TINA Project

Transient Integrated Network Analysis
Summary

TINA project

- Motivations and needs
- Current situation
- Project status
- Dynamic unit interface extension
- Demonstration
- Conclusion
Motivations and needs

- Hydrates
- Paraffin wax
- Asphaltens
- Insulation
- Multi phases flow
- Processing, gas-lift activation
- Damage
- Sand arrival
- Pumping
- Separation
- Paraffin wax
- Asphaltens

CO-LaN Annual Meeting, COMO - TINA Project - 02-17-05

© IFP-2005
Motivations

*TINA Project*

• Ensure effluent transportation from the reservoir to the topside applications
  – Manage production system in its all
  – Respect production schedule fixed by the reservoir studies

• Knowing elementary information
  – Reservoir production
  – Nature of the fluid
  – Bottom temperature and pressure
  – Surface pressure

• Respecting a number of constraints
  – Economic (CAPEX, OPEX, RISKEX)
  – Environment
  – Security
Current situation

Well Head

Software and limits

OLGA-PVTSIM-OLGAS
TACITE-PVT_IFP-TACITE HDM
PIPESIM
PIPEPHASE

ATHOS
ECLIPSE
MBAL

• Data management (reservoir, fluid, production system,...)
• No model consistency
• No true interoperability between software
• Different resolution modes (dynamic/steady State)
Project Status

• Development and integration
  – IPR (Inflow Performance)
  – Static Pipe
  – Transient Pipe

• Interoperability
  – RSI Units, IFP Units, ...
  – MultiFlash (V3.3 and 3.4), RSI Thermo
  – HYSYS (V3.1), Pro/II (V7.1)

• Deepwater application case
Project Status

Static and dynamic simulations

Topside process

HP Compression

P, T

Export

P, T

DS3100

GLV-1

to water treatment

to DS3400

RV-1

P

%

P, T

Cycle gas-lift

Manifold

P, T

P, P, T

Res,

PI

WT

WHV

PFL

%
Dynamic interfaces

• Three types of unit operations for three interfaces
  - Boundaries
    • A boundary is a network limit, and does not support any specific interfaces but ICapeDynamicUnit.
  - Nodes
    • A Node is a specific unit operation characterised by:
      - Inlet and outlet pressure are identical
      - Hold up.
    • Therefore a node unit operation should implement two interfaces: ICapeDynamicUnit and ICapeNodeDynamicUnit
  - Arcs
    • An Arc is a specific unit operation characterised by:
      - Pressure drop
    • Therefore an arc operation should implement two interfaces: ICapeDynamicUnit and ICapeArcDynamicUnit
Dynamic interfaces

• Need for another type
  – There are unit operations that are neither of the arc, nor of the nodes, and even less of the limits of networks.
  – Typically, these unit operations have the following characteristics:

\[
\begin{align*}
F_{\text{in}} & \quad \text{Pressure drop} \\
F_{\text{out}} & \\
\text{P}_{\text{in}} & \quad \text{Inlet and outlet flows are different} \\
\text{P}_{\text{out}} & 
\end{align*}
\]

Where F is flow and P is pressure and

– To deal with this kind of unit operation, it is necessary to define a new type and a news interface.

• BiArcs
  – A BiArc is a specific unit operation characterised by:
    • Pressure drop
    • Inlet and outlet flows are different
  – Therefore a BiArc operation should implement two interfaces: ICapeDynamicUnit and ICapeBiArcDynamicUnit
Conclusion and future work

• The platform and its components form a useful integrated tool
  – Design
    • Steady state simulation under constraints
  – Operating procedures
    • Dynamic simulation
      – Shut down-restart
      – Unit cooling and hydrate appearance
    • Data reconciliation
    • Training

• Commercial version is planned for the end of year 2005

• CAPE-OPEN Standard
  – Proposal for Hydrodynamic
  – Improved Dynamic Unit standard