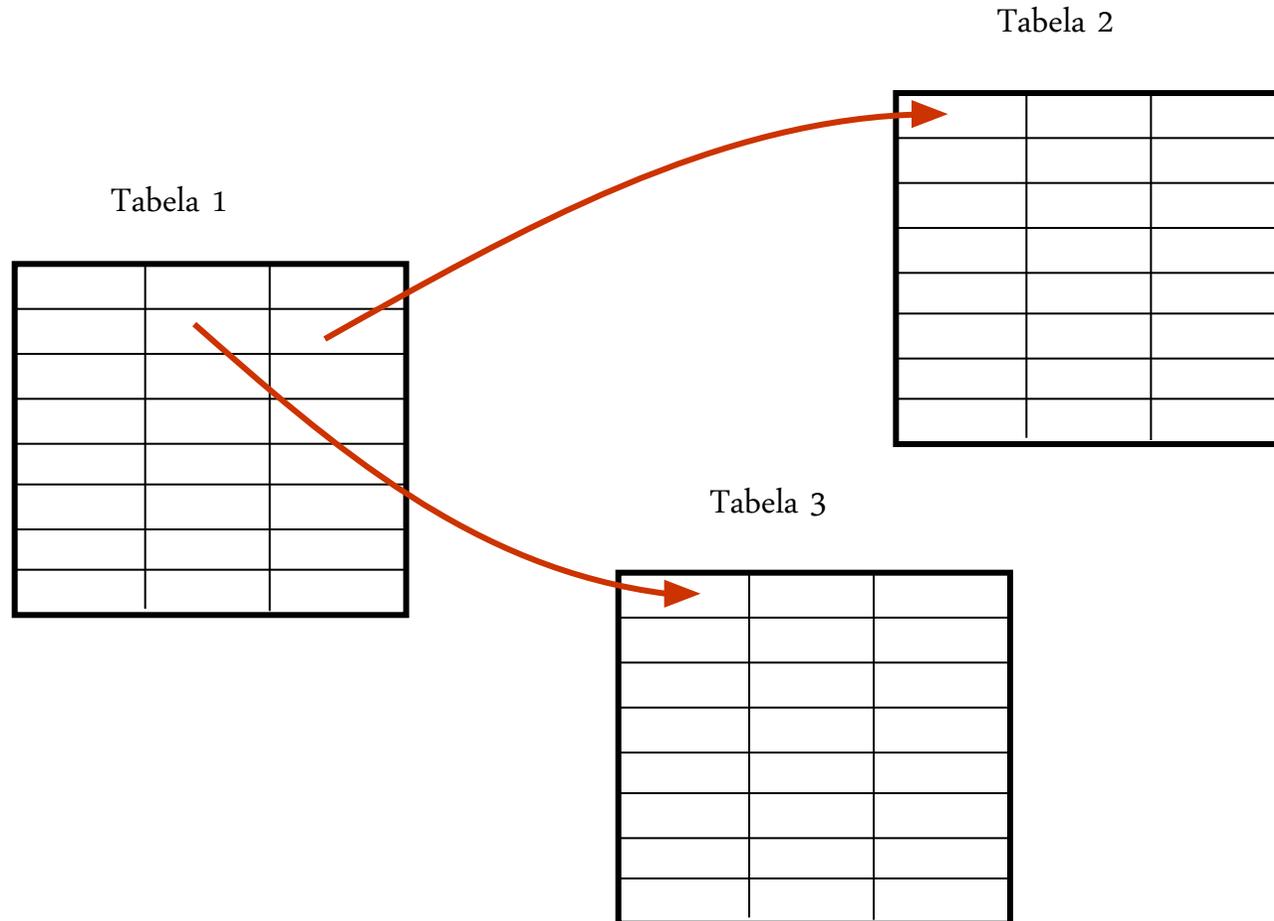
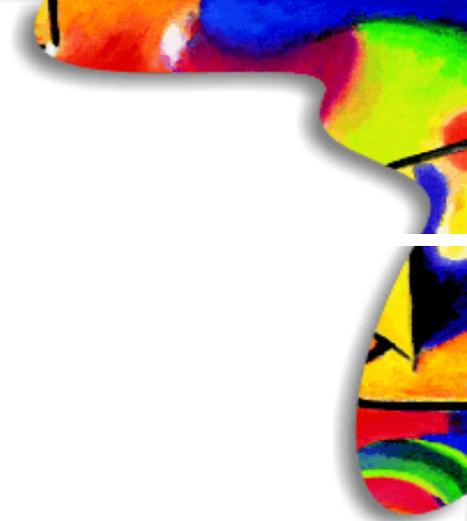
# Sistema PIMS

## Banco de Dados Temporal



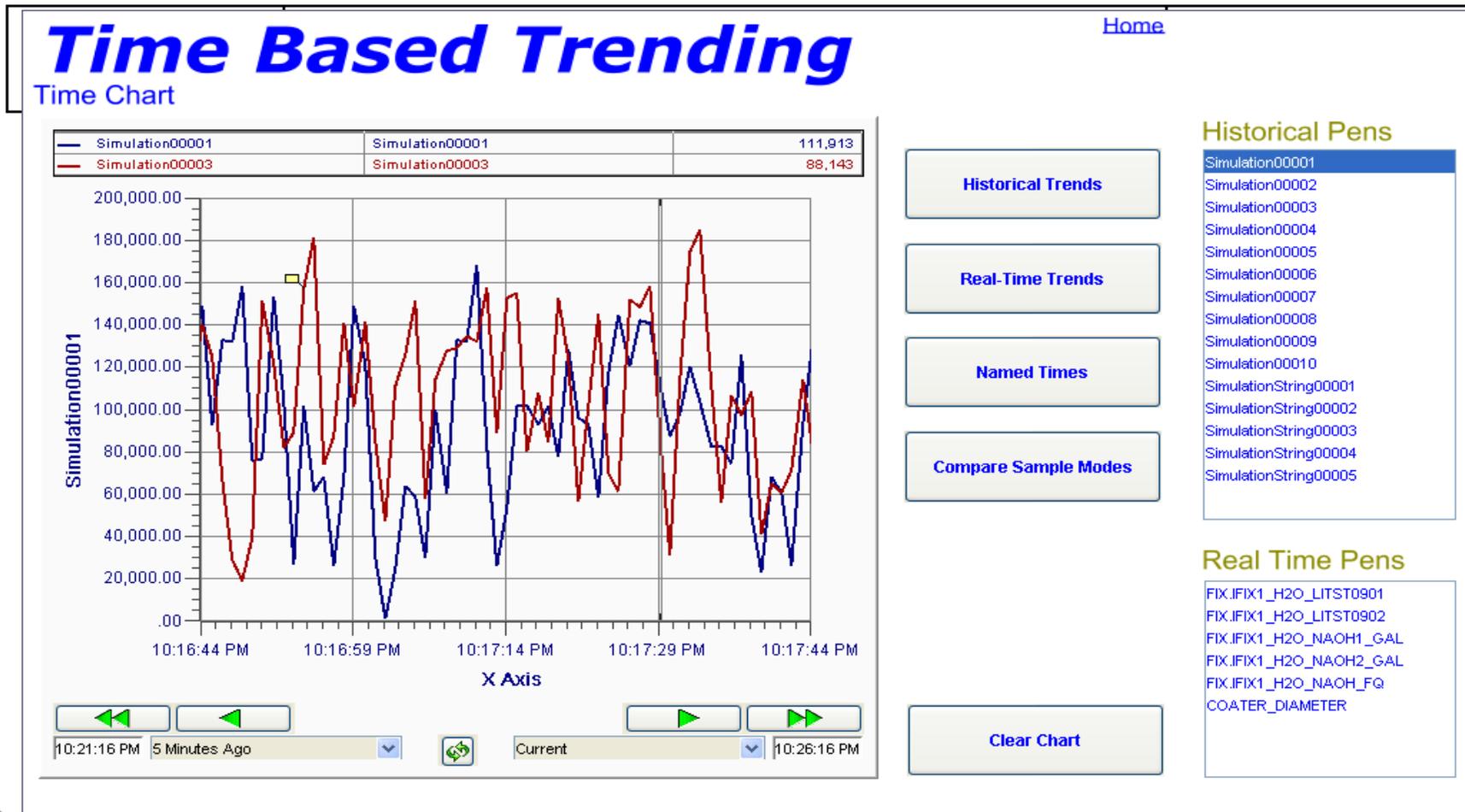
# Sistema PIMS

## Banco de Dados Relacional



# Sistema PIMS

## Exemplos

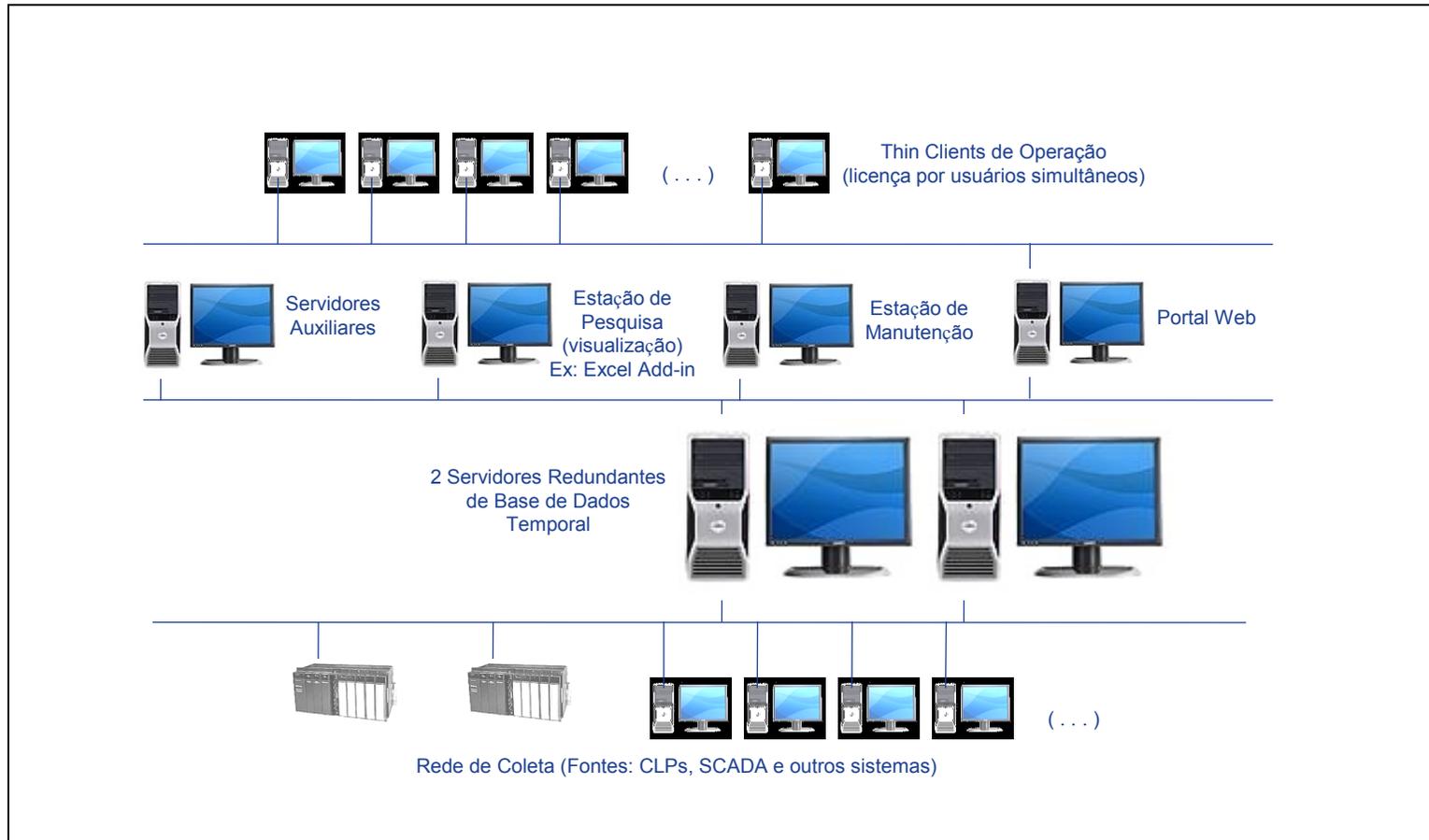


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# Sistema PIMS

## Arquitetura Típica



# Agenda

**Arquitetura de Software**

**Sistema SCADA**

**Sistema PIMS**

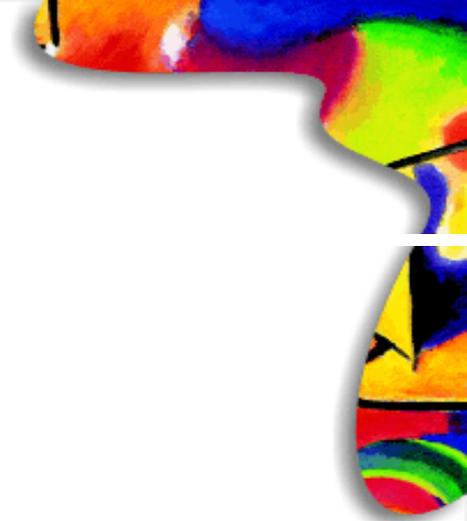
**Sistema MES**

**Exemplo**



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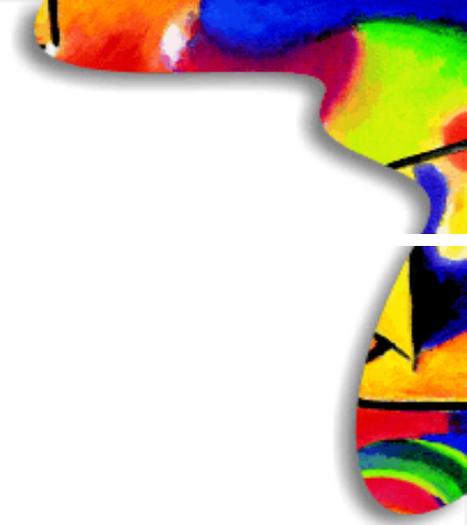
# Sistema MES

## Manufacturing Execution System



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# Objetivos do MES

- Eventos de Chão de Fábrica
- Comunicação com Sistemas Corporativos
- Relatórios para Equipes de Qualidade, Manutenção, Produção e Estratégica



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# Sistema MES

## Modelo Mesa International



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# Sistema MES

## Eficiência



### Objetivo

- Monitoramento de OEE (Overall Equipment Effectiveness)
  - Paradas, contagem de produção e perdas, ineficiências
  - Associa eventos com suas causas em tempo real
- Análise de dados por máquina, processo, turno, etc

### Vantagens

- Melhor utilização dos ativos da planta (equipamentos, pessoal e material) através de um melhor entendimento da eficiência dos equipamentos em tempo real
- **Produzir mais com menor custo**



# Sistema MES

## Eficiência - Eventos

Paradas

Perdas

Contagem de  
Produção

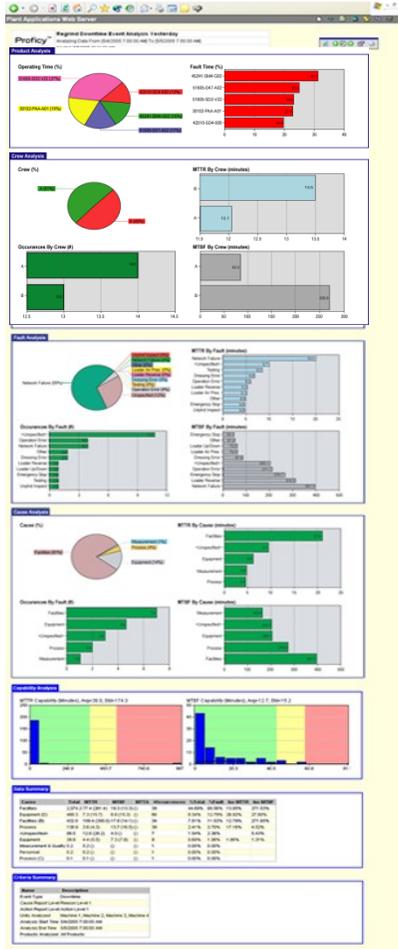
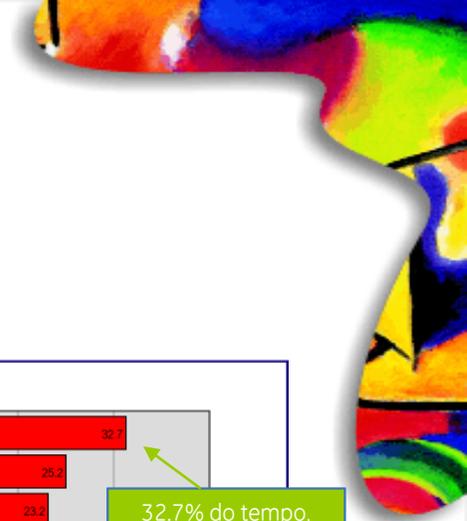


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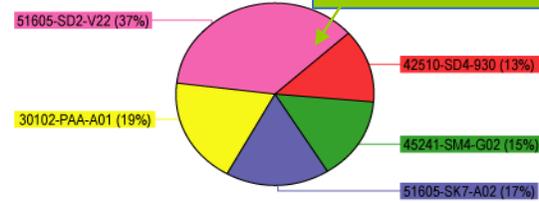
# Sistema MES

## Eficiência



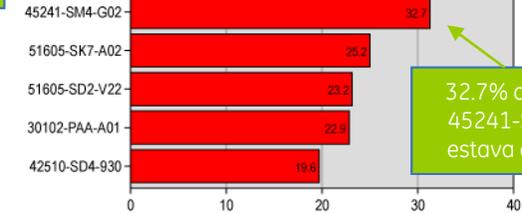
### Product Analysis

#### Operating Time (%)



37% do tempo de operação é atribuído ao 51605-SD2-V22.

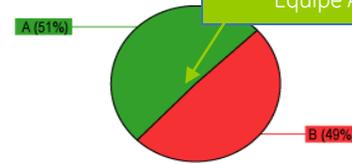
#### Fault Time (%)



32.7% do tempo, 45241-SM4-G02 estava em falha.

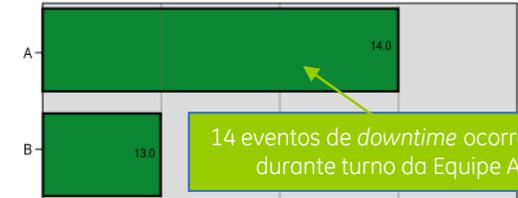
### Crew Analysis

#### Crew (%)



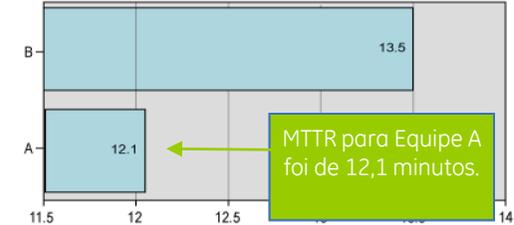
51% do total de paradas ocorreram durante turno da Equipe A

#### Occurrences By Crew (#)



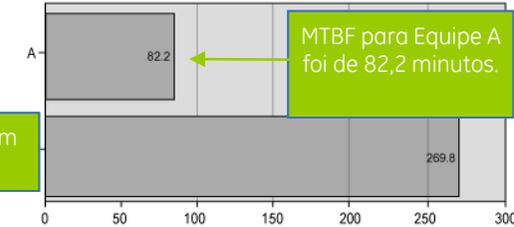
14 eventos de downtime ocorreram durante turno da Equipe A.

#### MTTR By Crew (minutes)



MTTR para Equipe A foi de 12,1 minutos.

#### MTBF By Crew (minutes)



MTBF para Equipe A foi de 82,2 minutos.



# Sistema MES

## Eficiência

$$\text{Disponibilidade} = \frac{\text{Tempo de Funcionamento}}{\text{Tempo Previsto}} \%$$

x

$$\text{Desempenho} = \frac{\text{Produção Real}}{\text{Produção Prevista}} \%$$

x

$$\text{Qualidade} = \frac{\text{Produção Válida}}{\text{Produção Total}} \%$$

=  
**OEE**



# Sistema MES

## Qualidade

### Objetivo

- Análise e controle da qualidade de produtos e processos
- Especificações e alarmes para condições fora das especificações
- Análise de dados por batelada, lote, item, turno, etc.

### Vantagens

- Melhor qualidade dos produtos e dos processos
- Redução dos custos de qualidade (retrabalho, refugo, recall etc.)
- **Faça certo na primeira vez**



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## Qualidade - Eventos



Produção

Disposição

Alarme

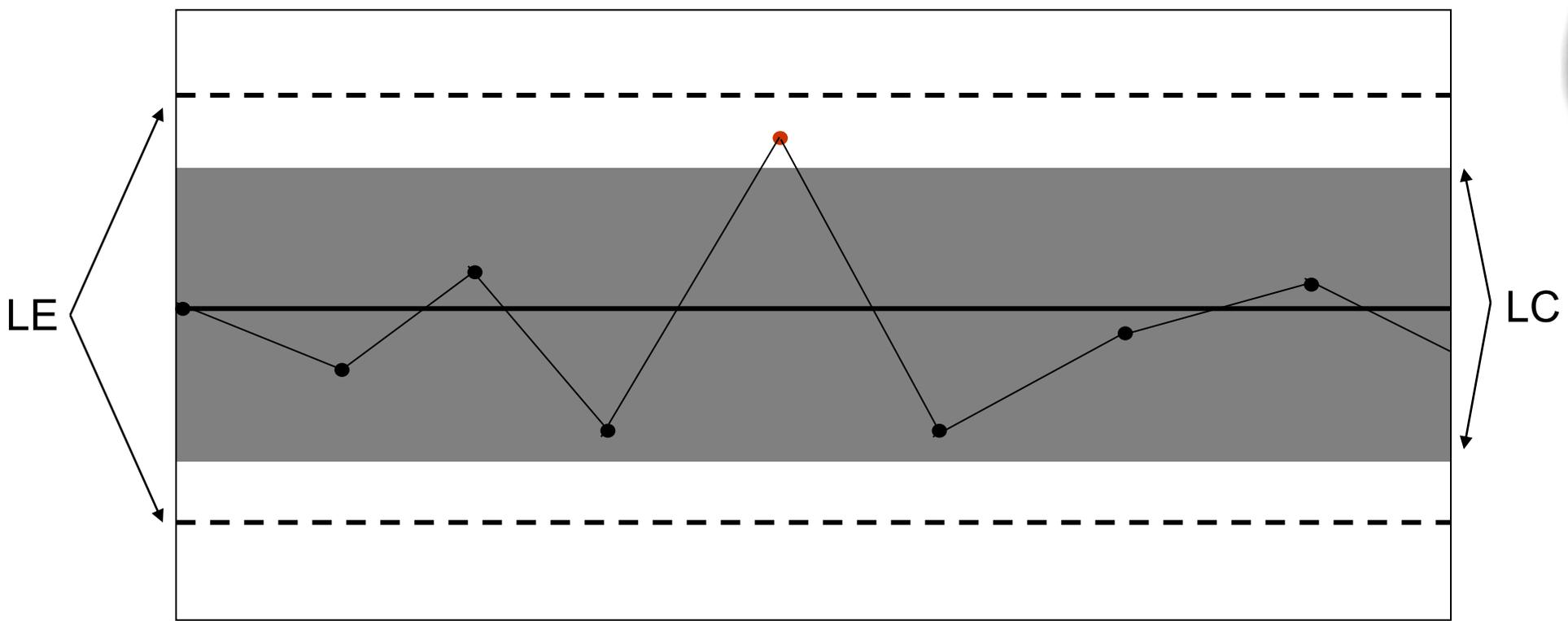
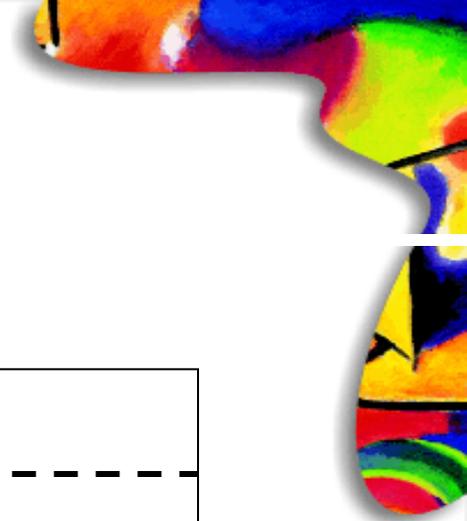


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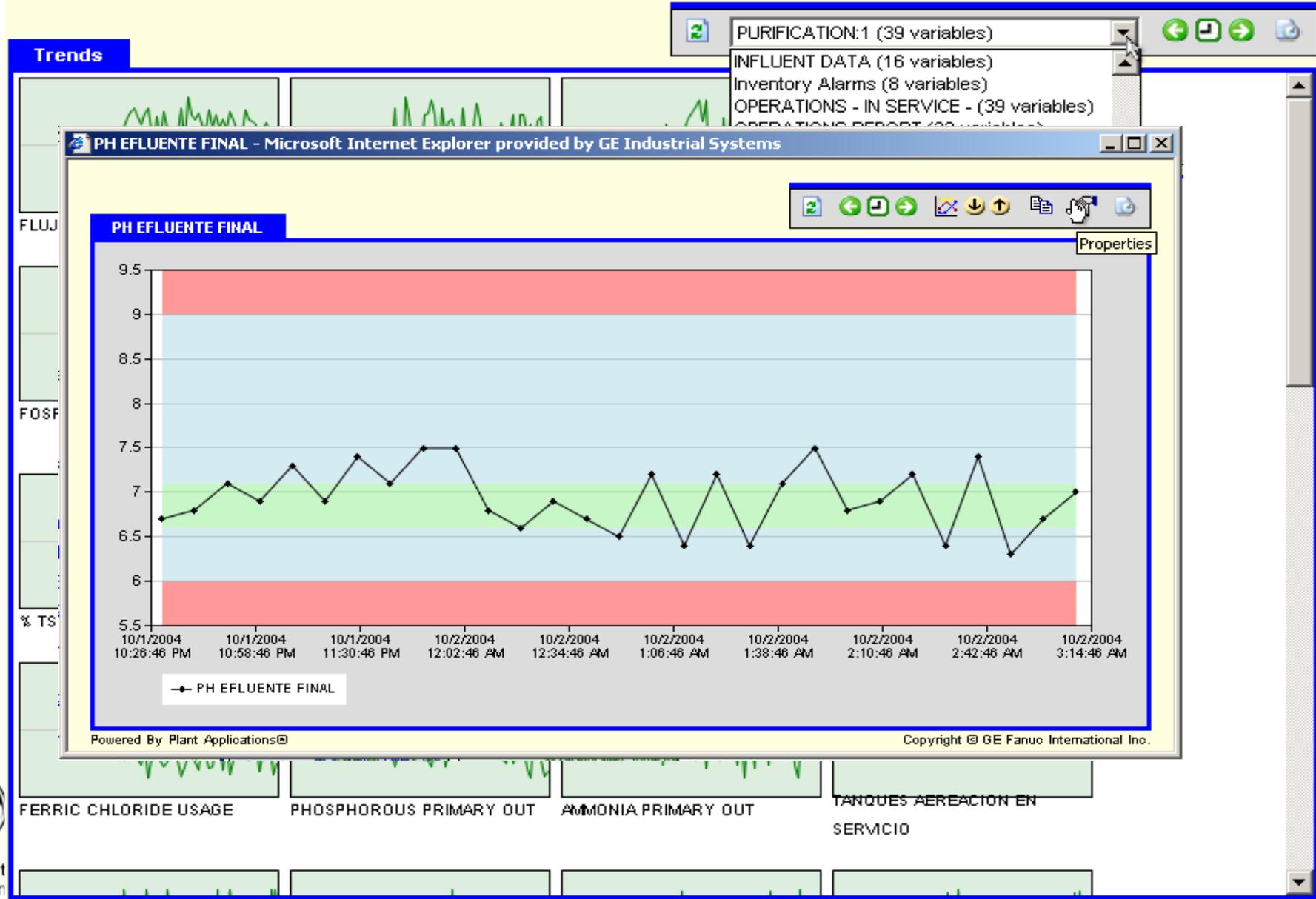
# Sistema MES

## Qualidade



# Sistema MES

## Qualidade



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# Sistema MES

## Produção - Genealogia

### Objetivo

- Rastreabilidade e Genealogia
  - Acompanhar o Real X Planejado e ajustar roteiros e programações com base em dados reais
  - Manter a rastreabilidade e a genealogia dos produtos
  - Integrar com sistemas de gestão (ERP) via S95/XML

### Vantagens

- Melhor eficiência operacional devido à adequação dos planos de produção à realidade do processo
- Adequação dos ciclos, estoques e do planejamento
- **Melhor conformidade (rastreabilidade e genealogia)**
- **Integração a sistemas de planejamento**



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# Sistema MES

## Produção – Genealogia – Eventos

Movimentação de Material

Genealogia

Consumo

Alterações no Planejamento



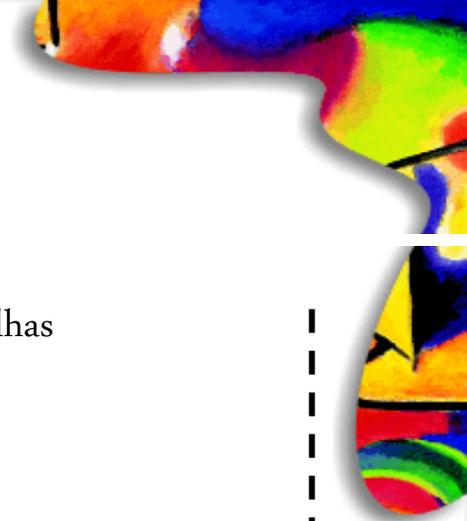
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# Sistema MES

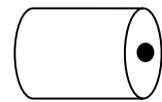
## Produção - Genealogia



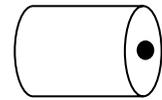
Rolo  
Jumbo



Rolo

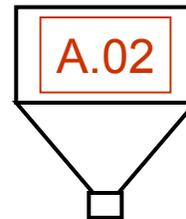
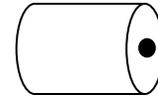
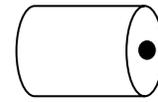
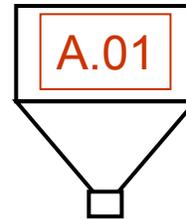


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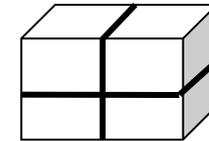
L.01.02

Revestimento



Folhas

L.01.01.A.01.01



L.01.01.A.02.01



L.01.01.A.02.02



L.01.01.A.02.03

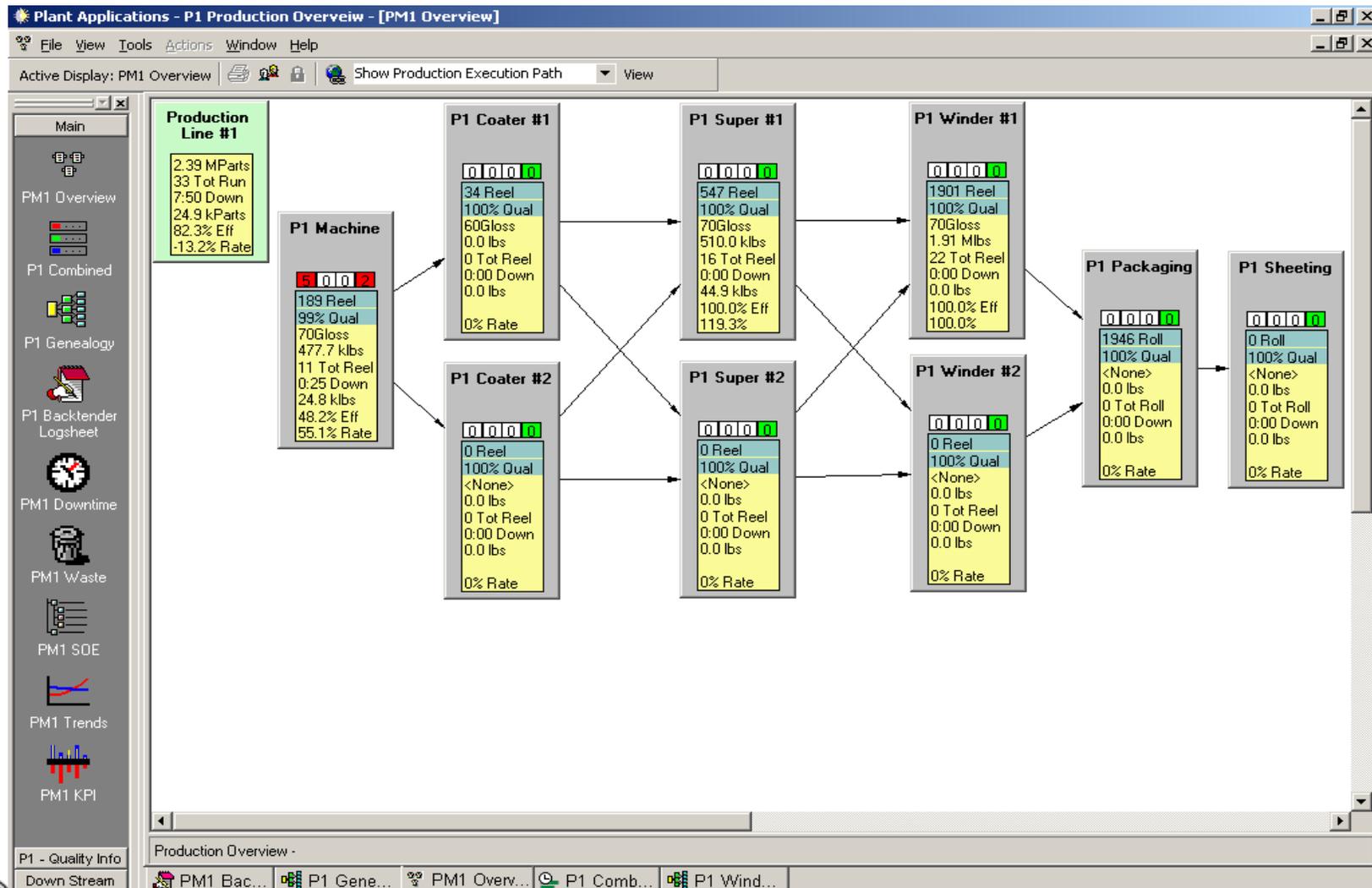


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# Sistema MES

## Produção - Genealogia

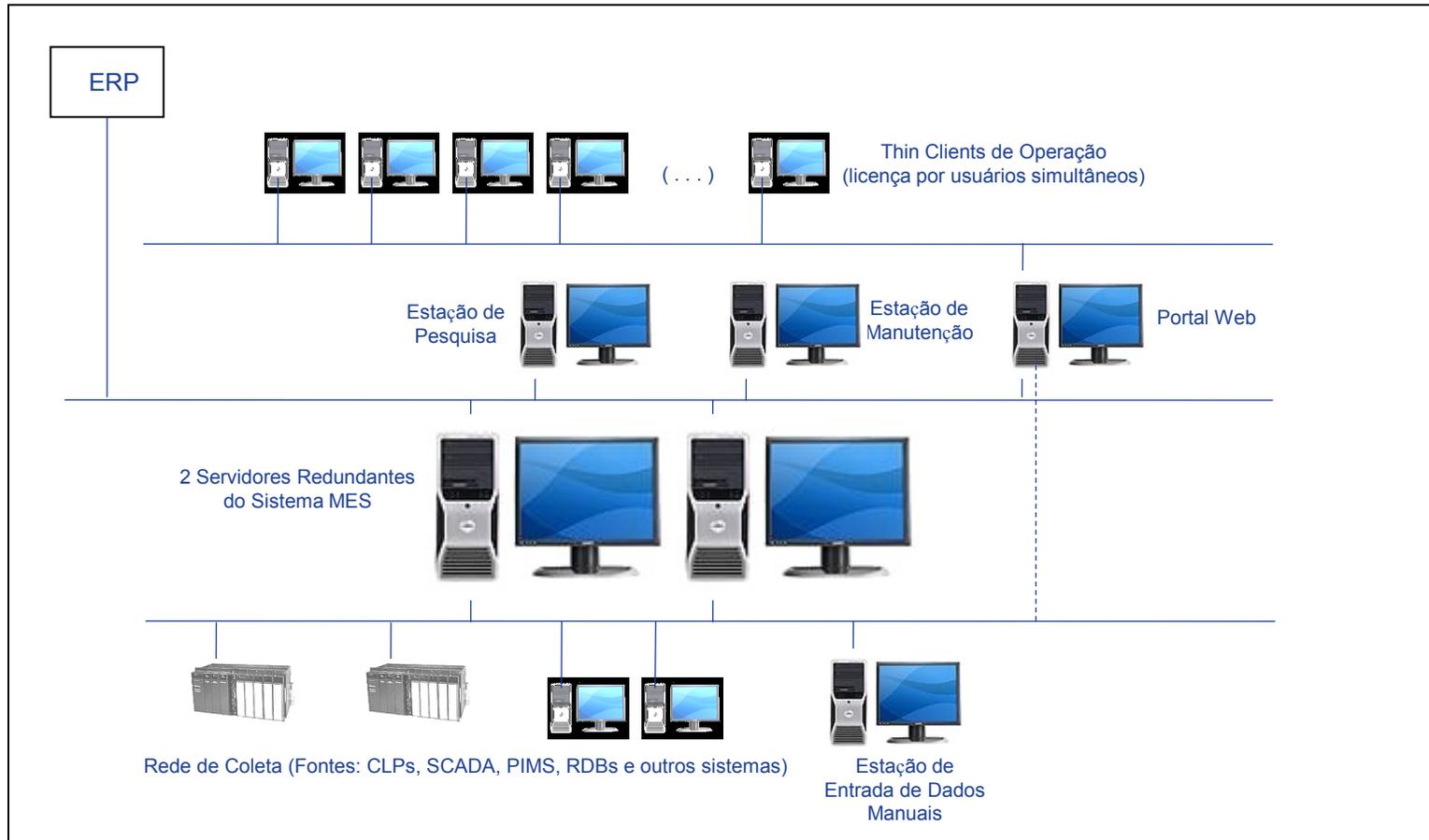


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# Sistema MES

## Arquitetura Típica

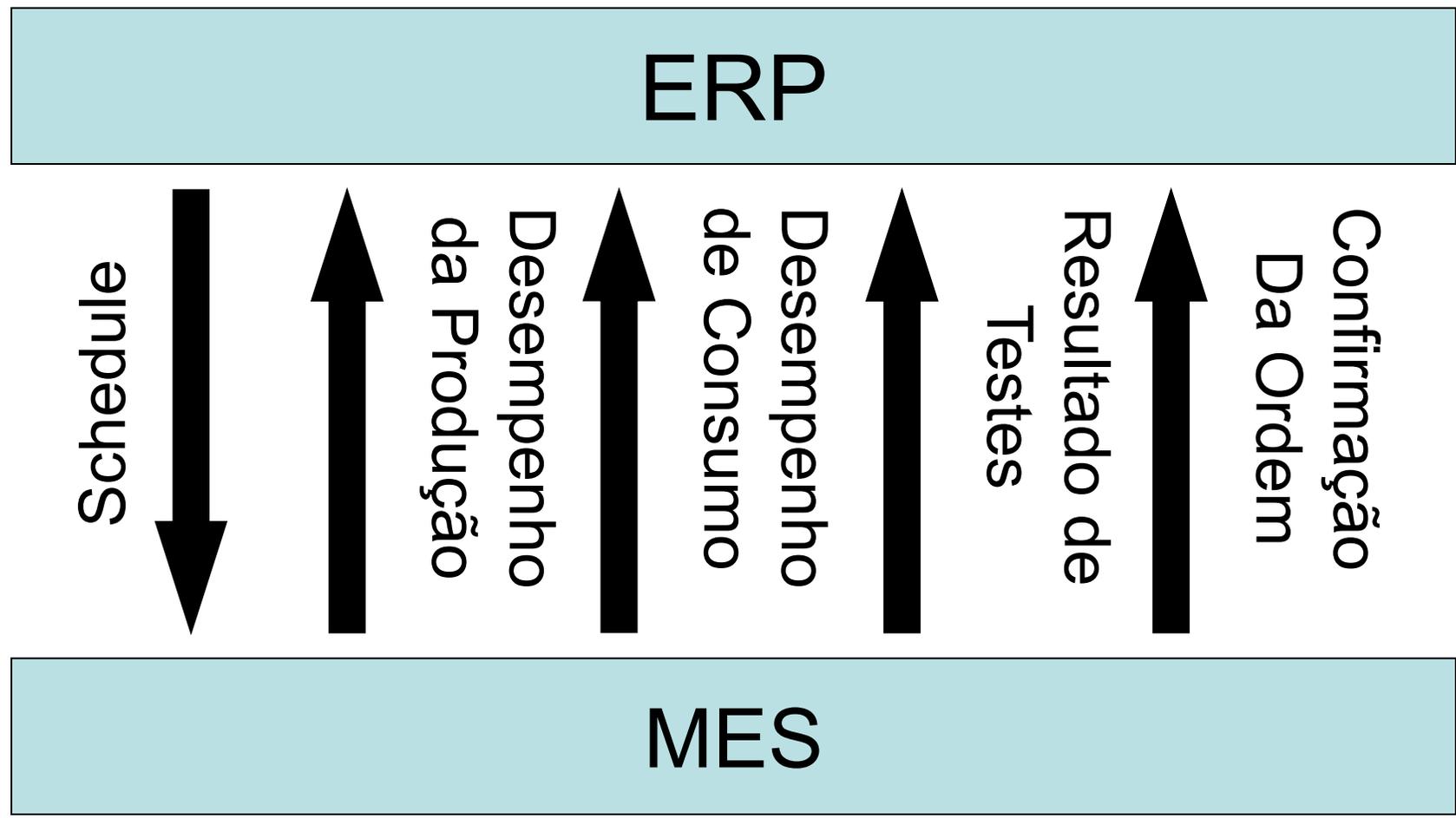
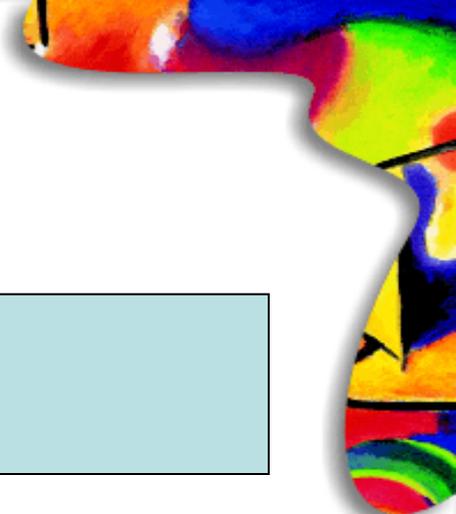


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# Sistema MES

## Interface com sistema ERP



# Agenda

**Arquitetura de Software**

**Sistema SCADA**

**Sistema PIMS**

**Sistema MES**

**Exemplo**



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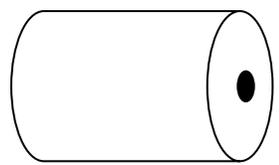
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software



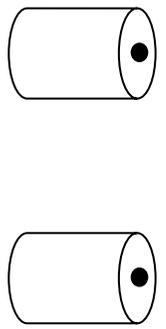
# Exemplo SCADA/ PIMS/ MES – P&P



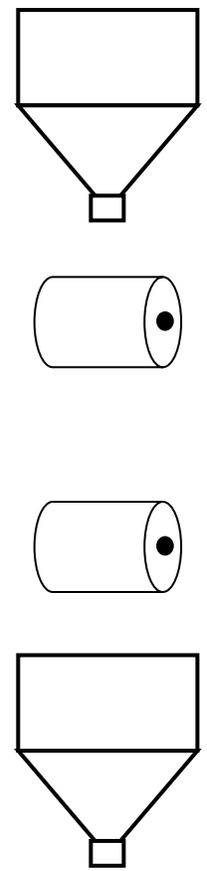
Rolo Jumbo



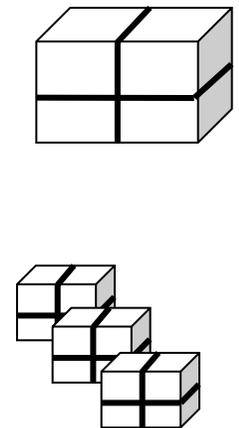
Rolo



Revestimento



Folhas



# SCADA

## Telas de Operação com:

- **Velocidade e Vibração dos Motores**
- **Comando de Acionamento**
- **Alarmes de Cada uma das Máquinas**
- **Parâmetros dos Controladores**
- **Consumo Instantâneo de Energia**



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# PIMS

## Relatórios com:

- **Perfis de Consumo Energético Diário, Semanal, Mensal e Anual**
- **Estatísticas de Vibração de Motores**
- **Medições On-line de Qualidade no Decorrer de Todo o Processo**



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# MES

## Relatórios com:

- Equipamentos que Mais Apresentaram Falhas
- Ordens de Produção
- Rastreabilidade da produção
- Relação entre Fornecedor de Insumos e Qualidade do Produto Final





**TRANSPETRO**



## SOLUÇÃO UTILIZADA

- Proficy Historian
- Proficy Portal

## Características

A Transpetro utiliza o Historian como PIMS corporativo, com coleta de dados de cerca de 60 locais distribuídos pelo Brasil, 150.000 tags, mais de 1.000 usuários (200 simultâneos) e 50 administradores.



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# Agenda

**Arquitetura de Software**

**Sistema SCADA**

**Sistema PIMS**

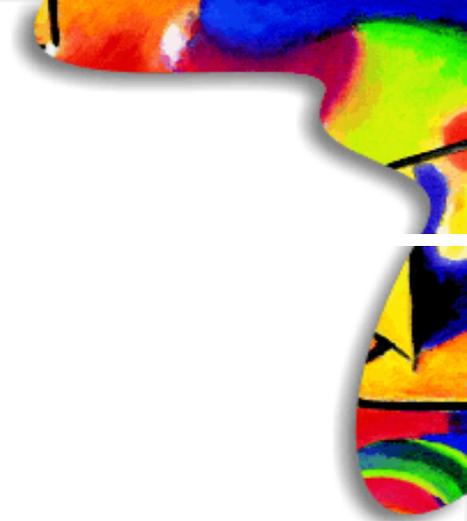
**Sistema MES**

**A evolução dos sistemas**



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# Evolução dos Sistemas

## Sistemas de *ontem* X Sistemas de *hoje*

Redundância, Arquitetura Flexível, Apoio ao Operador, “Alarmes Inteligentes”, Ger. Mudanças, Blocos de Função, Scheduler, Fonte de Dados, Simulação, etc.



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# Evolução dos Sistemas

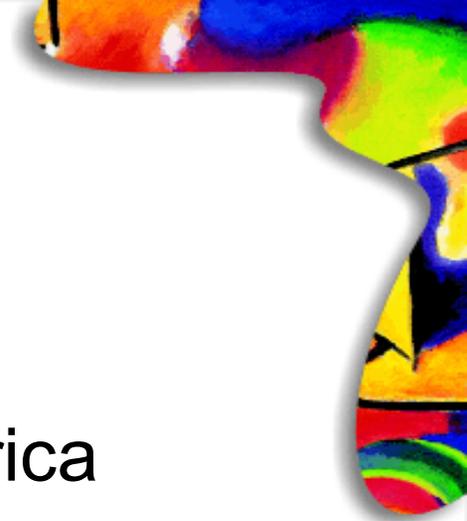
## Objetivos da Integração de Sistemas

- Confiabilidade dos Dados do Chão de Fábrica
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- Obtenção de Resultados de Análise
- Conhecimento e Melhoria do Processo



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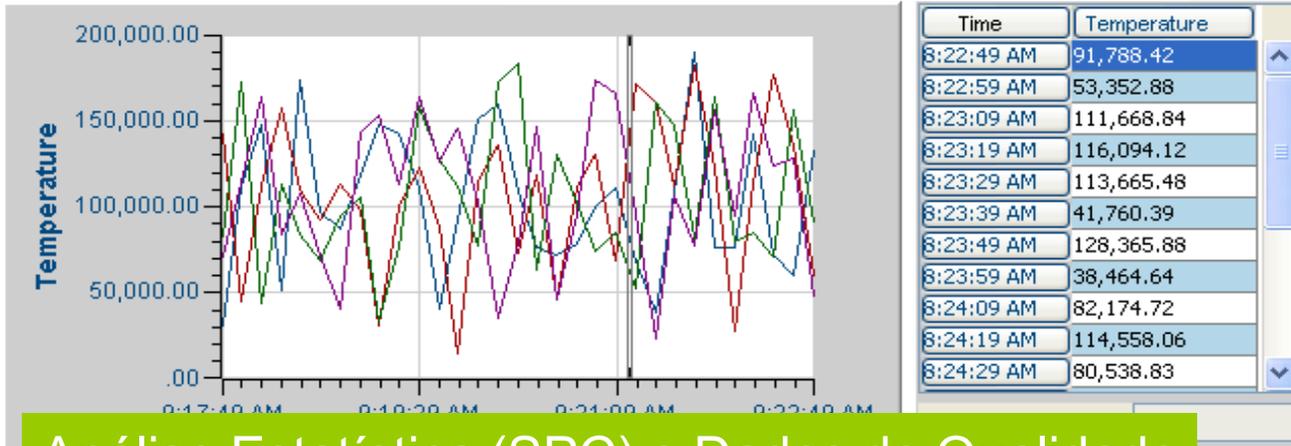
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# Key Performance Indicators

Análise de dados históricos

Indicadores



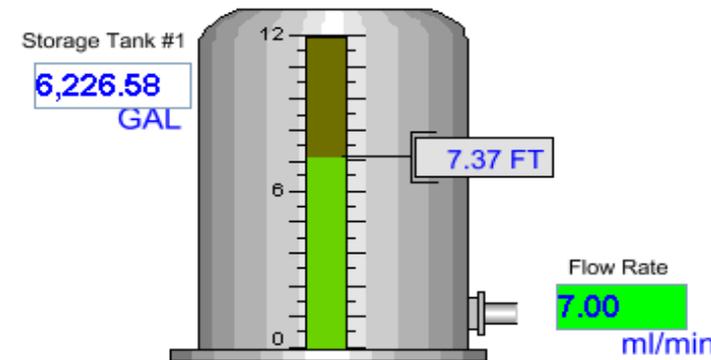
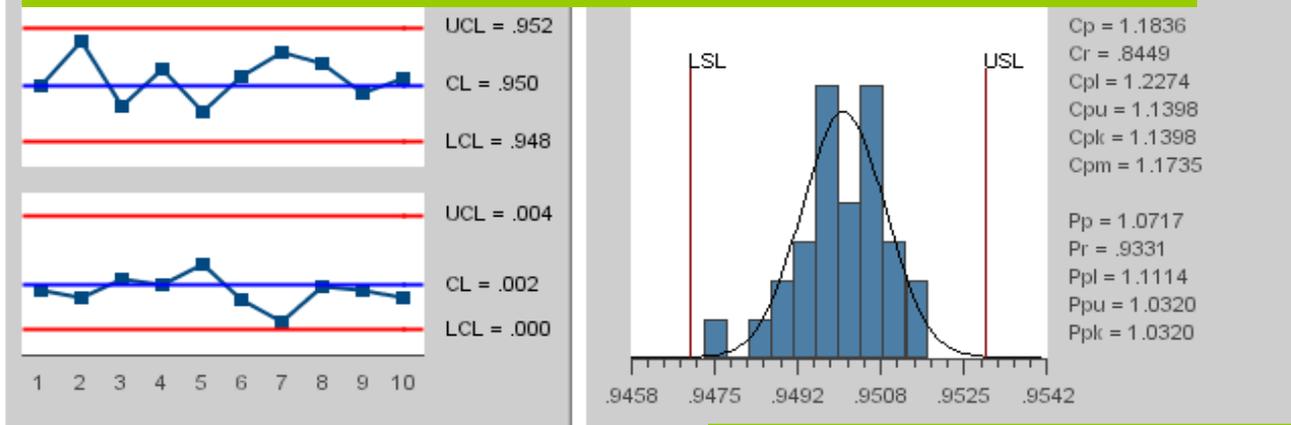
## Key Performance Indicators



## Shift to Date Metrics



## Análise Estatística (SPC) e Dados de Qualidade



Status e Notificações em tempo real

# E por falar em acesso via web...

Já em 2008, dispositivos conectados na internet excederam a população mundial

**4.6 Bilhões** pessoas tem um smartphone ou tablet

Em **2020**, este número de dispositivos será **6x** maior

**800,000,000** pessoas hoje estão no facebook



# Solução Web p/ Gestão Integrada – Mobilidade

## Proficy Mobile (RtOI)



**Geo-Referenciada**

**Navegação Estruturada**

**KPIs/Alarmes**



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# Proficy Mobile KPI

## Navegação e Visualização Estruturadas



# Proficy Mobile KPI

## Levando a Visualização de KPIs a Outro Nível

Nome do Ativo

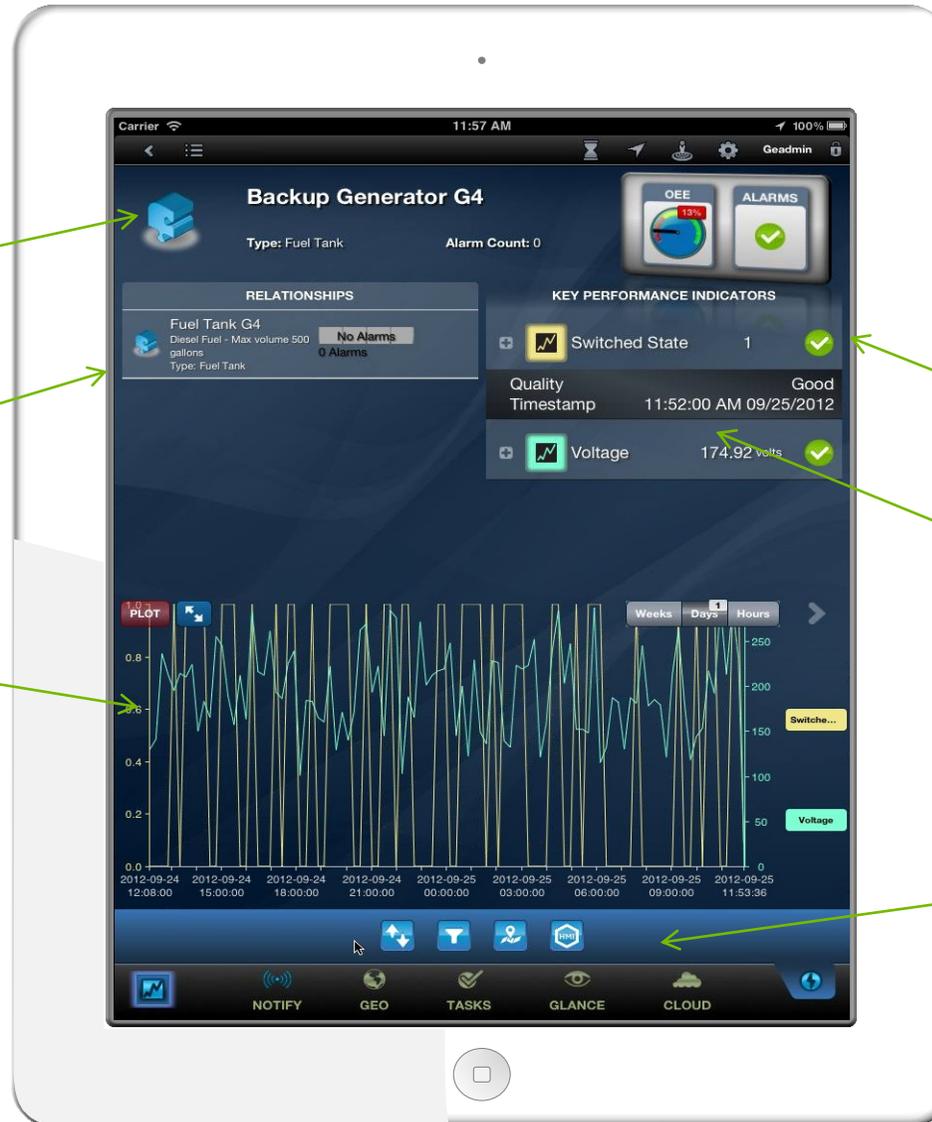
Relacionamentos  
entre Ativos

Gráfico  
Tendência

Agregação  
Alarmes

KPIs

Barra  
Tarefas



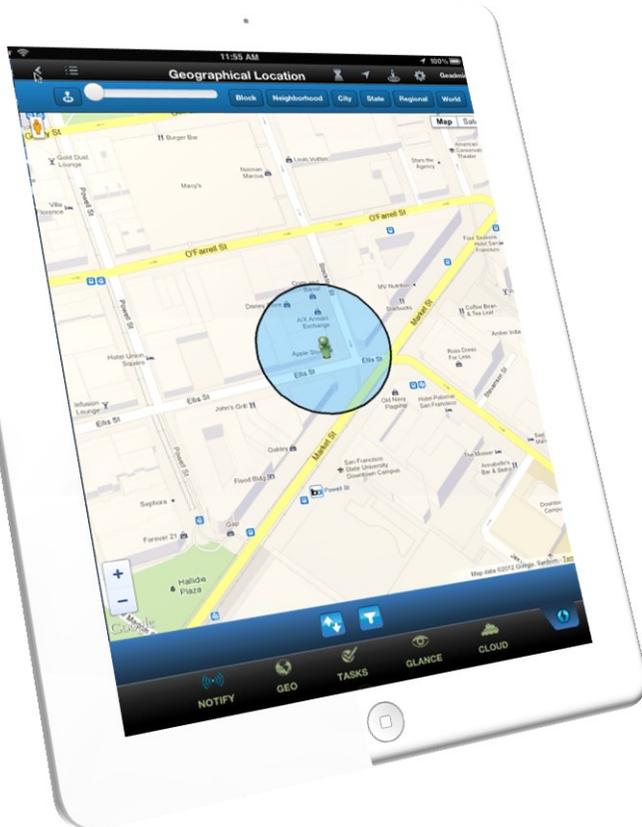
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# Proficy Mobile KPI

## Geo Referenciada – KPIs Relativos à Localização

A Informação correta no lugar correto, garantindo agilidade na tomada de decisões



Ao invés de gastar tempo buscando ou procurando a informação correta, seja notificado em tempo real



Mobilidade e Visibilidade Total!!!!



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# Proficy Mobile Alarm

## Saiba da Situação em Tempo Real



CRÍTICO



ALTO



MÉDIO



BAIXO



BOM



DESCONHECIDO

- Vincule os alarmes com base na estrutura da sua planta

- Agrega os alarmes do seu ativo de planta

- Auxilia na Análise do Processo ou Ativo

- ISA SP18
- EEMUA

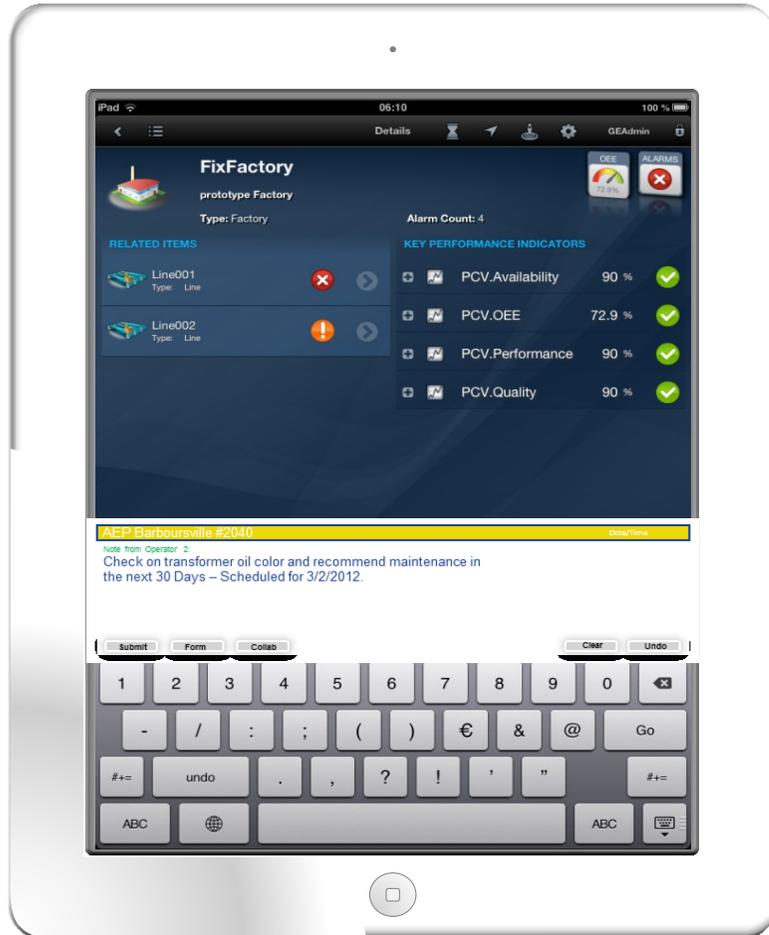


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# Proficiency Mobile Notes

## Eficiência Com Colaboração



- Capture Notas e Comentários
- Diário do Equipamento
- Diário do Processo



# Proficy Mobile OEE KPI

## Visualize em Tempo Real a Eficiência do Ativo

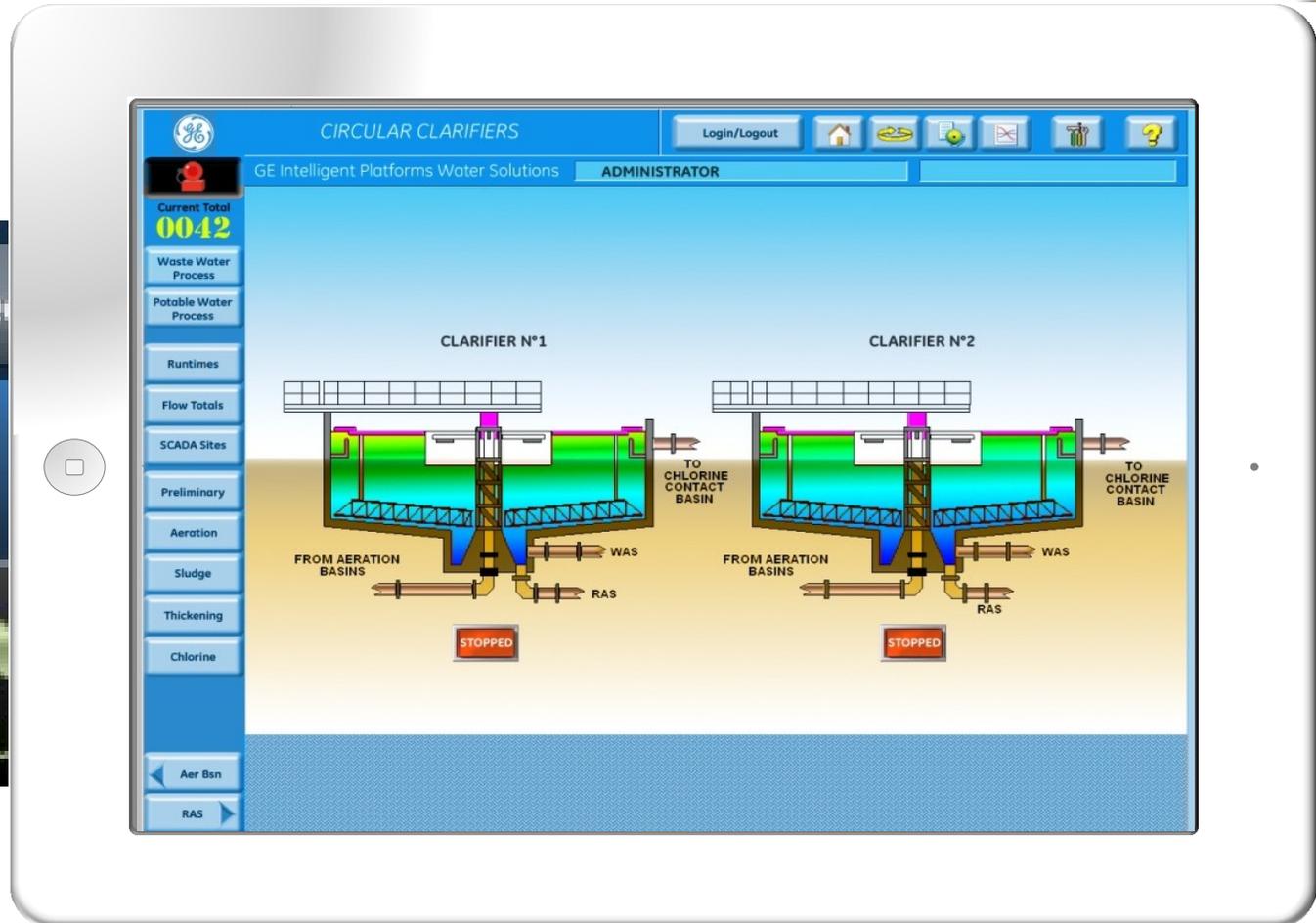
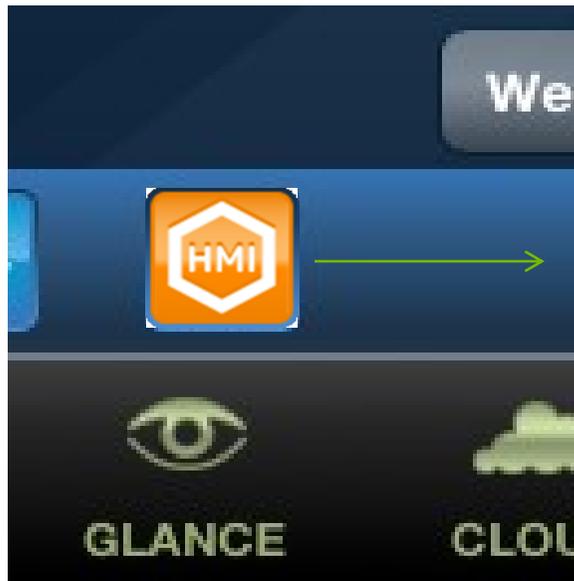


- KPI flexível para ser coletado automaticamente ou manualmente
- Utilize o índice para ajudar em avaliação de risco do ativo ou processo



# Proficy Mobile KPI

Integre com GlobalView/Webspace para SCADA WEB



\*Requer a venda do GlobalView/Webspace

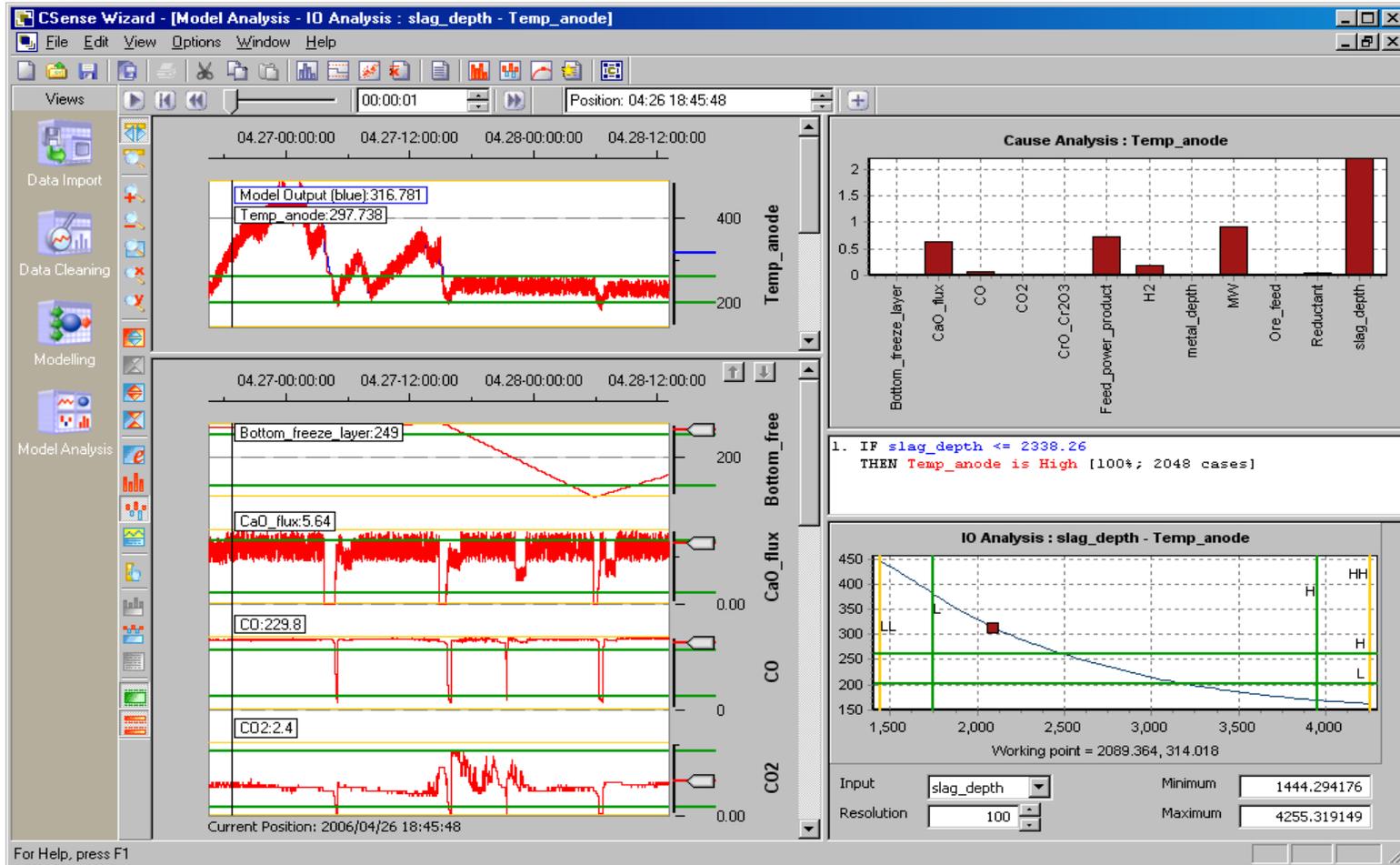


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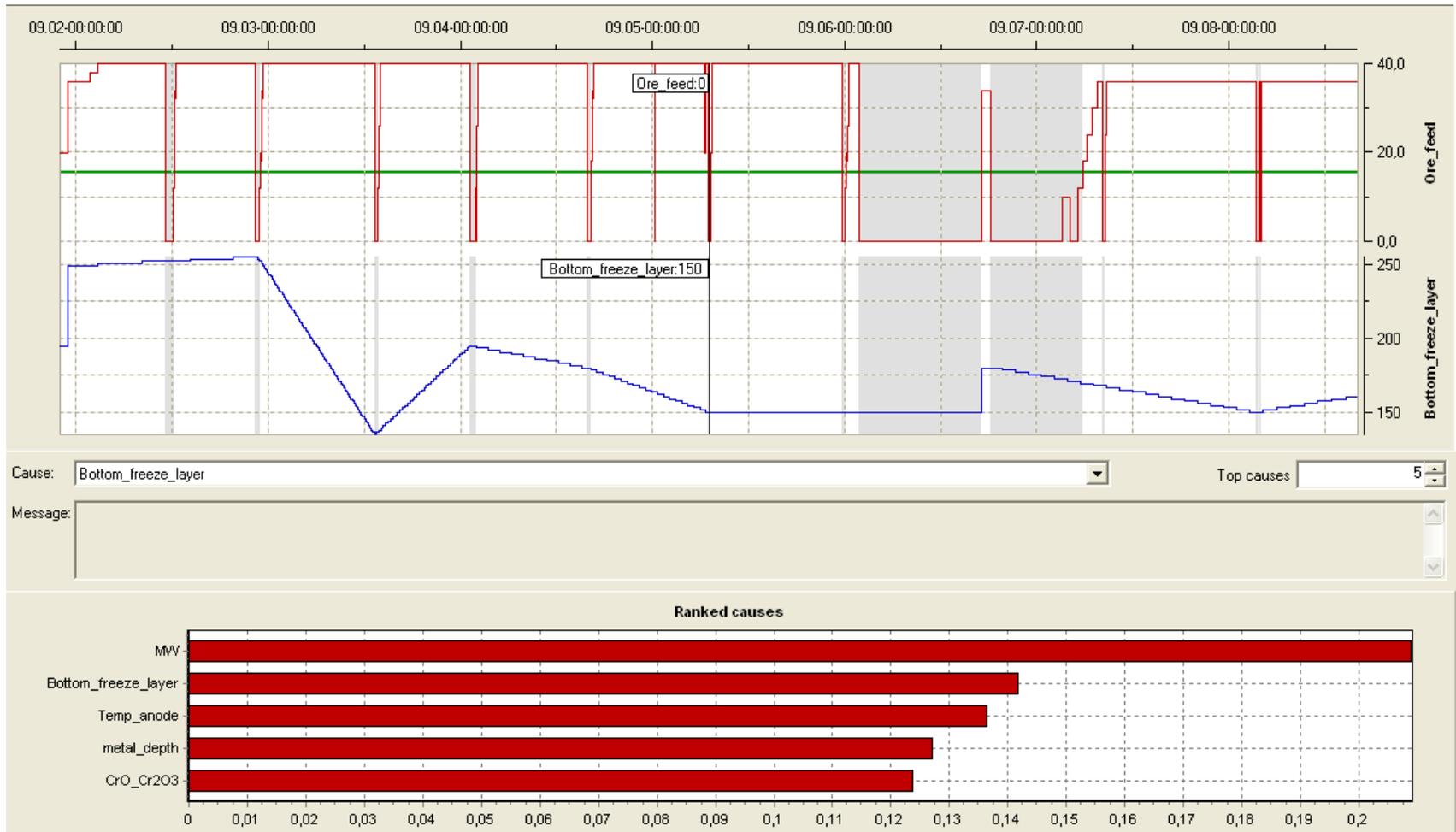
# Extração do conhecimento

## Proficy CSense



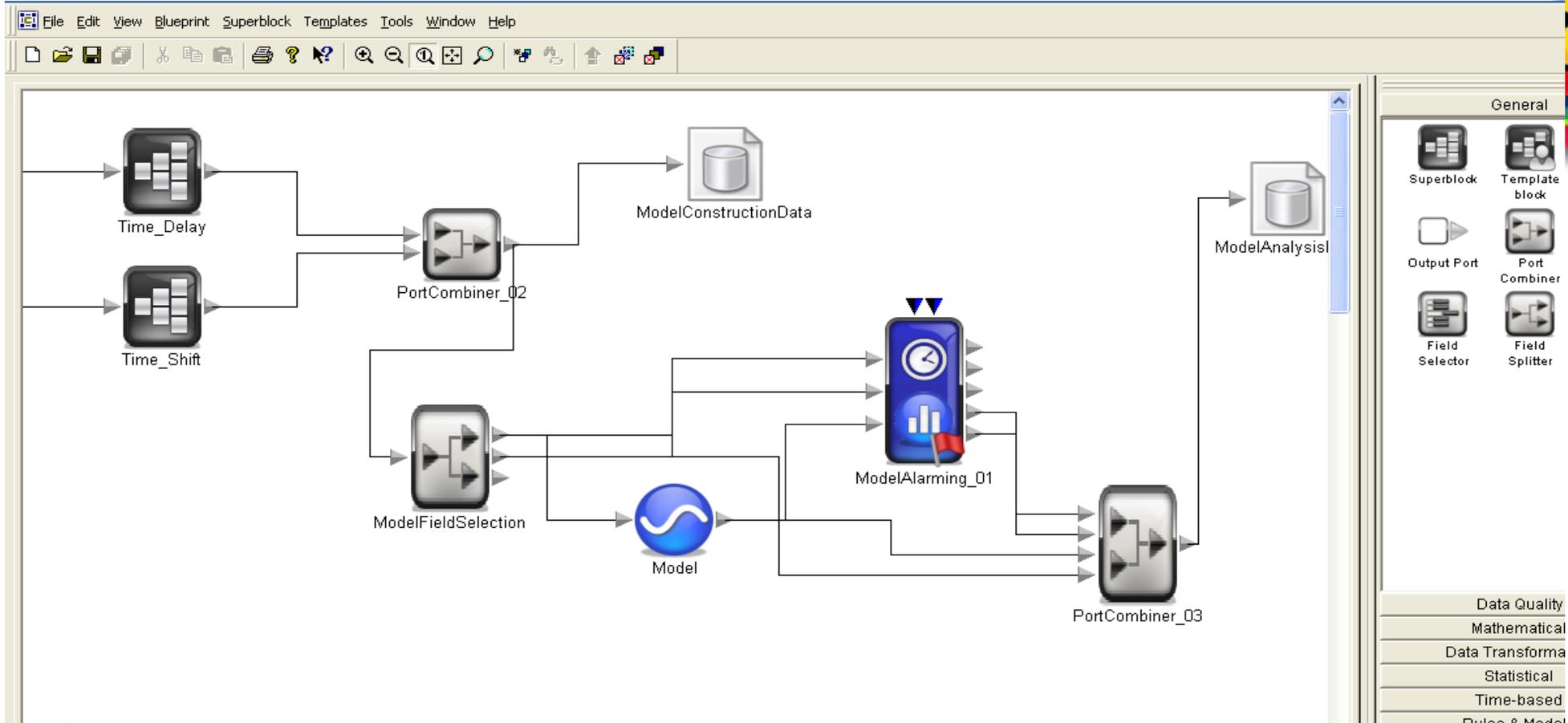
# Alarmes intelligentes

## Proficy CSense



# Controle Avançado e Sensores Virtuais

## Proficy CSense



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# Integração entre Sistemas

## Proficy Workflow

- Registro do conhecimento e melhores práticas;
- Digitalização do processo;
- Orquestração automática dos trabalhos e interação entre sistemas (SCADA, PIMS, MES, etc) e indivíduos;
- Menor variabilidade;
- Menor tempo de resposta;
- Treinamento e simulação.



Navigation: [Navigate](#) [Search](#) [Bookmarks](#)

GE FANUC

Buttons: [Add Production Line](#) [Delete](#) [Refresh](#)

**Models**

- Production
- Material
- Equipment
- Personnel
- Events
- Workflow
- Global Displays

**Entry Points**

- Classes
- Enterprises
- Sites
- Areas
- Production Lines
- Production Units
- Process Cells

**Site**

- Bike Plant

**Area**

- Bike Production Area
- Bike Plant 2
- Bike Area

**ProductionLine**

- Bike Production Line
- StorageZone
- Bike Storage Zone 1
- Bike Storage Zone 2

**WorkCell**

- Frame Assembly
- Handle Bar Assembly
- Tire Asse...orkstation
- Bike Assembly
- Bike Palletizer

---

**Workflow Management**  
Configure and manage workflows, tasks, and subprocesses

**Workflow Configuration**  
Workflow Editor

**Workflow Management**  
**Task Management**  
Running Workflows

**Common**  
Solution Home  
Task Client  
Global Viewer

**Bike Production Line -> Task Management** | 1 Object Not Compatible

**Tasks** Actions >>

Sort by: Priority, Expiry Time | No Filters Specified

<b>Alarm Notification</b>	Expires in 5:00 min	5:00 min
Responsibility: Operator, Canning Line 1		
<b>Production Run</b>		10:00 min
Responsibility: Operator, Canning Line 1 QA, Canning Line 1		
<b>Step 1</b>		11:05:00 AM
Responsibility: Operator, Canning Line 1		
<b>Step 2</b>		11:07:00 AM
Responsibility: Operator, Canning Line 1		
<b>Step 3</b>		2:00 min
Responsibility: Operator, Canning Line 1		
<b>Step 4</b>		Not Started
Responsibility: Operator, Canning Line 1		
<b>Step 5</b>		Not Started
Responsibility: QA, Canning Line 1		
<b>Daily Maintenance Checks</b>		35:00 min
Responsibility: Operator, Canning Line 1		
<b>Another Task</b>	Expires in 35:00 min	2:25 hours
Responsibility: Operator, Canning Line 1		
<b>Yet Another Task</b>	Expires in 45:00 min	45:00 min
Responsibility: Operator, Canning Line 1		

**Work Instructions** Task Step

**Production Run - Step 3**

1. Check the belt tension adjustment bolt for looseness
2. Perform the hourly checks indicated below



**Data Entry**

- Check label adhesive levels
- Check label materials, should be at least 50% full
- Enter Label Pot Temperature
- Check oil levels in Conveyor 1-4 gear cases

[Submit](#) [Cancel](#)

Documents: [Canning Line SOPs](#) [ACME Canner Maintenance Manual](#)

Ready

# Exemplo de uso do Proficy Workflow

Ferramenta que possibilita registrar as melhores práticas operacionais, identificar quais são as melhores formas de atuação, tanto em situações usuais como críticas, e orientar passo a passo a operação.

[\[Iniciar o vídeo\]](#)

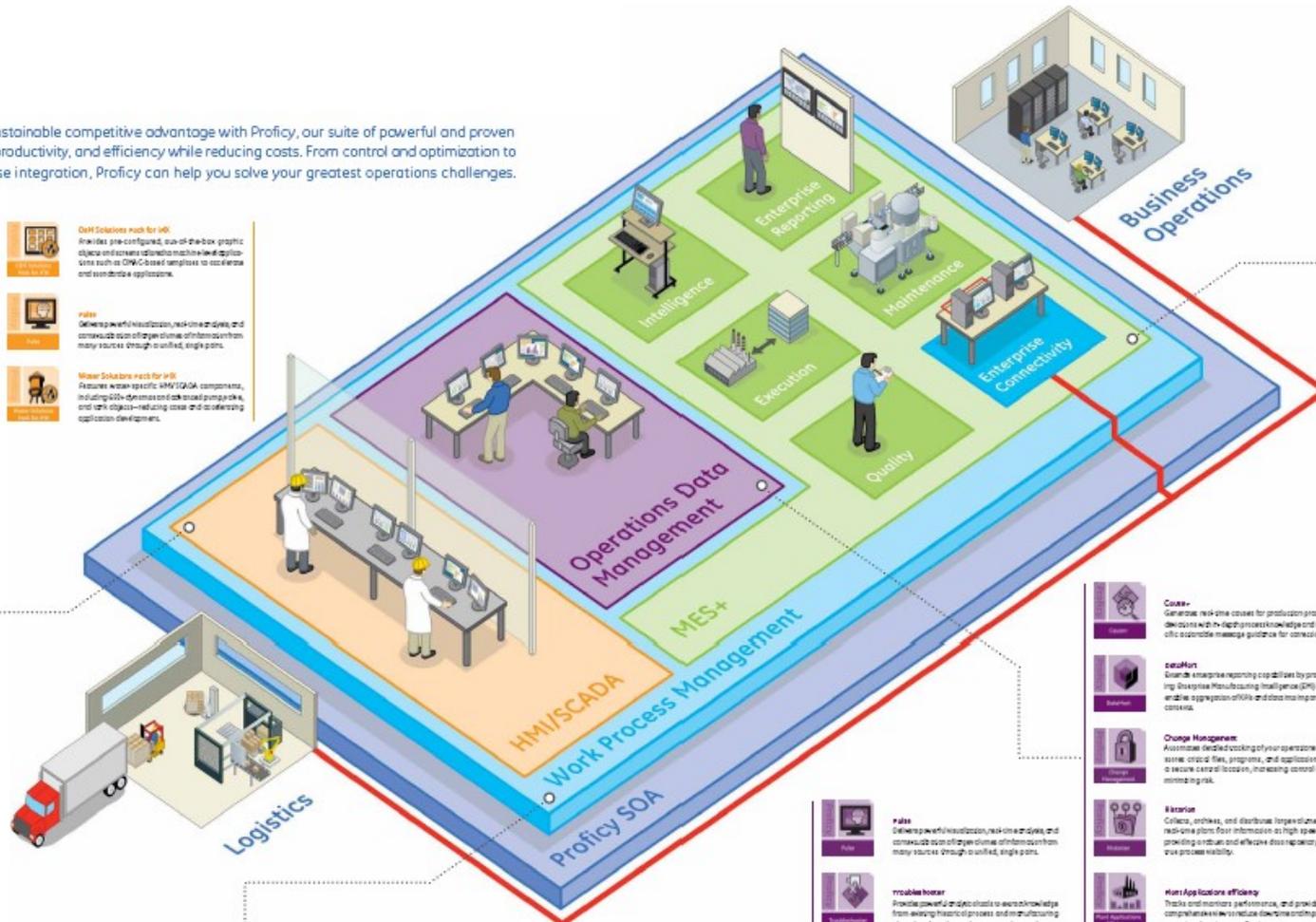


# Solução Proficy – Outros módulos

Transform your operations and gain a sustainable competitive advantage with Proficy, our suite of powerful and proven software solutions that improve quality, productivity, and efficiency while reducing costs. From control and optimization to lean production execution and enterprise integration, Proficy can help you solve your greatest operations challenges.

- Search Execution**  
Defines recipes for production, schedules and execution recipes, and stores information on recipe execution features for efficient and consistent production.
- Costs**  
Generates real-time costs for production process decisions with applicable knowledge and specific assembly message guidance for contractors.
- Change Management**  
Automates detailed tracking of your operations and stores critical files, programs, and applications in a secure central location, increasing control and minimizing risk.
- ControlView**  
Features high-quality graphic visualization development with the power of COMAUERT to remote clients, enabling real-time monitoring, data analysis, and plant floor control from within a web browser.
- HMIScADA – CHIMUERT**  
Collects and stores real-time and historical data across all business levels and provides accessible visibility to monitor and control plant processes, equipment, and resources.
- HMIScADA – CHIMUERT GlobalView**  
Delivers the power of COMAUERT to remote clients, enabling real-time monitoring, data analysis, and plant floor control from within a web browser.
- HMIScADA – iM**  
Provides process visualization, data acquisition, analysis and supervisory control of your operations with reliable information analysis and real-time decision management.
- HMIScADA – iM embedded**  
Delivers the power, reliability, and flexibility of iM on the Windows Embedded SP3 operating system, enabling use of next generation XP architecture based devices.
- HMIScADA – iM WebSpace**  
Provides full control and visibility capabilities over your operations in real-time or secure manner without the need to start the iM application, delivering ease of use.
- Industrial Gateway Server**  
Provides SCADA connectivity for the factory network and enables reliable communication your data for control, data acquisition, and analysis.
- Power**  
Features power-specific functionality for generation, distribution or substation automation in SCADA with real-time data collection, database management, dynamic data display and secure operator supervisory control.

- DAI Solutions pack for iM**  
Provides pre-configured, out-of-the-box graphic objects and screens tailored to machine-level applications such as CNC-based templates to accelerate and standardize applications.
- PAI**  
Delivers powerful visualization, real-time analysis, and contextual data of large volume information from many sources through unified, single pane.
- Water Solutions pack for iM**  
Features water-specific HMIScADA components, including SCADA-dynamics and data modeling tools, and rich objects-making ease and accelerating application development.



- Open enterprise**  
Communicates real-time information between your enterprise and execution systems and serves as a single point of connectivity—delivering visibility for improved decisions.
- Workflow**  
Digitizes and streamlines production processes from work instructions and SOPs to connect execution and HMI/SCADA monitoring—to create information-rich, cross-machine-based workflows.

- PAI**  
Delivers powerful visualization, real-time analysis, and contextual data of large volume information from many sources through unified, single pane.
- trouble hunter**  
Provides powerful analytics to expert knowledge from existing historical process and manufacturing plant data for risk averse process understanding.
- Workflow**  
Digitizes and streamlines production processes from work instructions and SOPs to connect execution and HMI/SCADA monitoring—to create information-rich, cross-machine-based workflows.

- Costs**  
Generates real-time costs for production process decisions with applicable knowledge and specific assembly message guidance for contractors.
- SearchM**  
SearchM enterprise reporting capabilities by providing Enterprise Manufacturing Intelligence (EMI) and enables aggregation of data and data mapping across various sources.
- Change Management**  
Automates detailed tracking of your operations and stores critical files, programs, and applications in a secure central location, increasing control and minimizing risk.
- Historian**  
Collects, archives, and distributes large volumes of real-time plant information to high speed—providing a robust and flexible data repository for true process visibility.
- HM Applications efficiency**  
Tracks and monitors performance, and provides a comprehensive view of real-time downtime and operational equipment effectiveness.
- HM Applications Quality**  
Captures the specifications of your ideal production and helps you create consistency throughout your entire production—reducing waste and eliminating quality issues.

- Search Execution**  
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Communicates real-time information between your enterprise and execution systems and serves as a single point of connectivity—delivering visibility for improved decisions.
- HM Applications search Analysis**  
Allows you to track and analyze performance recorded by HMIScADA and other real-time data and enables data to be used for improved production control and consistency.
- HM Applications efficiency**  
Tracks and monitors performance, and provides a comprehensive view of real-time downtime and operational equipment effectiveness.
- HM Applications Quality**  
Captures the specifications of your ideal production and helps you create consistency throughout your entire production—reducing waste and eliminating quality issues.
- real-time information portal**  
Applies sophisticated trending, graphical presentation, and statistical analysis to your online data and provides insight into how your plant operates.
- iM**  
Delivers process insights to the machine manufacturer and enables you to manage large process analytical technology (PAT) solutions for improved operations.
- Scheduler**  
Helps create and maintain dynamic and flexible production schedules—ensuring consistency throughout your entire production—reducing waste and eliminating quality issues.
- Shop floor SC**  
Collects, monitors, and analyzes real-time production quality data to help identify areas of improvement within the production environment.
- trouble hunter**  
Provides full control and visibility capabilities over your operations in real-time or secure manner without the need to start the iM application, delivering ease of use.
- trouble hunter**  
Provides powerful analytics to expert knowledge from existing historical process and manufacturing plant data for risk averse process understanding.
- Workflow**  
Digitizes and streamlines production processes from work instructions and SOPs to connect execution and HMI/SCADA monitoring—to create information-rich, cross-machine-based workflows.

# Solução Proficy



## IHM / SCADA (Sistemas Supervisórios):

- Proficy iFIX
- Proficy Cimplicity

## Repositório de Dados da Planta (PIMS):

- Proficy Historian

## Performance e Execução da Planta (MES):

- Proficy Batch Execution (iBatch & iWorkInstruction)
- Proficy Plant Applications

## Portal Web em Tempo Real:

- Proficy Portal (RTIP)

## Gerenciamento de Ativos de Software:

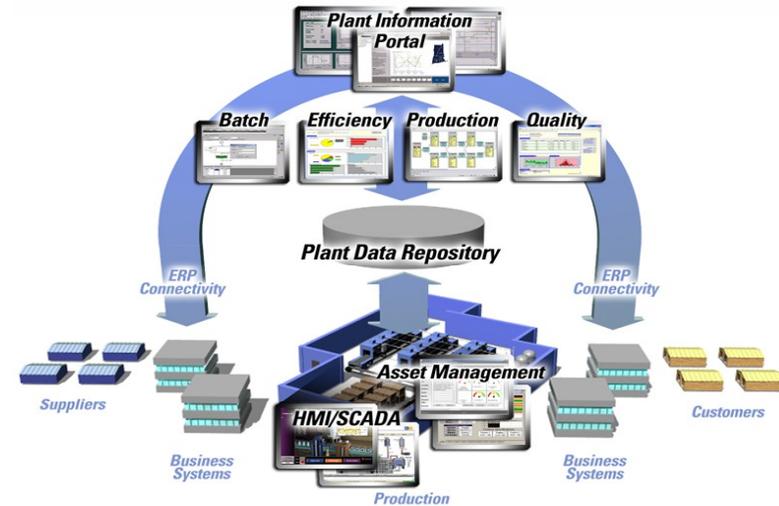
- Proficy Change Management (Manager)

## Automação de Procedimentos:

- Proficy Workflow

## Interface para dispositivos móveis:

- Proficy Mobile (RtOI)



## Simulação – Otimização & Controle:

- Troubleshooter Discreto & Batelada
- Troubleshooter Contínuo

## Monitoramento do Processo:

- Process+

## Análise de causa de desvio de processo:

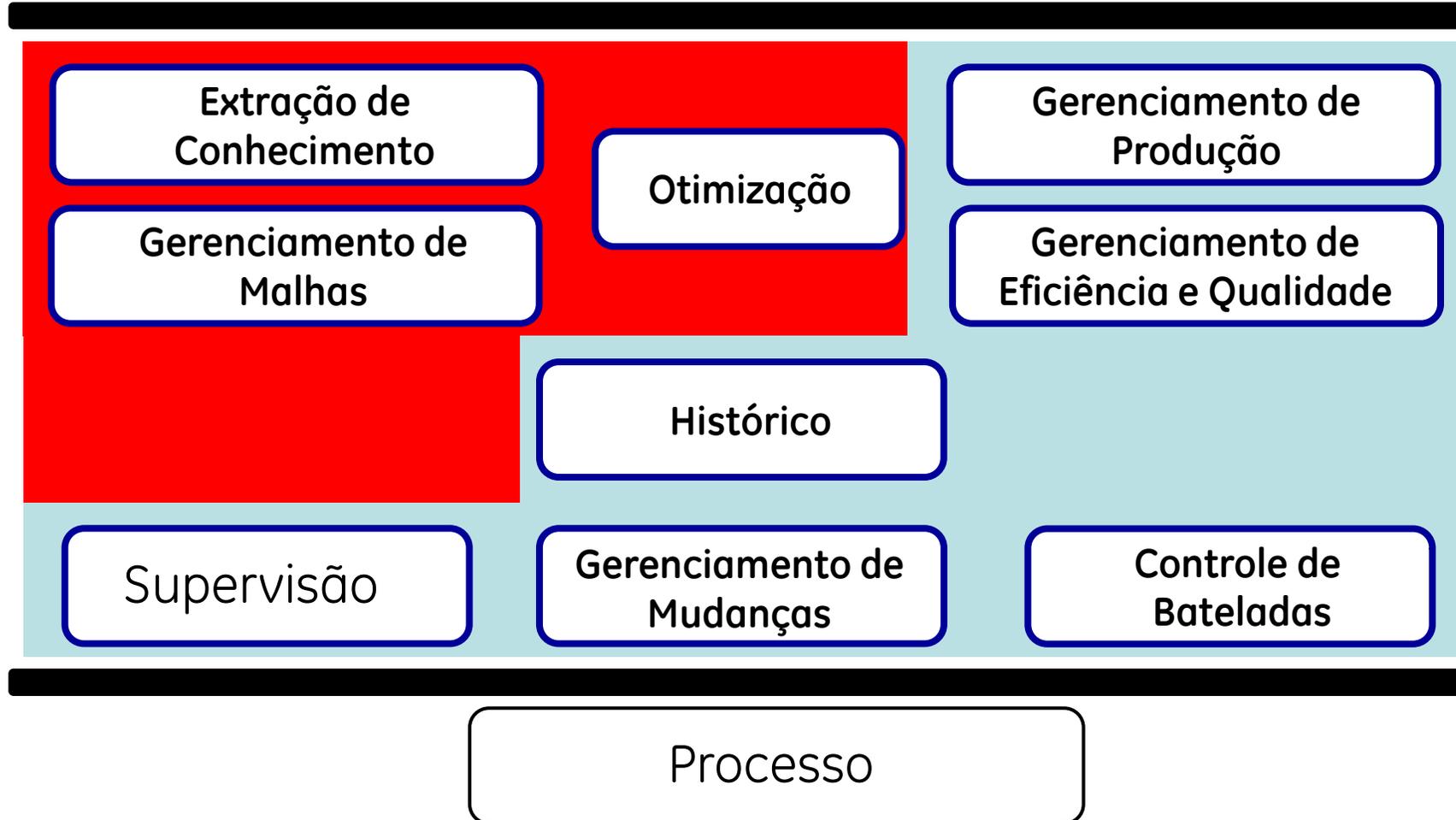
- Cause+

## Controle estatístico de processo (SPC):

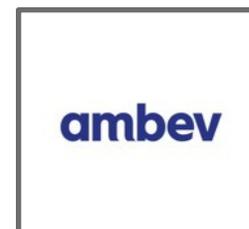
- SPC+



# Sistemas Corporativos



# Alguns Clientes



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# Sites recomendados

**MESA:** [www.mesa.org](http://www.mesa.org)

**ARC:** [www.arcweb.com](http://www.arcweb.com)

**ISA:** [www.isa.org](http://www.isa.org)

**AMR:** [www.amrresearch.com](http://www.amrresearch.com)

**Aquarius:** [www.automacao.com.br](http://www.automacao.com.br)

[www.aquarius.com.br](http://www.aquarius.com.br)



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# Conte com nossa equipe para...

- Visitas técnicas e comerciais
- Consultoria para levantamento e especificação
- Elaboração de propostas
- Indicação e referências
- Acompanhamento de projeto
- Treinamento e suporte

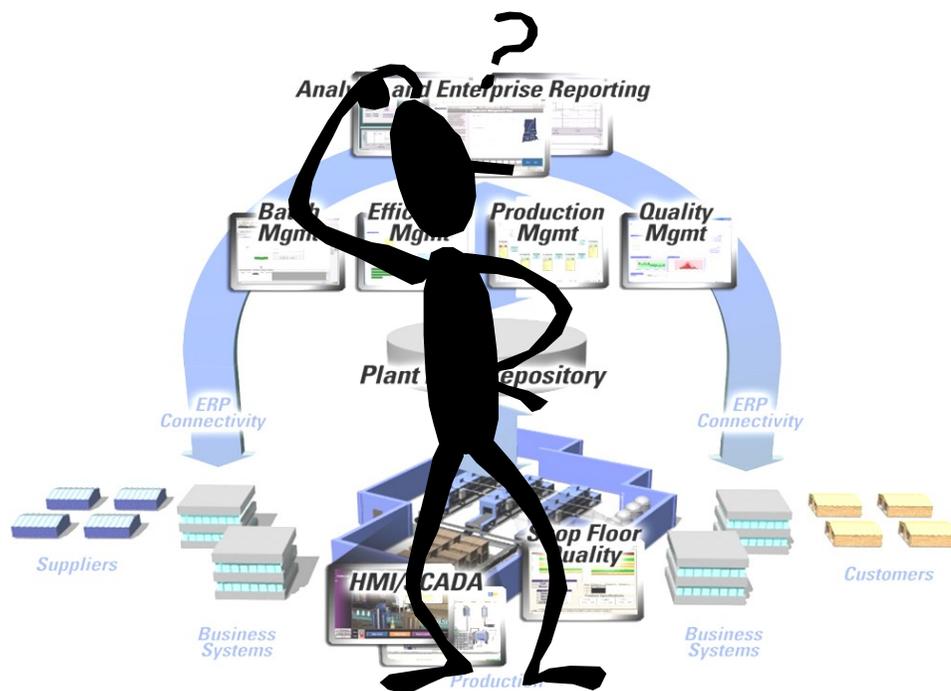


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# Dúvidas / Comentários / Sugestões



Obrigado!

Carlos Paiola

[cpaiola@aquarius.com.br](mailto:cpaiola@aquarius.com.br)

(11) 3178-1700



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