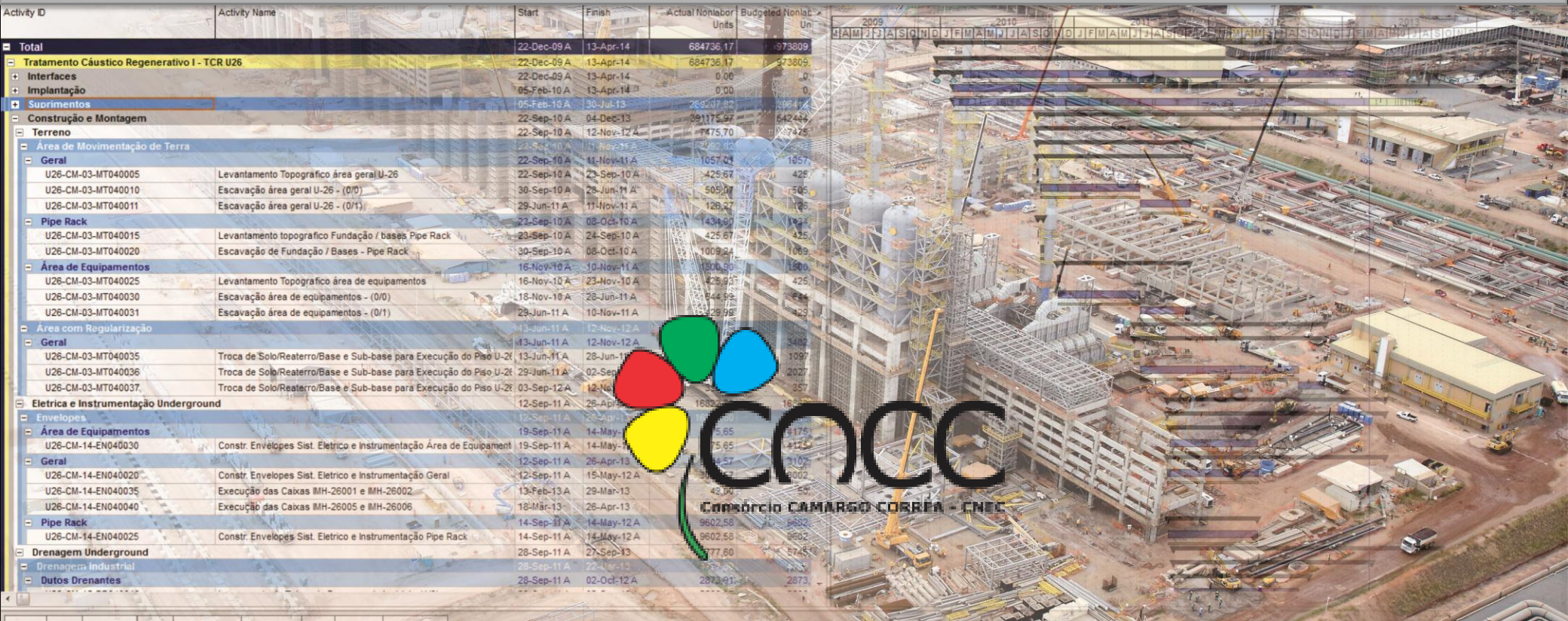
CAMARGO CORRÊA

Construções e Comércio Camargo Correa S.A.

SYSTEMS DEVELOPMENT - PLANNING AND BIM



Project Summary- Implementation of the Abreu e Lima refinery in Ipojuca-PE / Brazil. The Petrobras refinery will be the most modern ever built in the country, with capacity to process 240,000 barrels per day of oil.

Amounts of project:

- ✓ 7700 tons of Pipe
- ✓ 13000 tons of Steel Structure
- ✓ 52000 m³ of Concrete
- ✓ 2400 km of Electric Cables
- ✓ 8000 Employees

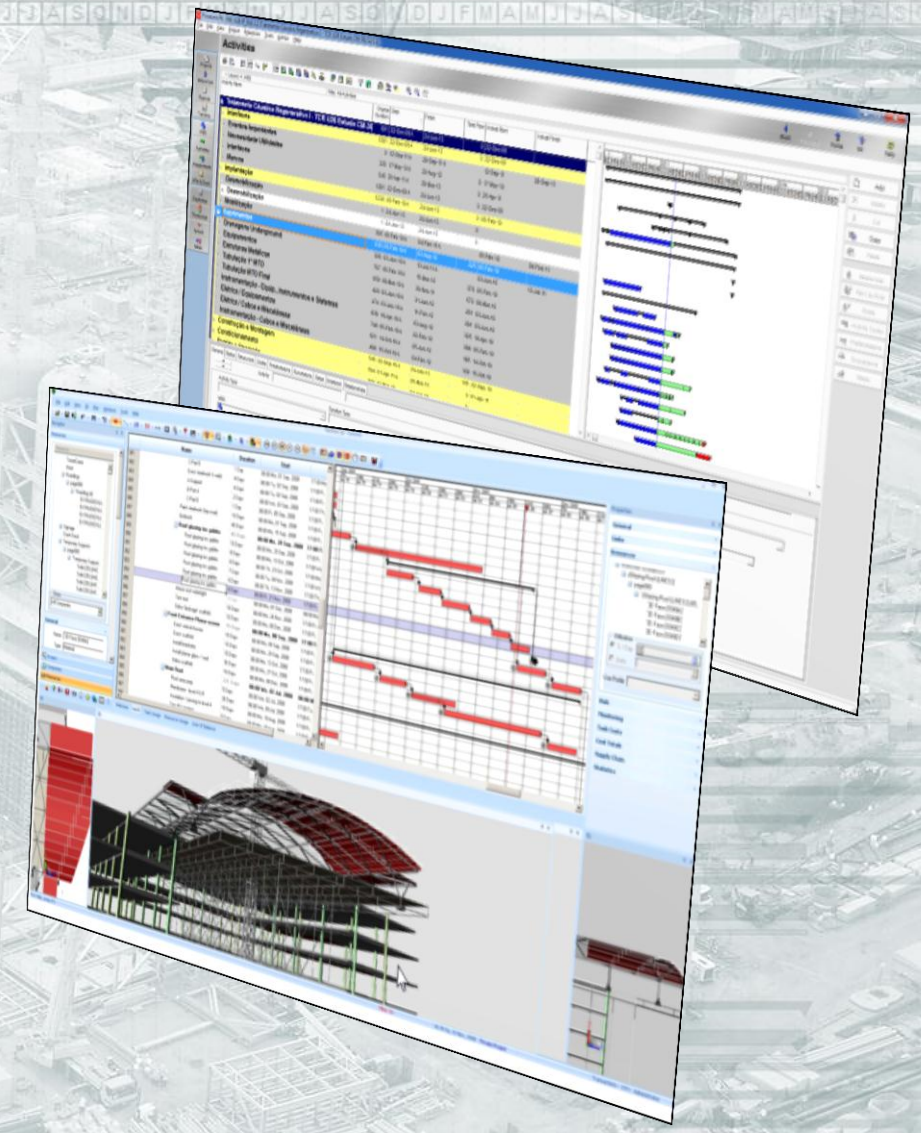
SYSTEMS DEVELOPMENT - PLANNING AND BIM

DEVELOPMENT SYSTEMS - PHASE 4

- **Phase 1 -** Implementation of Synchro PRO
- **Phase 2 -** Planning Process
- **Phase 3 -** Integration of Piping Control System and the 3D model (Status of Piping 3D)
- **Phase 4 -** The Commissioning and Integration Systems Development (Data Book Virtual)

- **Phase 1 - Implementation of Synchro PRO**

  - ✓ Project management over time (resources, cost, and scope);
  - ✓ Facilitated in making decisions regarding possible interference;
  - ✓ Simulates methods and executive sequence;
  - ✓ Sequential understanding of the design and the construction stages;
  - ✓ Share common views among all disciplines of the project (Planning, Production, Quality, SMS, etc.);
  - ✓ Integration between the design team and planning.

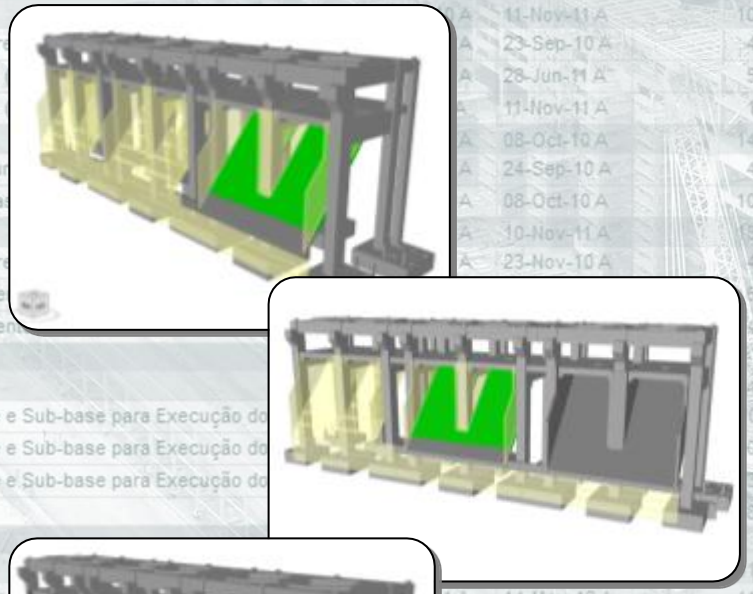


- **Phase 2 - Planning Process**

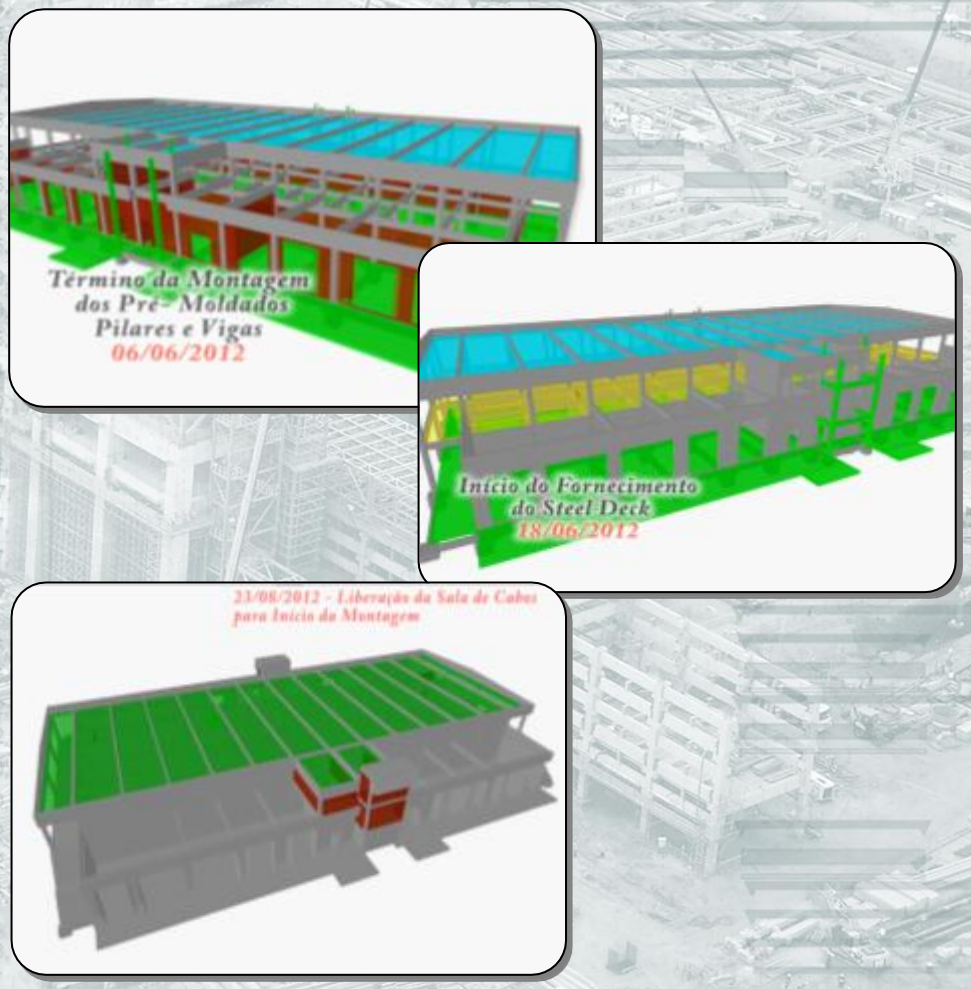
  - ✓ Analysis of Constructability
  - ✓ Analysis of the Scheduled Month
  - ✓ Negotiations with Customer
  - ✓ Verification between the Scheduled v Realized
  - ✓ Check for possible interference in activities
  - ✓ Monitoring of ongoing activities through reports

❖ Analysis of Constructability

Sequence execution and concreting of the ramp.

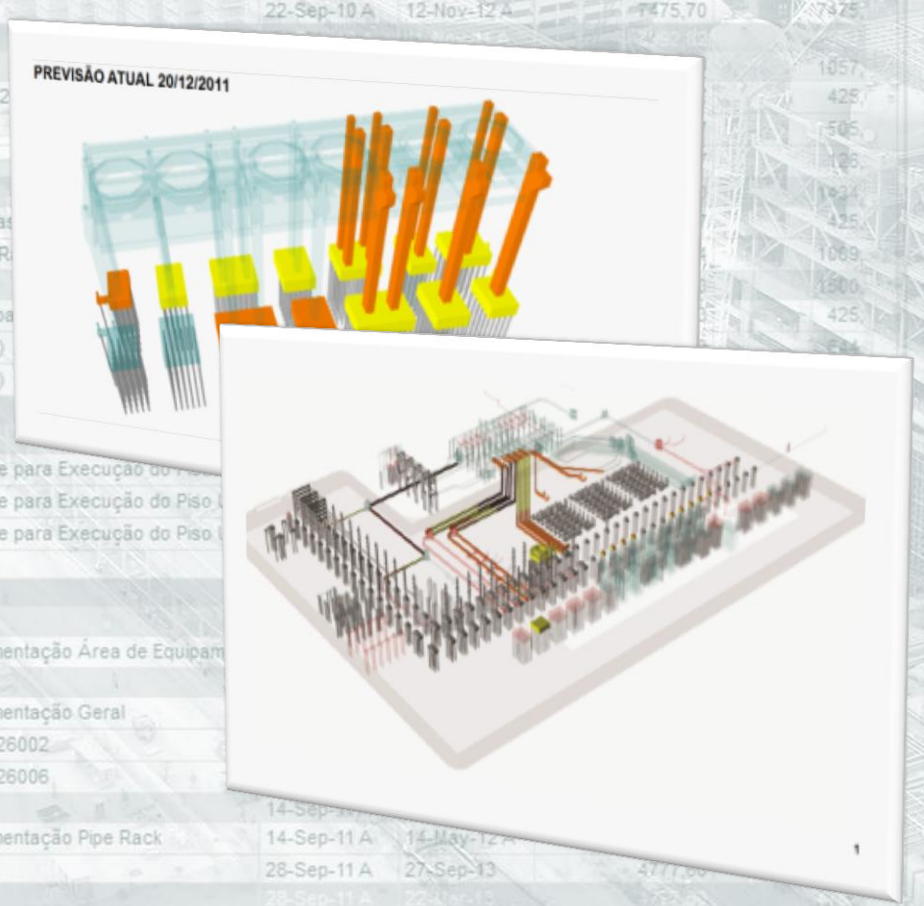


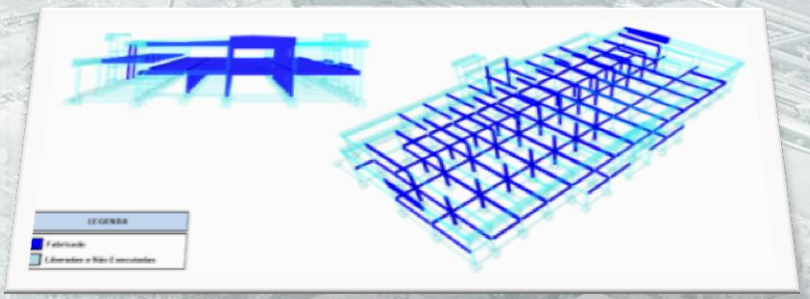
Implementation of Substation.

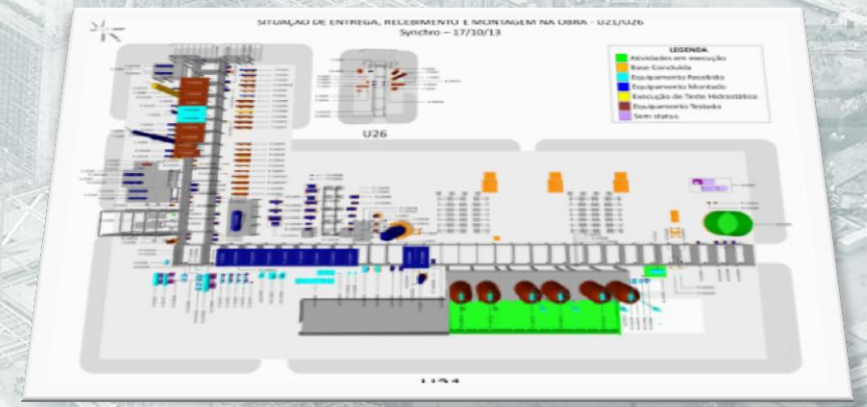


❖ Monitoring of ongoing activities through reports

- ✓ The progress of the project is tracked with detailed 4D images



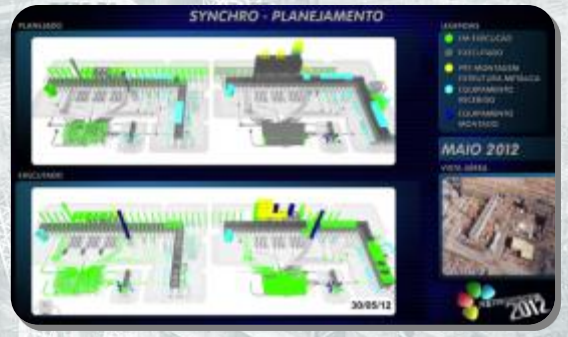




❖ Analysis of the Scheduled Month

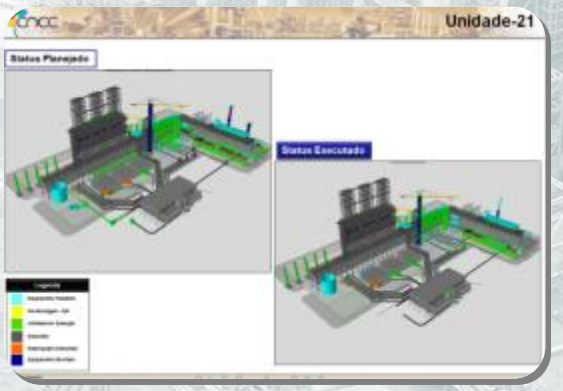
- ✓ Through Synchro PRO it was possible to create detailed analysis and provide reports of project status informing managers of the progress of the work.

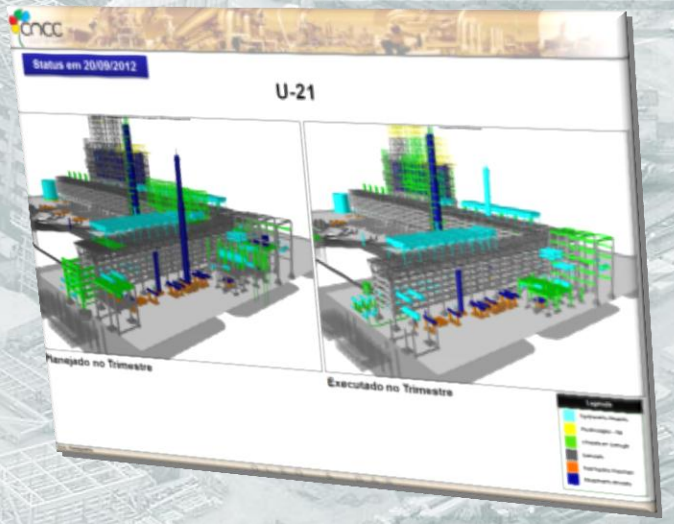
❖ Verification between the Scheduled v Realized



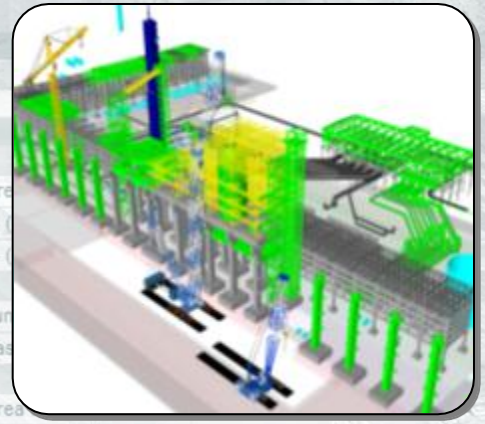
View the reprogramming and changes over time.

Use of images in internal meetings

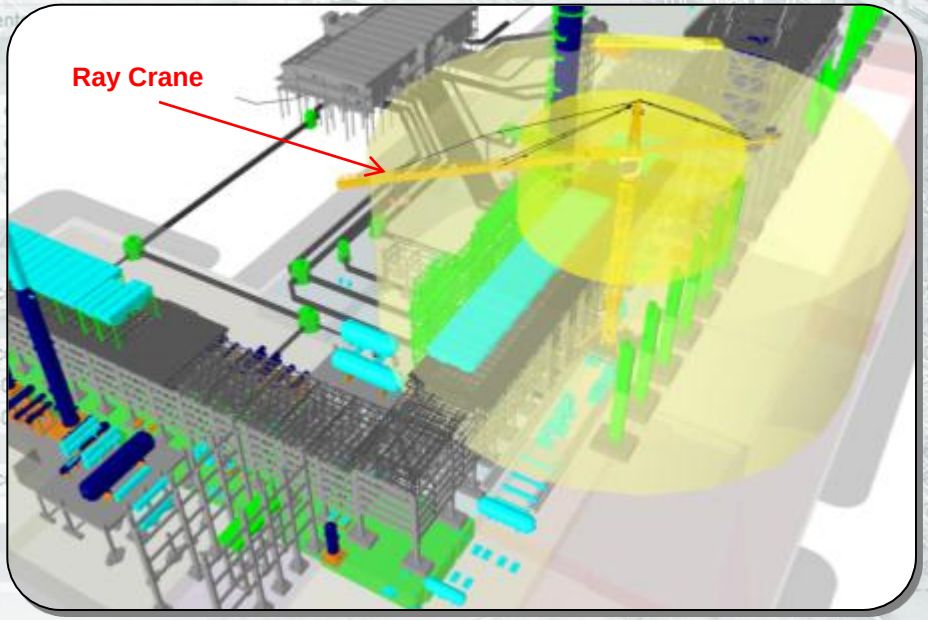


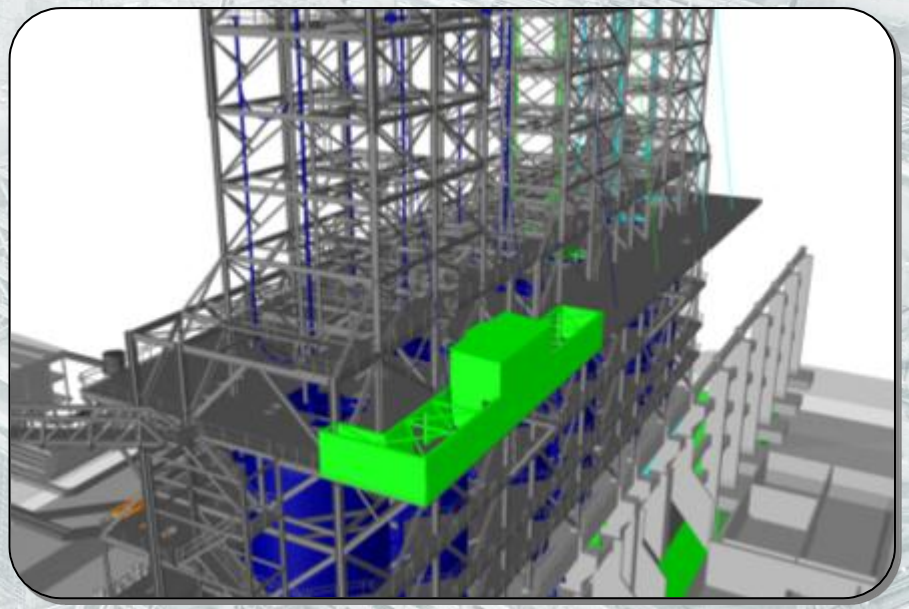


❖ Check for possible interference in resources using clash detection



Interference checking, usage duration and area of access equipment.



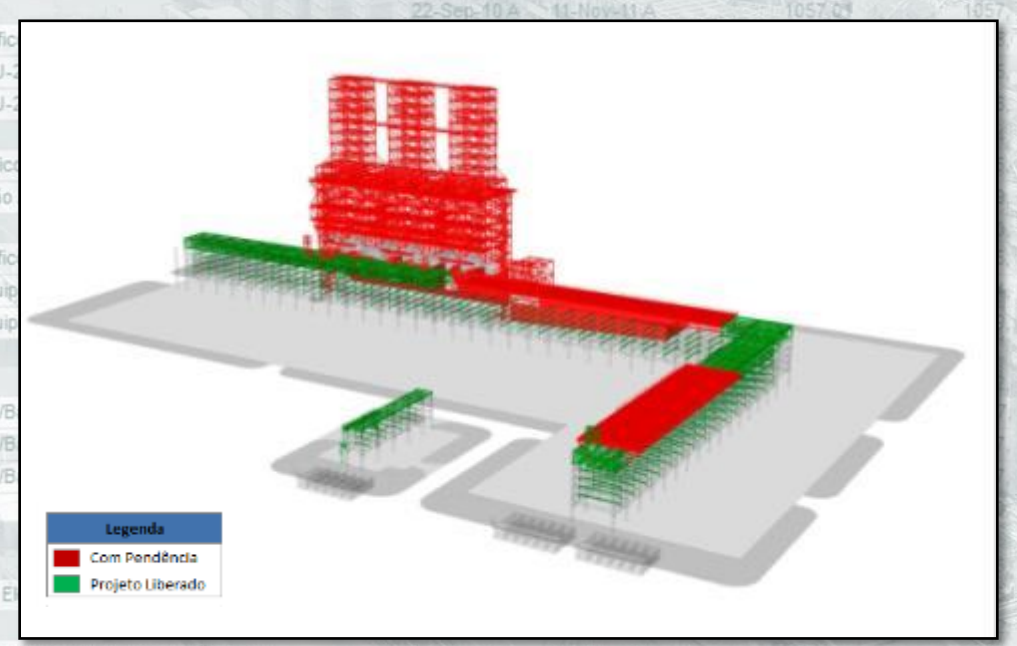


Impact study on the implementation of the activity, business methodology and its predecessors.

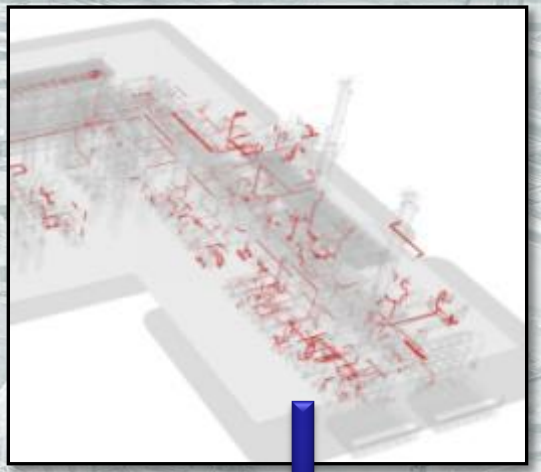
❖ Negotiations with Customer

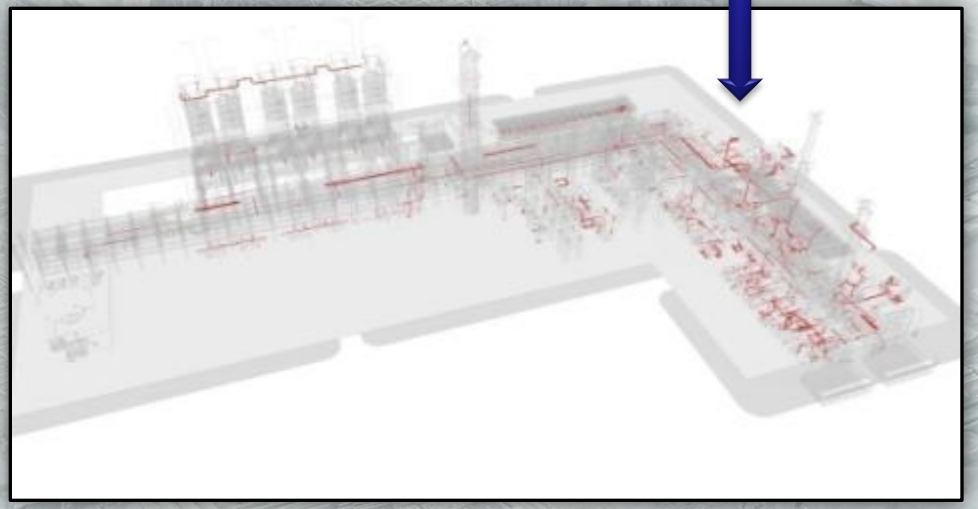
- ✓ By integrating spreadsheets with revisions and the model, it was possible to visually identify the affected area.

✓ **Release Project**



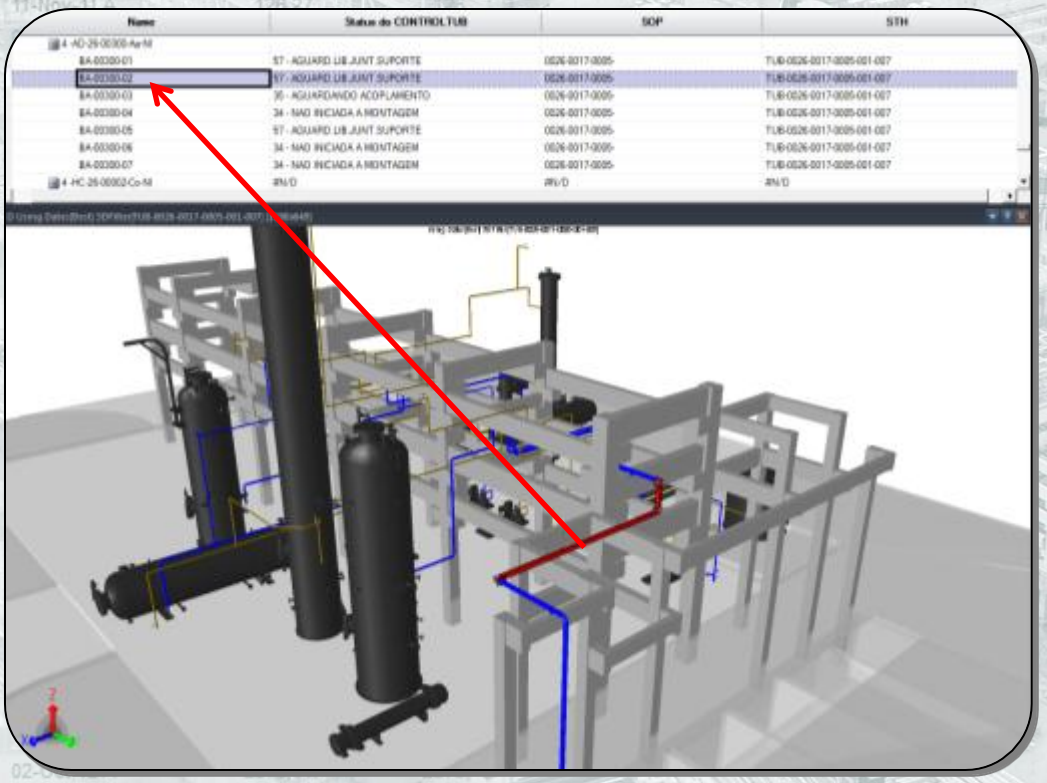
✓ Revised projects





- **Phase 3 -** Integration of Control System Tubing and the 3D model (Status of Piping 3D)

Integrated Work - 3D Status includes information from different areas of the project, the involvement of ISI Engineering was essential in order to generate an easy and integrated visualization, adding value to the work.



STATUS OF PIPING 3D

The 4D model provided a way to integrate the information from the computer model used in project design and Controltub (management pipe software, contractually required by our client), allowing viewing of the details of the project in all its stages (manufacturing and assembly), covering all “spool” status.

- ‘Spools’ are cuts made in piping design . The purpose of these cuts is to enable the pre -fabrication, facilitating assembly by stretches. The “spools” have a unique ID, allowing control and traceability.

Before the programming, the model on display was made by pipe lines and without informing status.

- Linha is a set of spools. The line does not have identification to allow traceability.

The 3D Status became a way to reduce the use of different software and poor accessibility (PDMS and Controltub).

GENERATED IMPACT / RESULTS

With the detailing and identification of the pipe status, it was possible to minimize the changes, improving construction delivery in a meaningful way throughout the process . Below is listed some of the results achieved:

- Manufacturing - with the identification of the status through colors, we can identify and drive the Pipe Shop and quickly disseminate lists of priorities for manufacturing, streamlining the workflow and all costs involved.
- Programming - increased from 70% to 95 % in assertiveness programming, because when the spool's are divided on the model, we can see both the interference of various disciplines and provide a reliable sequence for assembly so that we could meet all goals and avoid delays.
- Assembly - using Synchro, we were able to identify possible interference, resource requirements and new possibilities for assembly in advance of construction, previously we could only do this on a site visit. Today we can manage more quickly and more comprehensively while staying within the schedule. Using the 3D model and 4D animations, we reduced the time to optimize our strategy for implementation of programming because the visual effect clarifies the project instantly.

DECREASE THE TIME NEEDED TO PREPARE THE SCHEDULE (SPOOL LOCATION)

In the development of the weekly schedule for a team of 240 men, it's possible to check the availability of spools, positioning, resources and other information.

An average production rate of 150 T/month previously took 400h/month. Today the same programming is only 100h/month.

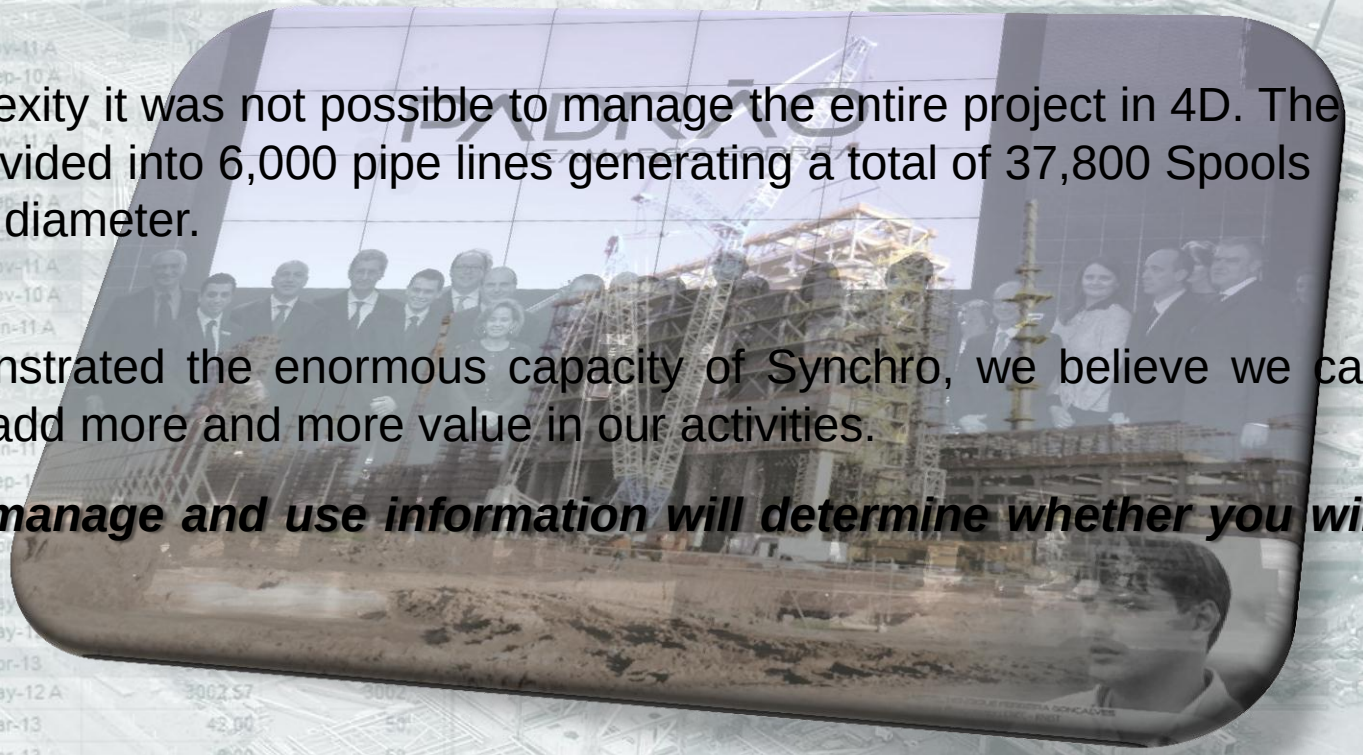
- Calculation:
  - ✓ Total Manpower involved in programming (Planning and Production) - 16 people
  - ✓ Average value of burdened salary - R$ 20.000,00
  - ✓ Value of labor – R$ 100,00 per team
  - ✓ Without 3D/4D detail - R$ 40.000,00 month
  - ✓ With 3D/4D detail - R$10.000,00 month
  - ✓ Time of pipe execution – 24 months

Thus we can say that this attitude resulted in a saving of R$ 720.000,00 (~ US$ 310.000,00).

DIFFERENTIAL

With this experience, we can use Synchro in other processes, linking not only the schedule.

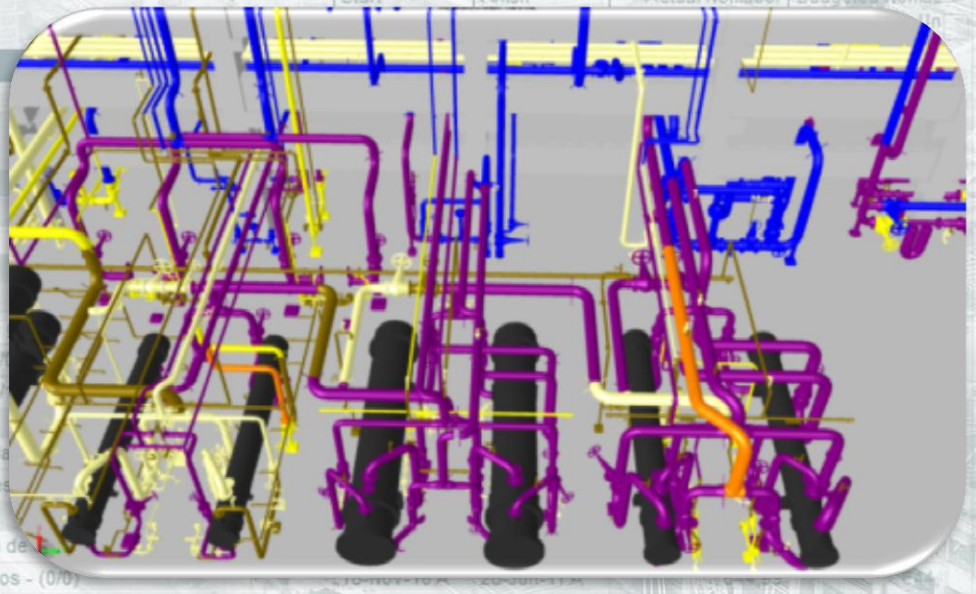
Due to the level of complexity it was not possible to manage the entire project in 4D. The project has 7,741 tons, divided into 6,000 pipe lines generating a total of 37,800 Spools ranging from ¾ "to 36" in diameter.



This exercise has demonstrated the enormous capacity of Synchro, we believe we can reach new horizons and add more and more value in our activities.

"The way you collect, manage and use information will determine whether you win or lose."

Bill Gates

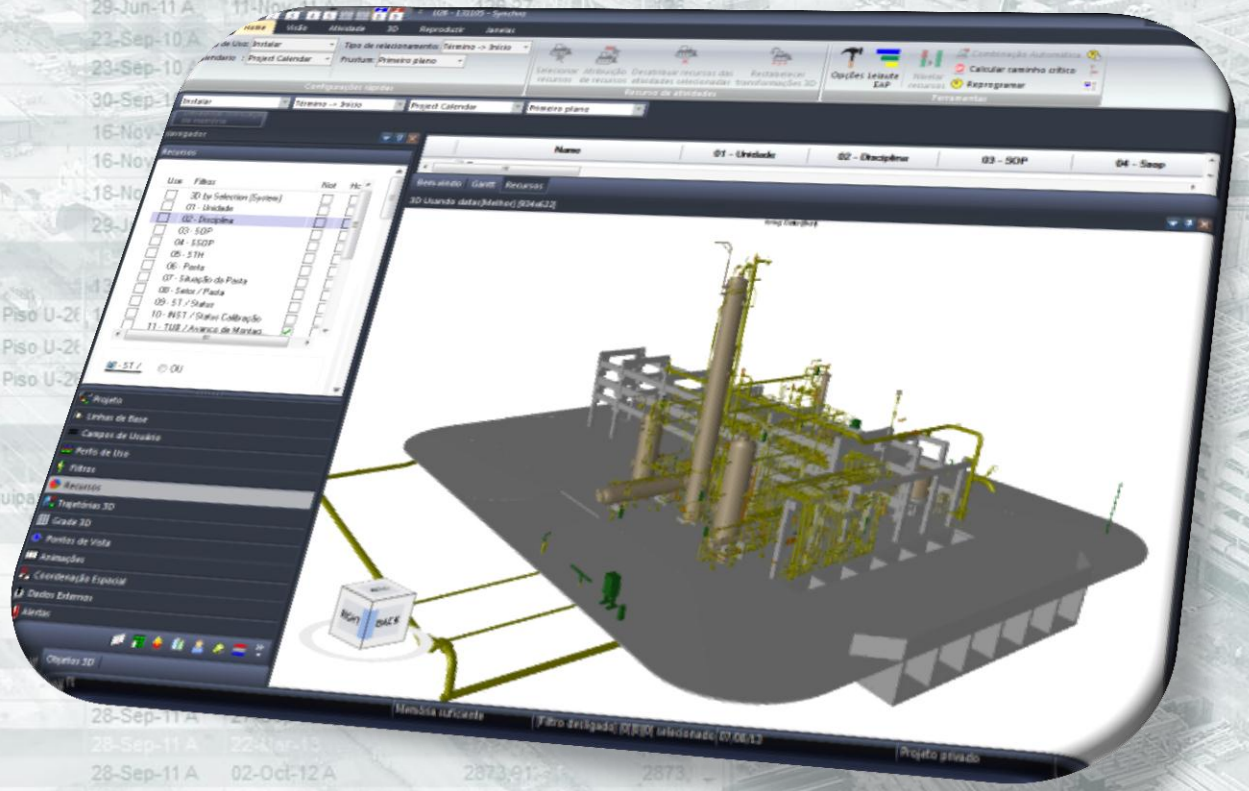


Legenda - ABOVE

- Não Iniciado Fabricação
- Em Fabricação
- Fabricado
- Solicitado
- Recebido
- Em Montagem
- Liberado CQ

- **Phase 4 -** The Commissioning and Integration Systems Development (Data Book Virtual)

  - Allow the interface of 3D model with controls implemented in industries and design disciplines, enabling the communication and integration in Synchro and accessing information in external systems (CCD, SCM, Projects, etc.).



Integration with systems

- Integration of the model is possible through accessing external systems.
- Access to external systems becomes much easier, the understanding of the process is possible using links to display project access information registered in the CCD, Project Wise, SCM and others as needed.
- For 2014 there is the likelihood of developing an interface between SAP and the BIM model.

➢ Information

➢ The link between the model and the spreadsheet containing the information linked to this TAG

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/CFF-26-0001B
/CFF-26-0001C
/CFF-26-0002A
/CFF-26-0002B
/CFF-26-0002C
/CFF-26-0003A
/CFF-26-0003B
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/CFF-26-0004C
/CFF-26-0005A

	Name	01 - Unidade	02 - Disciplina	03 - SOP	04 - Ssop	05 - STH	06 - Pasta	07 - Situação da Pas
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2	Elétrica							
3	Equipamentos							
4	Instrumentação							
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6	//PDA-260002-1	#N/D	#N/D	#N/D	#N/D	#N/D	#N/D	
7	//PDA-260003-1	#N/D	#N/D	#N/D	#N/D	#N/D	#N/D	
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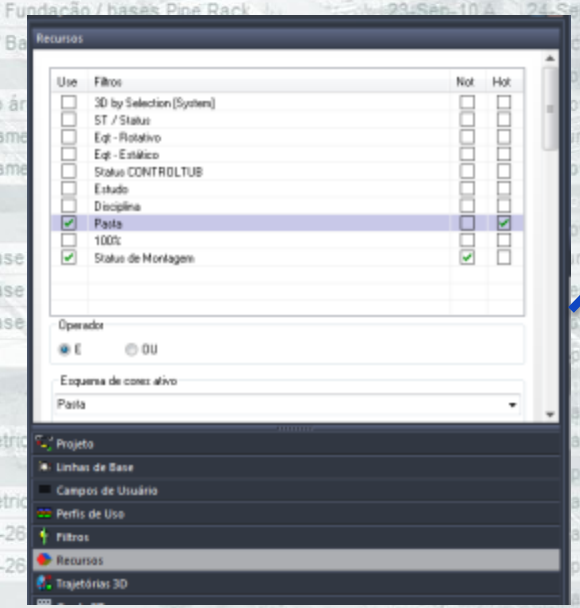
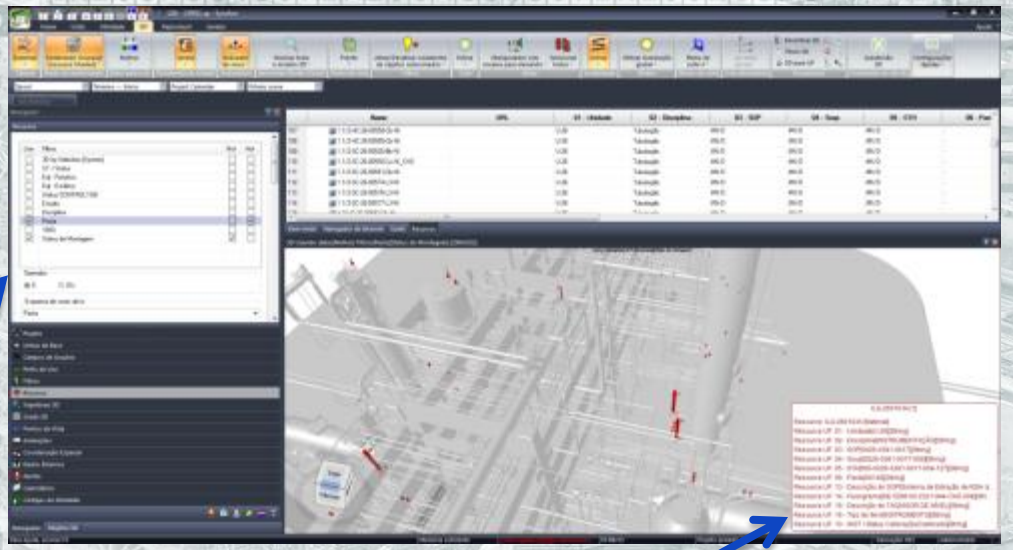
➢ Viewing Information

- Filters: You can select existing and / or create new filter options, allowing us to customize the display of the model according to the information for installation and commissioning filters.





- Placing the mouse over the item of the model, a window will show the available information.

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Resource UF: 02 - Disciplina[INSTRUMENTAÇÃO][String]
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Resource UF: 06 - Pasta[00142][String]
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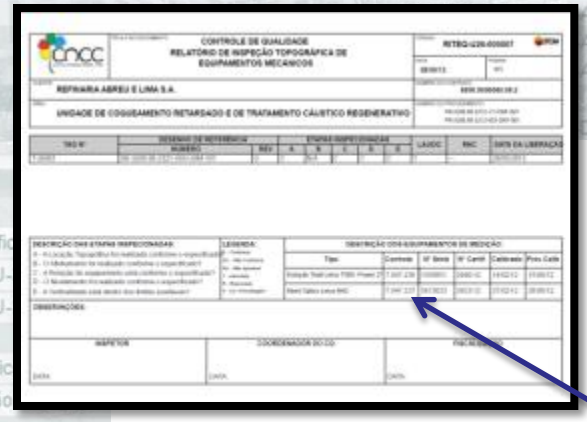
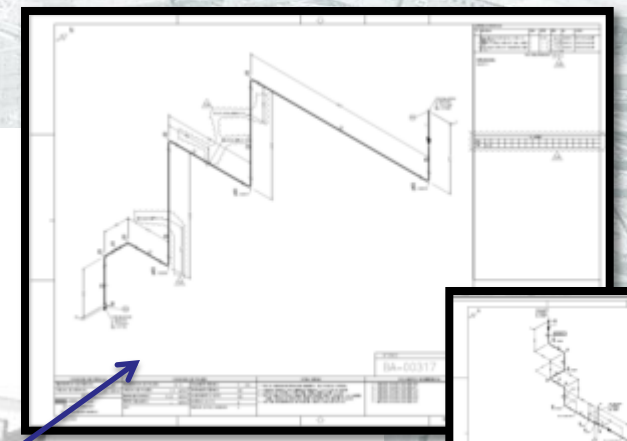
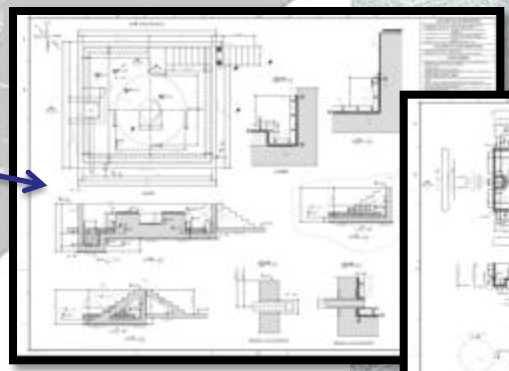
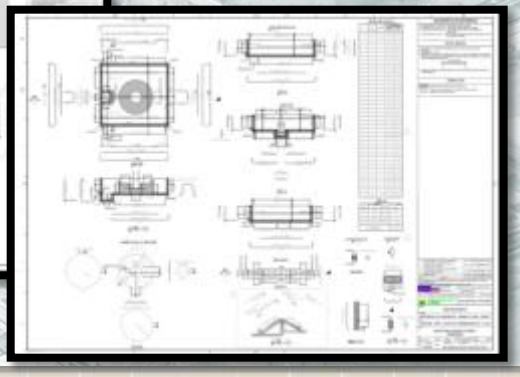
Resource UF: 14 - Fluxograma[DE-5290.00-2321-944-CHZ-204][Stri...
Resource UF: 15 - Descrição do TAG[VISOR DE NÍVEL][String]
Resource UF: 16 - Tipo de Item[INSTRUMENTO][String]
Resource UF: 10 - INST / Status Calibração[Calibrado][String]

- **Integration With systems.**



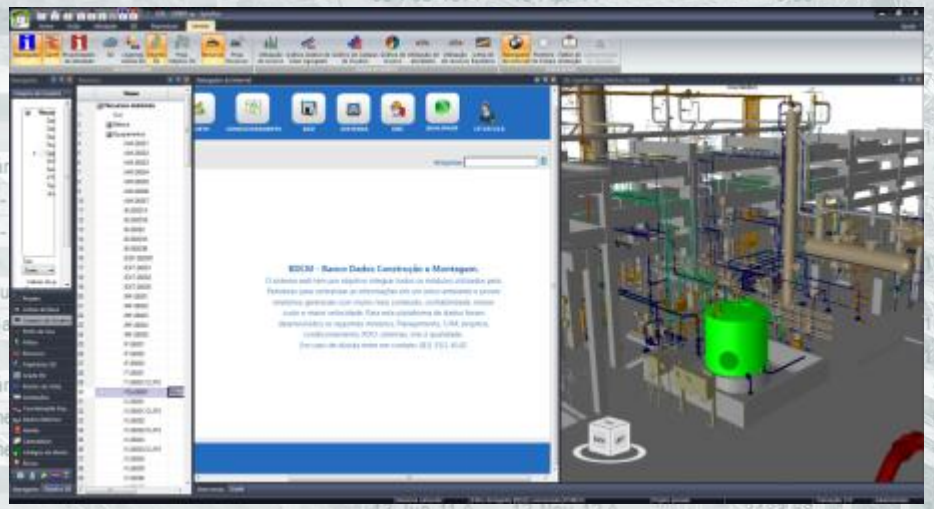




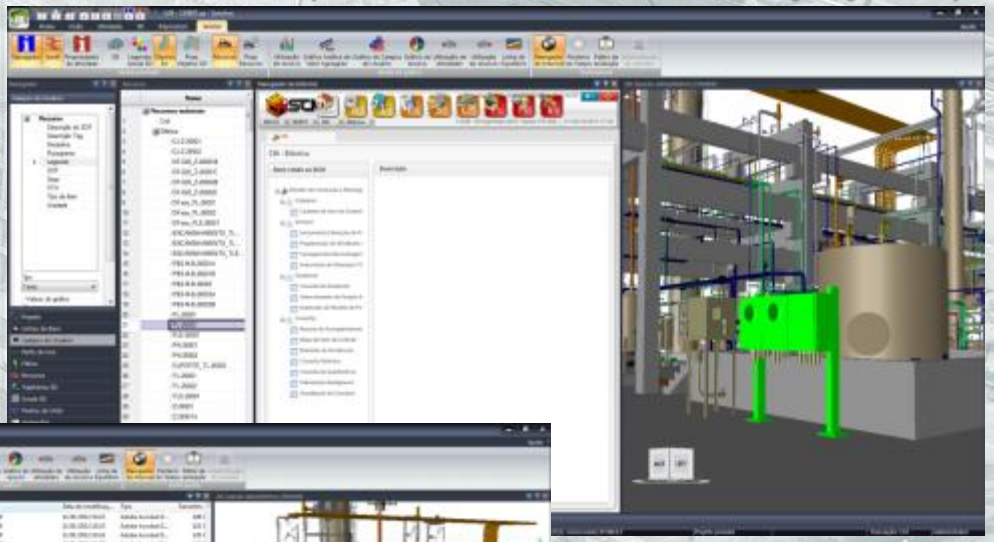
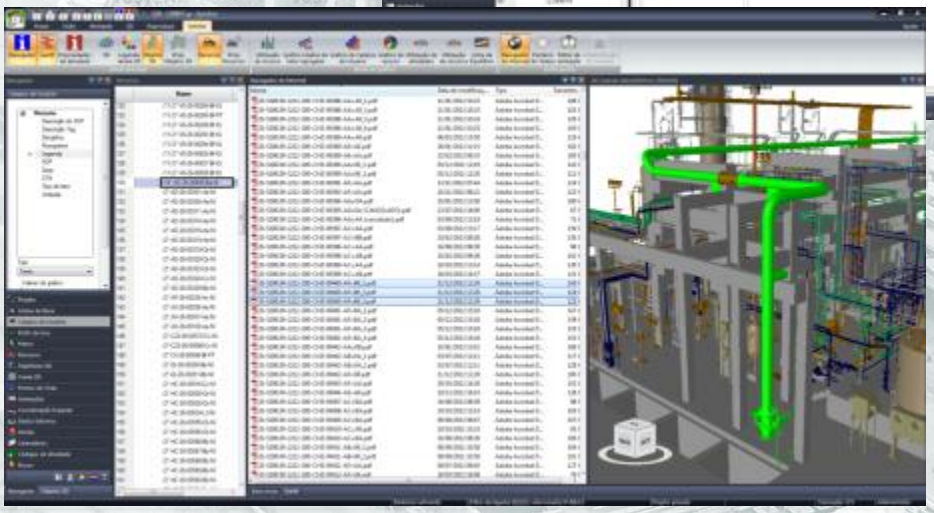


- **More agile process**

BDCM



SCM (Construction and Assembly System)



Projects PDF