

# Vitória Flexible Manufacturing Plant



**Eduardo Merhi**, Head of Flexibras Project Management Department

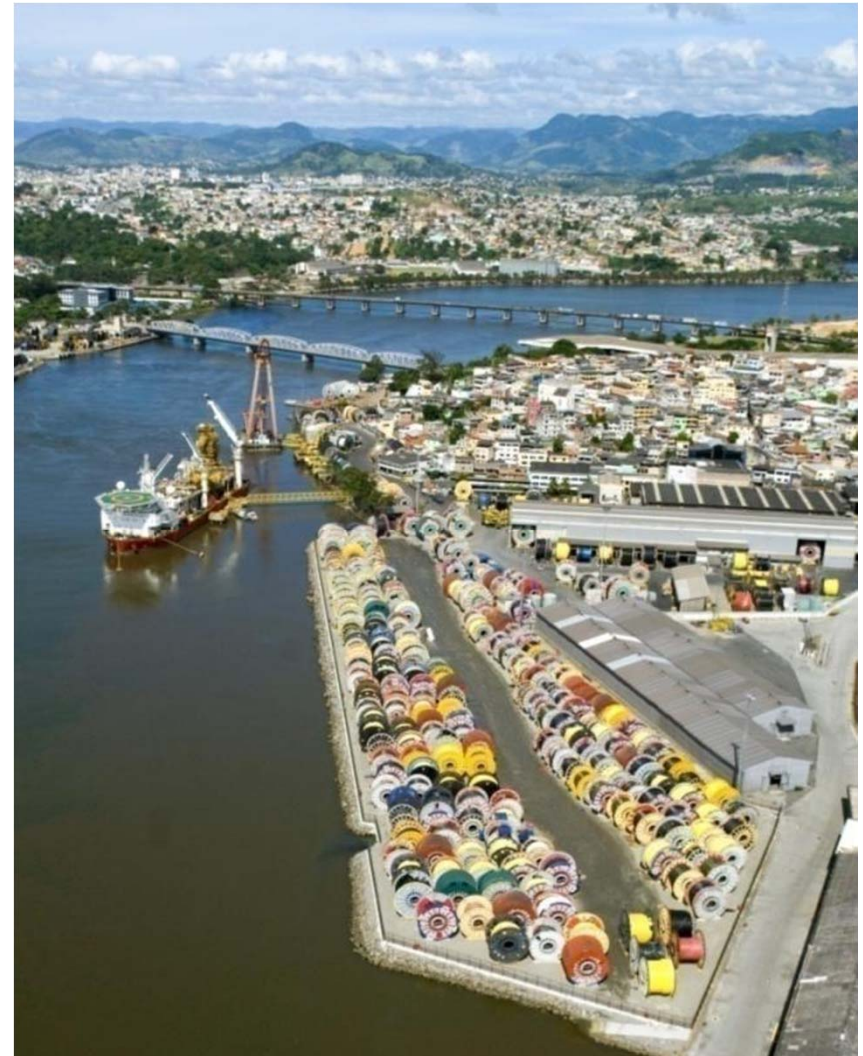
**Monica Mesquita**, Brazil QHSE Superintendent

Investor Day in Brazil October 4, 2011



# Flexibras at a Glance

- **Inaugurated in 1986**
  - Location: Vitória
  - Over 3,300 km flexible pipe manufactured
- **Products**
  - 2 flexible pipe production lines
  - DTS (real time riser temperature monitoring system)
  - Cold lamination unit for flexible raw material (Zeta profile)
  - Thermoplastic umbilicals and ISU® (Integrated Service Umbilical) production capability
- **Logistics base**
  - Integrated into the company
  - 350 ton handling capacity
  - 2 front load capacities
- **Flexibras test center**
  - Qualification of flexibles for Pre-Salt





# Flexibras Map







## Technip: Strong Commitment to HSE

**“I want Technip to become the reference company in Health, Safety, and the Environment.”**

**Thierry Pilenko**  
**Chairman Technip Group**  
**PULSE event Aberdeen June 2008**







# Technip: HSE Management System





# Law Monitoring & Risk Analysis

## Law Monitoring



**constituição federal**

**legislação federal**

**legislação estadual**

**legislação municipal**

**projetos de lei**

O banco de dados LegisAmbiental, produzido pela Norma Ambiental Serviços e Informática, possibilita o fácil acesso à legislação de Meio Ambiente, Saúde Ocupacional, Segurança do Trabalho, Responsabilidade Social e Metrologia e Normatização emitida pelos órgãos públicos dos âmbitos Federal, Estadual e Municipal, através da classificação, seleção e busca por meio de palavras-chave.

O Grupo Norma Ambiental conta ainda com a Norma Ambiental Consultoria e Treinamento para oferecer consultoria especializada na área de legislação aplicável às atividades, aspectos e impactos específicos de cada empresa.

Monthly Law Update

**By August 2011, Technip Vitória Team has analyzed:**

- 155 Federal Laws
- 32 State Laws
- 18 Municipal Laws
- 49 Environmental Permits

## Risk Analysis

Technip		IDENTIFICAÇÃO DE PERIGOS, AVALIAÇÃO E CONTROLE DE RISCOS (IPAR)											
Data: 27/09/2007		Revisão 1											
Setor: Métodos - Oficina de Ferramentaria				Serviço: Montagem e desmontagem de cabeças de extrusão									
Participantes da Análise de Risco:				Cargo - Empresa				Empresa					
Rubens Gomes				Lider de Métodos				Flexbrás Tubos Flexíveis LTDA					
Mônica Mesquita				Gerente HSE				Flexbrás Tubos Flexíveis LTDA					
Aprovado por:		Enio Vinicius Costa											
Ordem	Atividade	Perigo ou Fonte de Perigo	Dano	Medidas de Controle Existentes (E)	Avaliação de Risco			Medidas de controle a Implementar (I)	Avaliação de Risco Residual			Indicar o controle ações	
					S	P	PR		S	P	PR		
1	Movimentação de materiais com o auxílio de ponte rolante e empilhadeiras	Trânsito de pedestres	Esmagamento, fratura	Sinalização de área	8	2	16	Melhorar sinalização e barreiras de acesso	8	2	16	Todas ações serão controladas na CM 165/2007	
		Queda de ferramentas (punção, guia tubo, distribuidor, feiras, etc.) e carga	Esmagamento, fratura	IT-FLB-04-MIP-002 Treinamento para os operadores de ponte rolante e empilhadeira Sistemática de controle de acessórios (PR-FLB-55-MIP-039)	8	2	16	Instalação de elevador de distribuidor, instalação de suporte para manuseio de peças 0201 para manter posição vertical sem risco de queda.	8	2	16		
		Queda da carga no pallet (transporte com empilhadeira)	Esmagamento, fratura	IT-FLB-04-MIP-002 Treinamento para os operadores de ponte rolante e empilhadeira Sistemática da SICCA	8	2	16	Estudo de melhoria no pallet de transporte de carga do MIP	8	2	16		
		Atrópelamento (empilhadeira)	Esmagamento, fratura	IT-FLB-04-MIP-002 Treinamento para os operadores de ponte rolante e empilhadeira	8	2	16	Sinalização e/ou acesso restrito	8	2	16		
2	Armazenamento de ferramentas	Queda de punção, guia tubo, distribuidor, feiras	Esmagamento, fratura	IT-FLB-04-MIP-002 Treinamento para operadores de ponte rolante	8	2	16	Melhoria no uso dos acessórios de içamento (gancho de puxar cinta no punção) Confeccionar suporte	8	2	16		
Superfície Quente		Queimadura		IT-F									

Risk Analysis Spreadsheet

Risk Analysis Spreadsheet

**By August 2011, Technip Vitória Team has conducted:**

- 140 Safety Analysis
- 139 Environmental Analysis



# Technip Brazil: HSE Tools

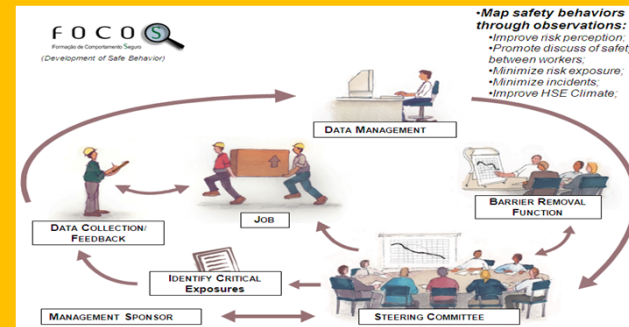
## DAILY SAFETY MINUTE

**Objective:** Promote daily HSE awareness before working



## FOCOS

**Objective:** Map safety behaviors through observations



## HSE MONITOR

**Objective:** Enhance HSE awareness and to promote behavior change



Fabiano  
Equipe Flexibrás

## SAFETY MENTOR

**Objective:** Instruct HSE practices to new employees in order to prevent incidents





# Flexible Pipe Manufacturing Process

- Customized design of each layer as per projects requirements (such as: fluid composition, water depth, pressure, etc...)
- Raw material purchase as per customized design
- Machine set-ups to adapt to different products
- Production layer by layer
- Tests
- Storage

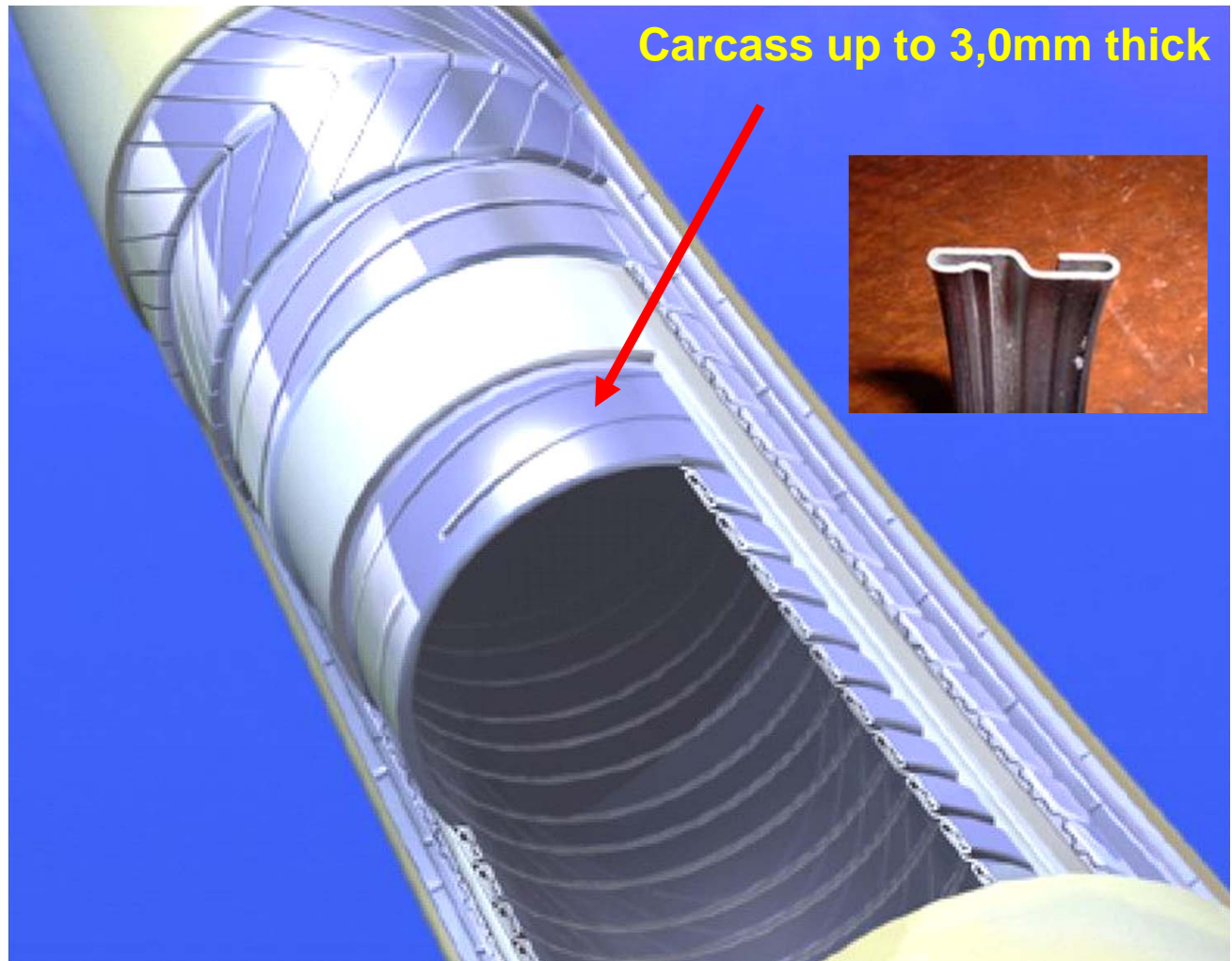
[ Customized products





## Layer 1: Carcass

- Radial resistance (collapse, installation)
- Harsh corrosive resistance
- Process reliability
- Large range of raw material
- Large diameter

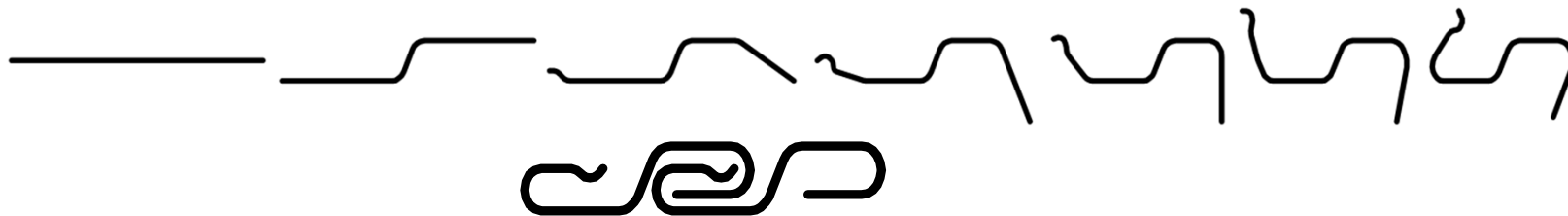




# Layer 1: Carcass Profiling Machines SP-20, SP-16 & SP-6

## New SP-20

- Inaugurated in 3Q 2010
- Biggest machine in the world
- Meet harsh pre-salt corrosion requirements
- Deepwater solution
- Great resistance to collapse
- Flexible pipes diameter up to 20"

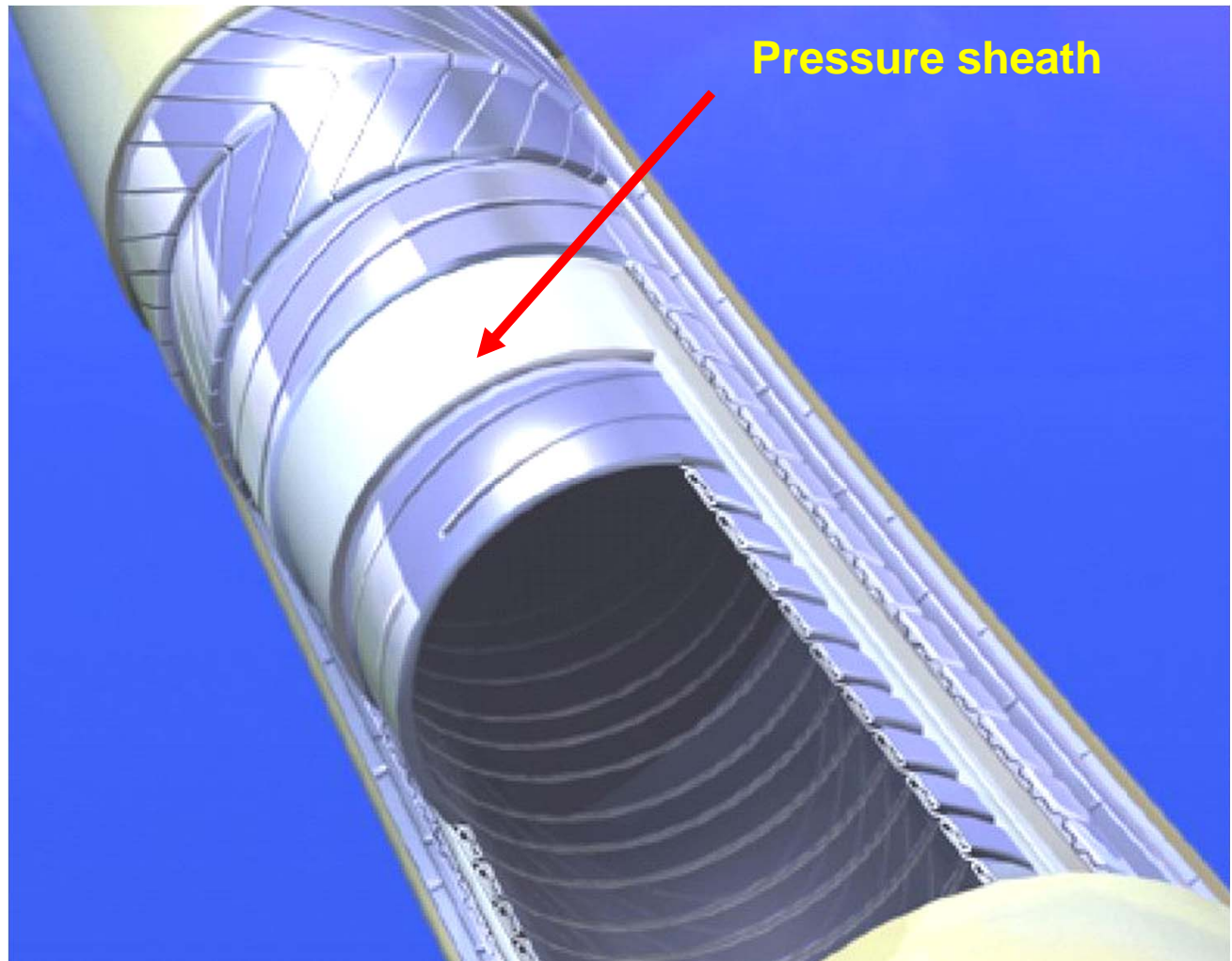


**Cold-forming a flat steel strip through a set of profiling tools to reach a specified profile**



## Layer 2: Pressure Sheath

- Internal leakproofness
- High temperature resistance
- Large range of thermoplastic polymers raw material
- Large diameter





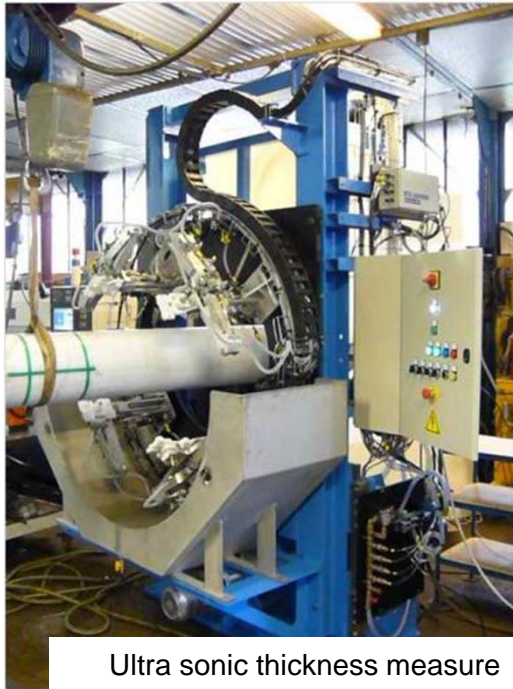
## Layer 2: Pressure Sheath Extrusion Machine G-153 & G-201



Wide range of extrusion heads  
to allow processing of large  
numbers of polymers



# Extrusion Quality Control



Ultra sonic thickness measure



Bubble detector (OPUS)



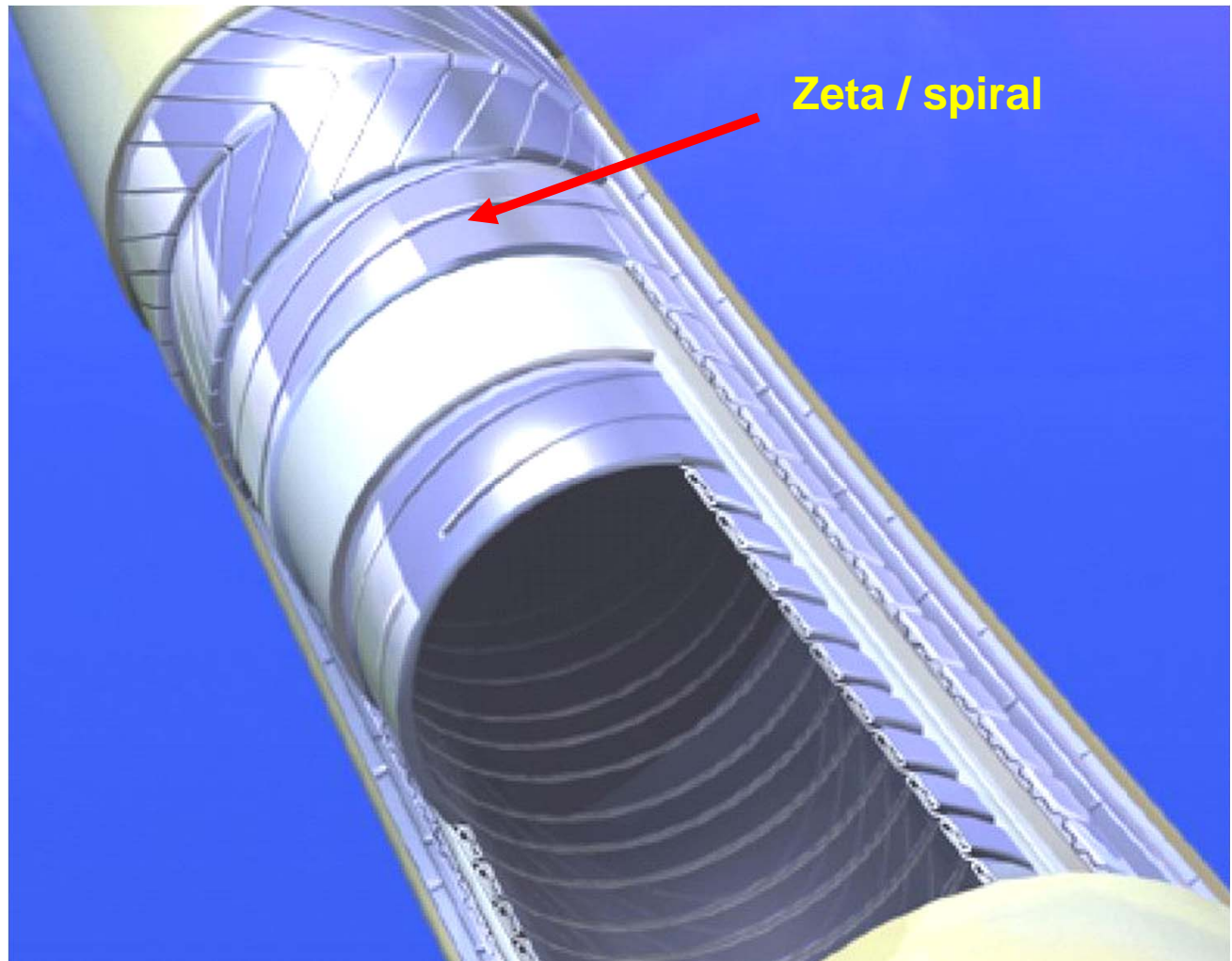
X-Ray

**Non-destructive tests combined with destructive test to guarantee the quality of the layer**



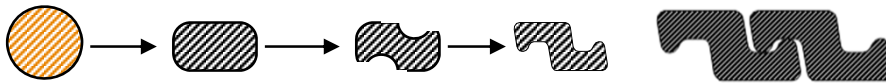
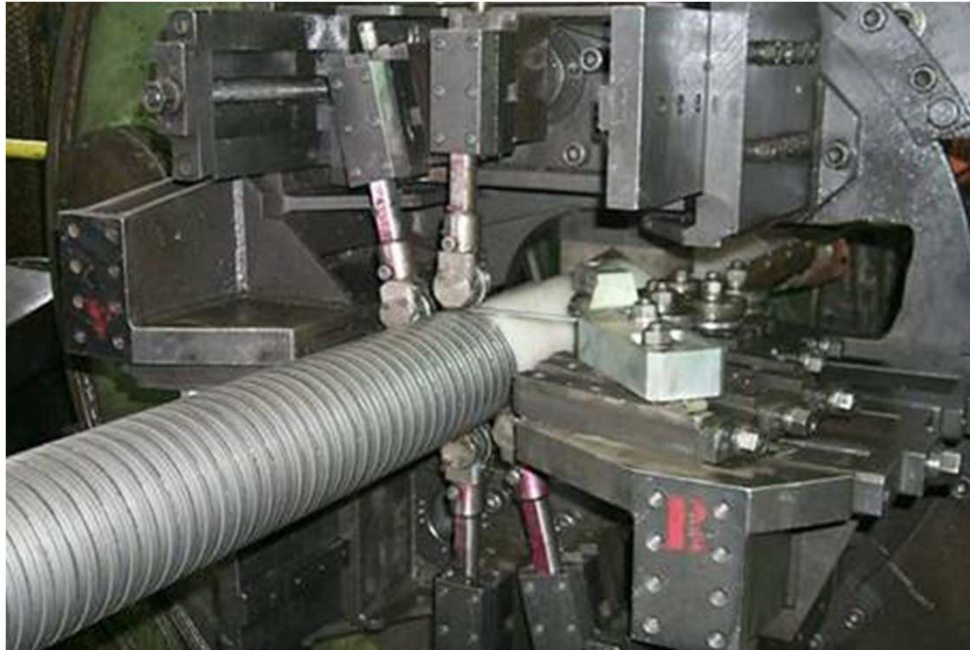
## Layer 3: Zeta / Spiral

- Pressure vault
- Patented wire profiles
- Fatigue corrosion resistance solution
- Ultra deepwater solution
- High pressure resistance
- Large diameter
- Raw material manufacturing capacity (Zeta profile)





## Layer 3: Zeta / Spiral Spiraling machines SP-5 and SP-12



**12mm thickness Zeta profiles for ultra deepwater and high pressure services (water injection)**



**SP-5: Zeta 6.2 and 8**

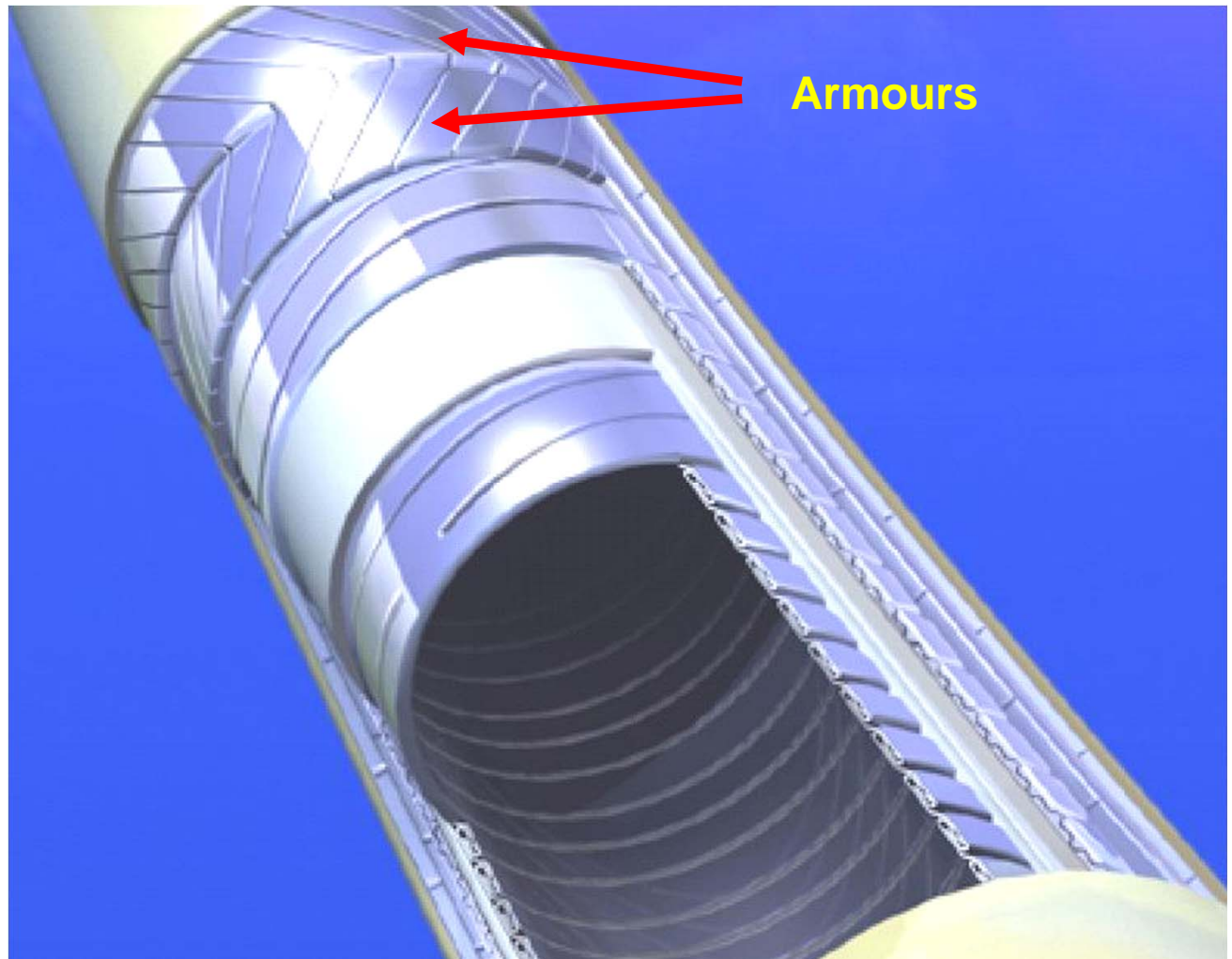


**SP-12: Zeta 6.2 up to 12**



## Layer 4: Armours

- Tensile loads resistance for deepwater services
- Various types of armours
- Large range of raw material
- Large diameter





## Layer 4: Armouring machine

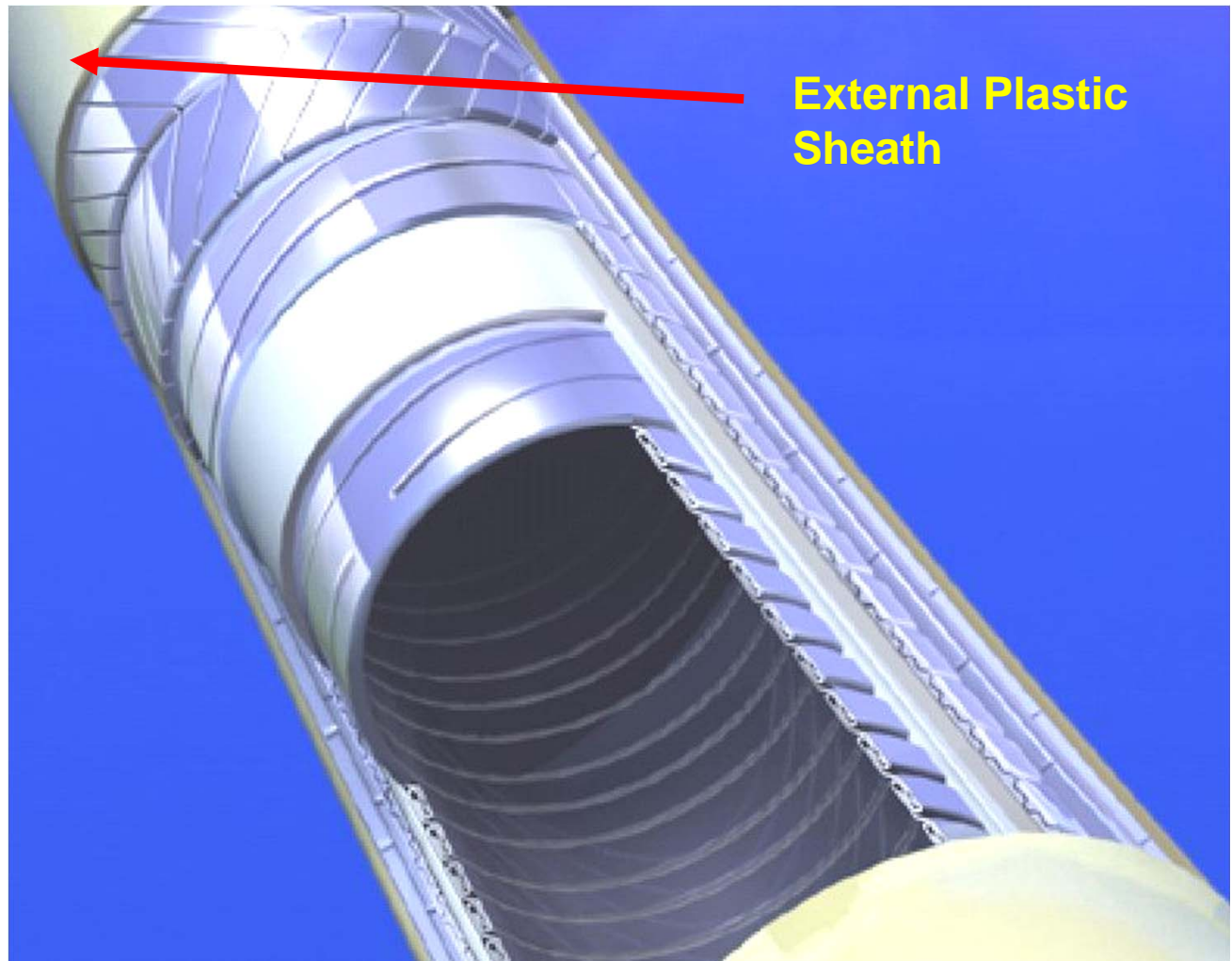


**Machines ready to process special wires with high corrosion resistance for Pre-Salt**



## Layer 5: External Plastic Sheath

- Protection
- Insulation
- *Other sheaths may be added to manufacture products meeting client's requirements*





# Mounting / Marking / Acceptance Test

- Mounting
  - Termination adapted to Client's specifications
  - Each flexible pipe layer individually connected to the end-fitting
- Marking
  - Identification of the line
- Testing
  - 24 hours hydrostatic test at 1.5x design pressure





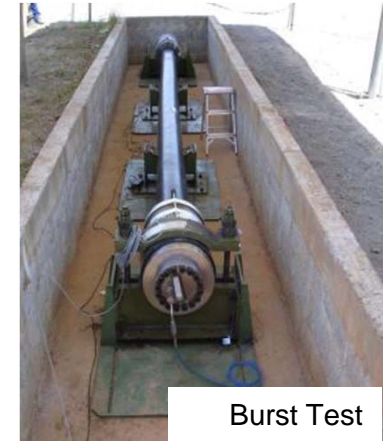
# World-Class Qualification Test Center in Brazil...



Dynamic Fatigue Tests (700 tonnes)



Tension-to-Tension Tests (400 to 700 tons)



Burst Test



Bending Tension Benches



Hyperbaric Chamber Collapse Test

...to continuously develop new flexible pipe technologies

**Technip**



# Thank you



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