Analisi termo-strutturali di condotte

Webinar 28-07-2020

ORGANIZZAZIONE WEBINAR

- Panoramica del software Start-Prof;
- Funzionalità di Start-Prof;
- Creazione di un modello e interfaccia software;
- Elementi per la creazione di reti di condotte;
- Modifica, gestione e importazione di modelli;
- Codici e normative;
- Condotta interrata;
- Azioni di carico e gestione delle combinazioni di carico;

PASS passuite.com | *ANALISI E DIMENSIONAMENTO DI CONDOTTE E SERBATOI*

Più di 50 anni di esperienza

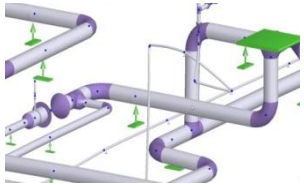
Più di 3000 utilizzatori

Utilizzo semplice combinato a calcoli avanzati

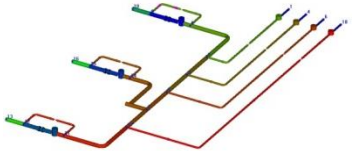
Ampia applicabilità

ENGINSOFT

PASS/START-PROF fa parte dei software PASS Suite:

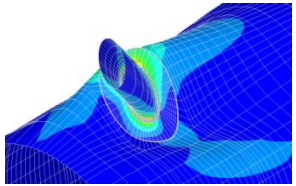


PASS/START-PROF – Analisi termiche e strutturali di condotte

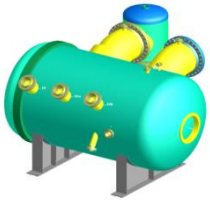


PASS/HYDROSYSTEM – Analisi fluidodinamiche

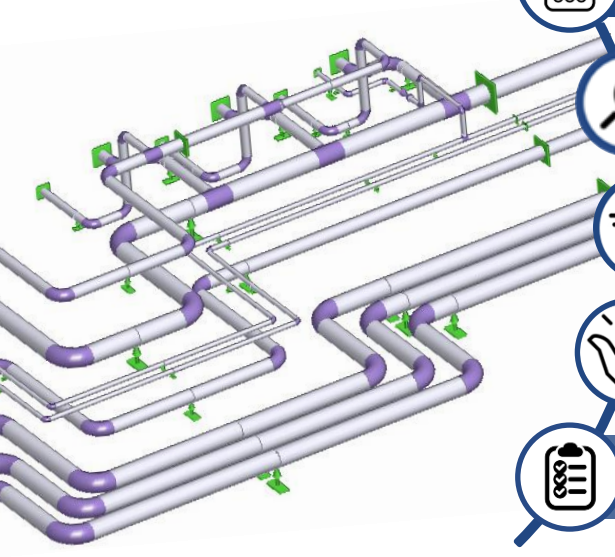
PASS/ NOZZLE-FEM – Analisi FEM bocchelli-serbatoio. Calcolo SIF, k-factors, Nozzle Flexibility and Stress Analysis, etc.



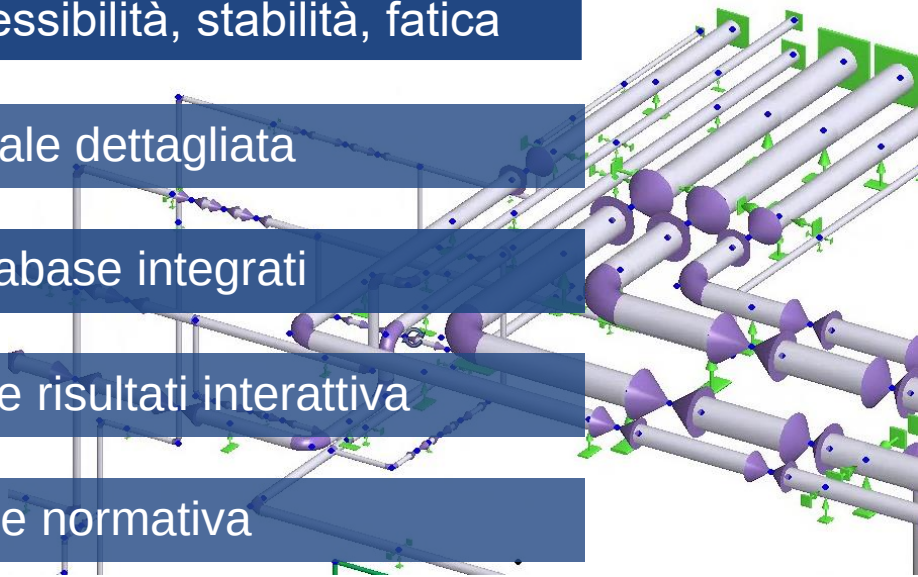
PASS/EQUIP – Calcolo e analisi di serbatoi, cisterne e apparecchiature in pressione



Analisi termo-strutturali di condotte



- Calcolo stress, flessibilità, stabilità, fatica
- Analisi strutturale dettagliata
- Librerie e database integrati
- Visualizzazione risultati interattiva
- Vasta integrazione normativa



Campi applicativi

- Reti di condotte industriali
- Reti per impianti Oil&Gas
- Reti di sottoservizi
  - Riscadamento
  - Gas naturale
  - Acqua
- Reti per generazione energia

PASS
passuite.com

ALCUNI CLIENTI START-PROF

ROSNEFT

TechnipFMC

LUKOIL OIL COMPANY

UNG O'ZLITINEFTGAZ

GAZPROM

Tecnimont

Severstal

GAZPROM NEFT

MITSUBISHI HEAVY INDUSTRIES AMERICA, INC.

中国石油天然气股份有限公司
PetroChina Company Limited

SNC·LAVALIN

TRANSNEFT

WorleyParsons
resources & energy

Northern Reflections
DESIGN AND DRAFTING

NOVATEK

thyssenkrupp

THE LINDE GROUP

Caspian Pipeline Consortium

DAELIM

中国市政工程华北设计研究总院有限公司

CEPDC CHINA POWER ENGINEERING CONSULTING GROUP
NORTHWEST ELECTRIC POWER DESIGN INSTITUTE CO., LTD.

SIBUR

KazTransOil

SEPA MÜHENDİSLİK & MÜŞAVİRLİK
ENGINEERING & CONSULTING

E&R

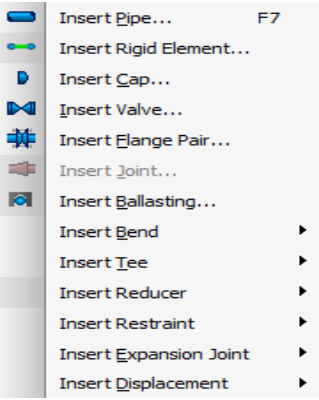
KEPCO

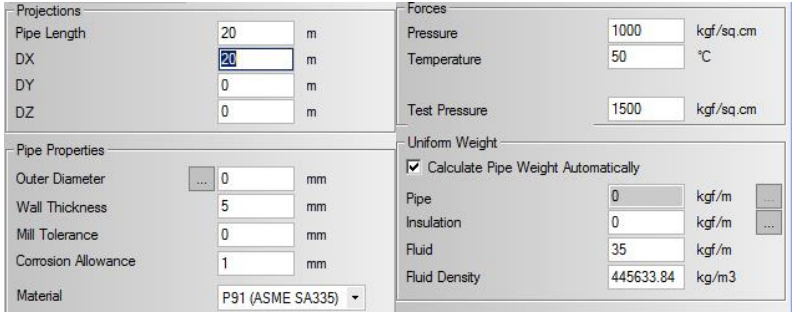
ENGINSOFT

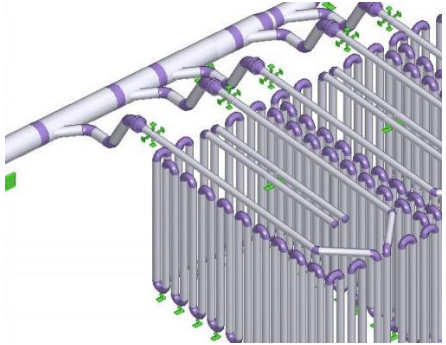
Definizione del modello

- Importazione del modello
- Creazione per elementi in Start-Prof

Importazione in Start-Prof	SmartPlant Isometrics
PASS/Hydrosystem	CADWorx
CAESAR II	Smart 3D
AutoPIPE	SmartPlant 3D
AVEVA PDMS and E3D	PCF format
OpenPlant	Neutral Format
AutoPLANT	PLANT 4D

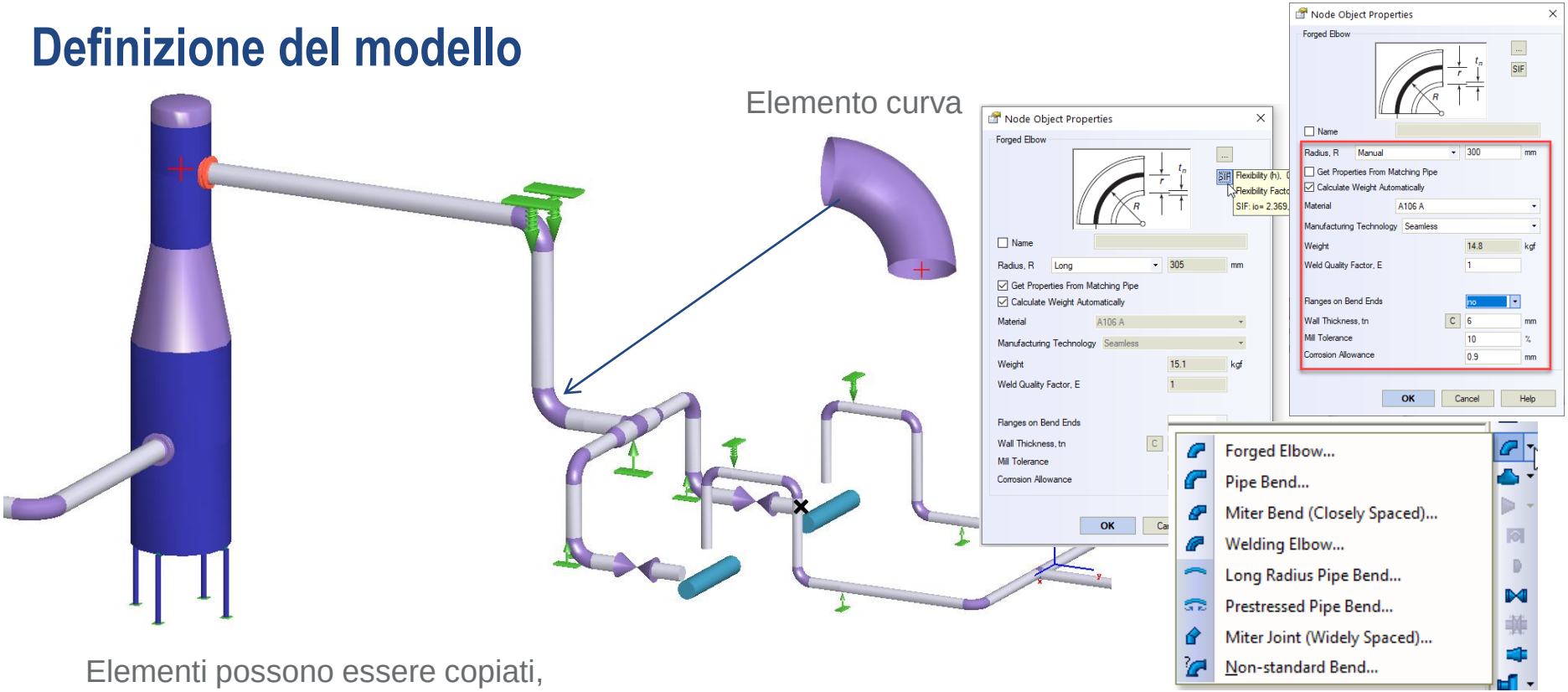






Definizione del modello

Elemento curva



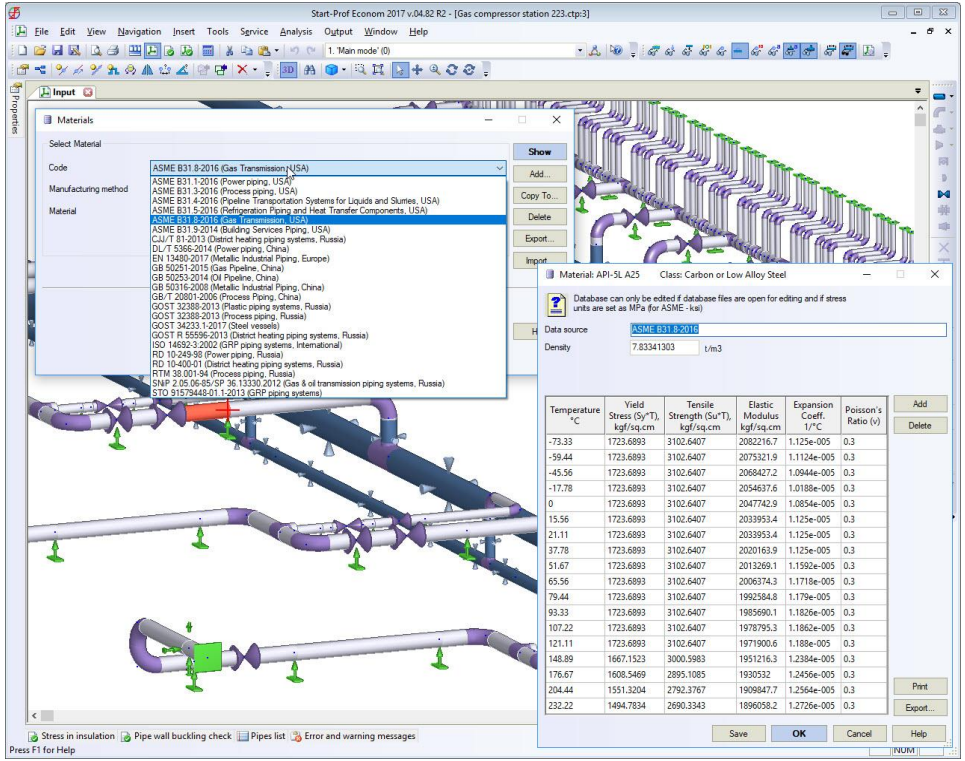
Elementi possono essere copiati, incollati ecc…

Normative integrate

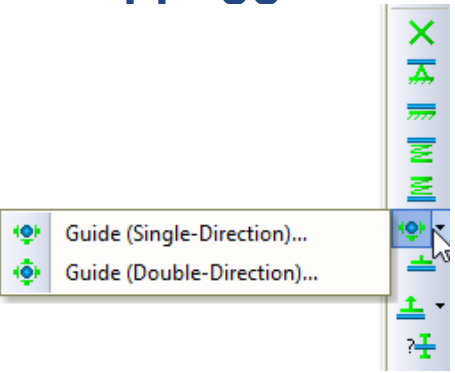
- **Power Piping**
- ASME B31.1-2018 Power piping (USA)
- DLT 5366-2014 Steam/Water Piping in Power Plant (China)
- RD 10-249-98 Steam and hot water piping (Russia)
- **Central Heating**
- CJJ/T 81-2013 Buried hot-water heating pipelines (China)
- GOST R 55596-2013 District Heating Networks (Russia)
- RD 10-400-01 District Heating Networks (Russia)
- **Process Piping**
- ASME B31.3-2018 + Ch. IX Process Piping (USA)
- EN 13480-2017 Metallic Industrial Piping (European Union)
- GB/T 20801-2006 Process Piping (China)
- GB 50316-2008 Metallic Industrial Piping (China)
- GOST 32388-2013 Process Piping (Russia)
- RTM 38.001-94 Process Piping (Russia)
- **Oil & Gas**
- ASME B31.4-2016 + Ch. IX & XI Liquid Transportation (USA)
- ASME B31.8-2018 + Ch. VIII Gas Transmission (USA)
- GB 50251-2015 Gas Pipelines (China)
- GB 50253-2014 Oil Pipelines (China)
- SNiP 2.05.06-85 Gas and Oil Pipelines (Russia)
- SP 36.13330.2012 Gas and Oil Pipelines (Russia)
- **Fiberglass Piping**
- ISO 14692-3:2002/Cor 1:2005 (International)
- Plastic Piping (PE, PE-RT, PP, PB, PVC, PVDF etc.)
- GOST 32388-2013 (Russia)
- **Other Piping**
- **SIF and flexibility factors**
- **Equipment Loads Check**
- **Nozzle Flexibility**
- **Seismic Loads, Wind Loads**
- **Snow Loads, Ice Loads**

Database estesi

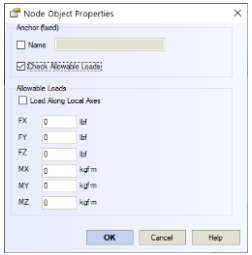
- Materiali
- Suoli (per condotte interrate)
- Giunti di dilatazione
- Isolamenti
- Raccordi a T
- Curve
- Riduttori
- Condotte
- Molle variabili
- Molle a carico costante



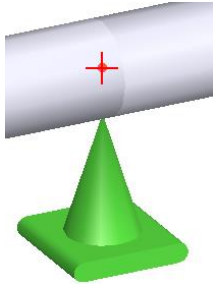
Appoggi

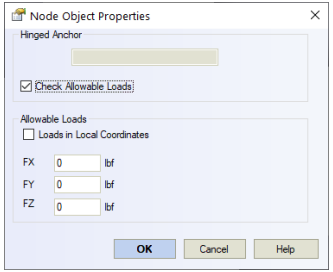


Anchor

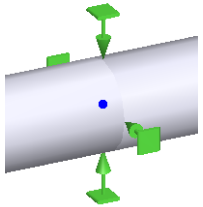


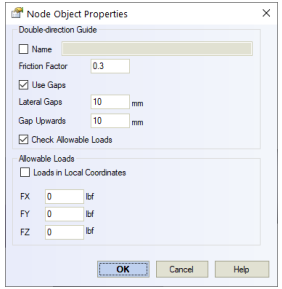
Hinged Anchor



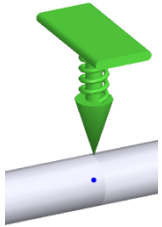


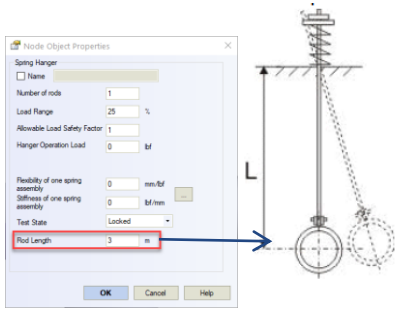
Guide Support



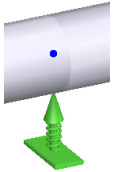


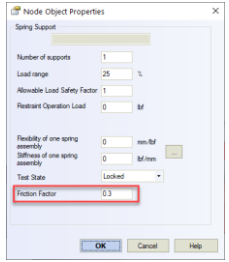
Spring Hanger



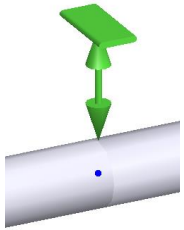


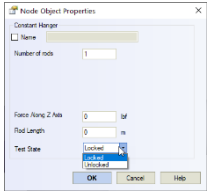
Spring Support



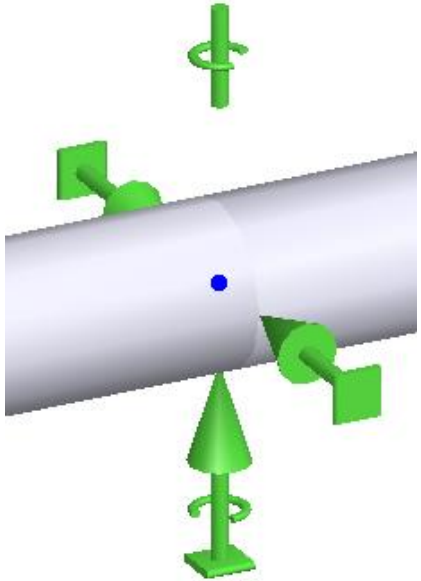


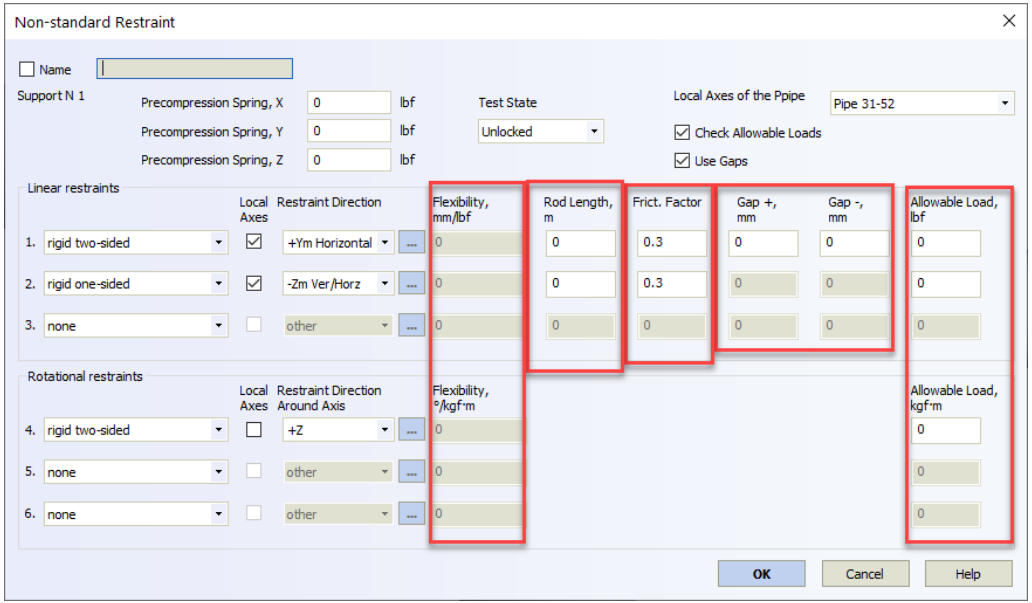
Constant Hanger



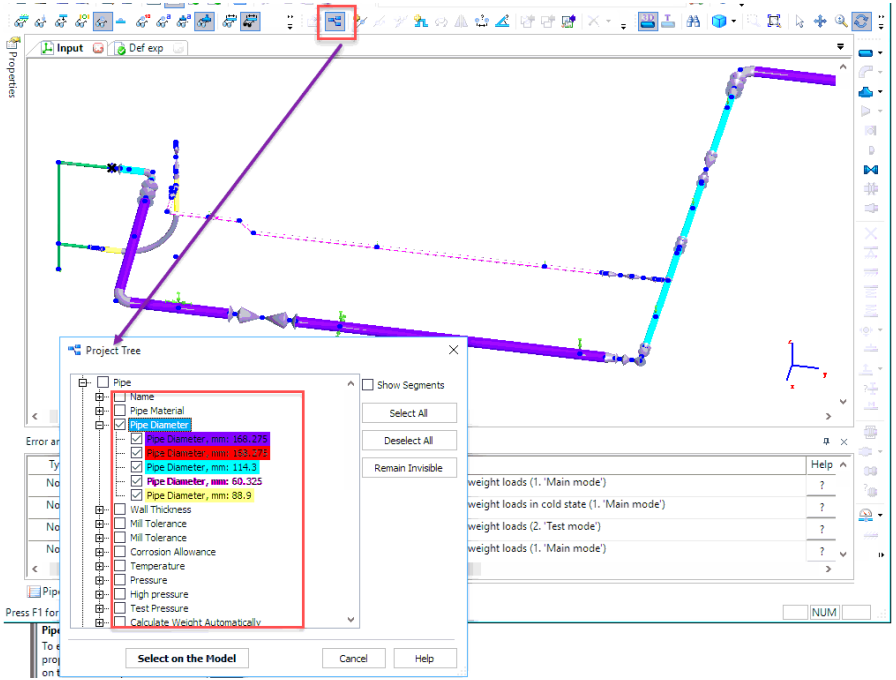


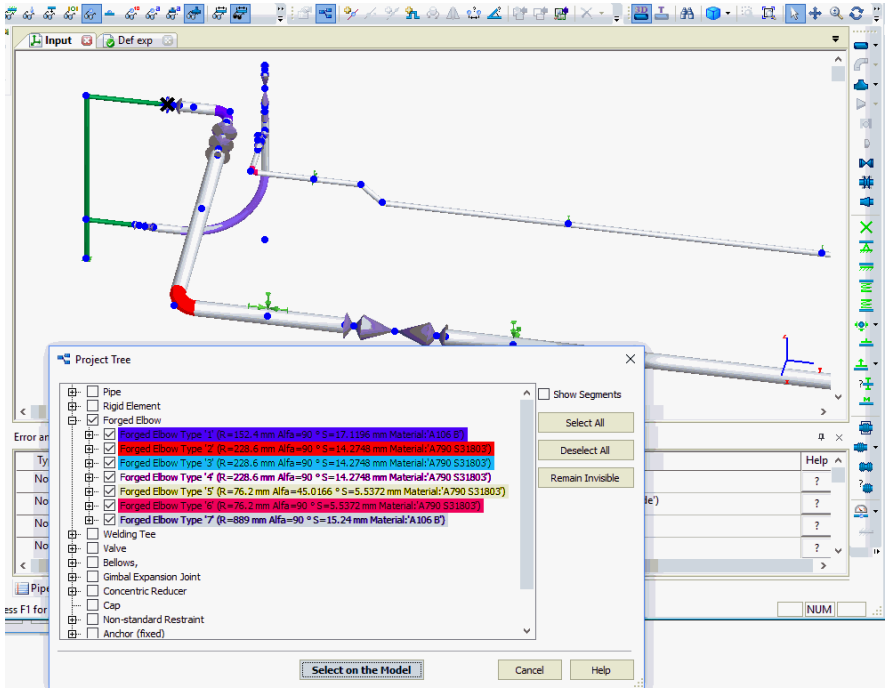
Appoggi, non standard





Classificazione degli elementi





Combinazioni di carico

- Generazione automatica combinazioni
- Creazioni di combinazioni di carico manuali aggiuntive

Smart Operation Mode Editor

*	#	Name	Hanger Sizing	High temperature	Installation State	Seismic	Wind	Snow/Ice	Friction Multiplier	Mode Type	Stress Range Betwee
☑	1	Operation mode	☑	☐	☑	☐	☐	☐	1.00	SUS	1-1A
☑	2	Emegrency	☐	☐	☐	☐	☐	☐	1.00	SUS	2-1A
☑	3	Test mode								Test	

Simplified Load Case Templates. Real load case templates please see in help
Operation Mode #1: Operation mode
L1: W1 Hanger Selection
L2: T1 Hanger Selection
L3: W1+P1+H SUS Stress Check
L4: W1+P1+H Alternative SUS (Using the L3 operating support confuguration) Stress Check
L5: W1+P1+T1+H OPE Support Loads, Displacements etc.
L6: L5-L3(#1) EXP(1-1A) expansion Stress Check

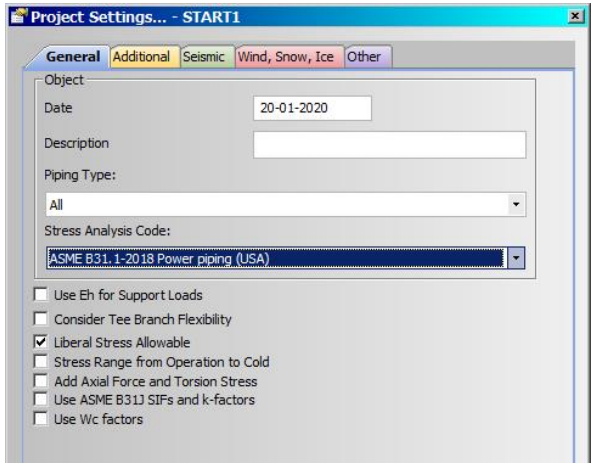
Smart Operation Mode Editor

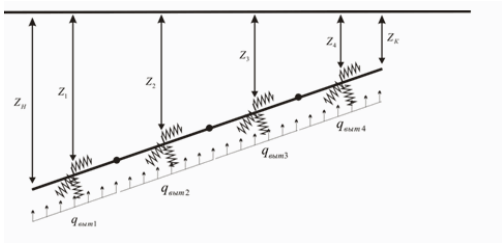
*	#	Name	Hanger Sizing	High temperature	Installation State	Seismic	Wind	Snow/Ice	Friction Multiplier	Mode Type	Stress Range Between	Help
☑	1	Operation mode	☑	☐	☑	☑	☑	☑	1.00	SUS	1-1A	?
☑	2	Emegrency	☐	☐	☐	☐	☑	☐	1.00	SUS	2-1A	?
	2.1	Relief Valve 1	-	-	-	-	-	-	-	SUS		?
☑	3	Test mode								Test		?

Add
Delete
Up
Down

Carichi ed azioni simulati

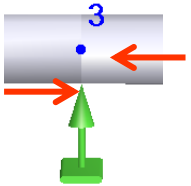
- Gravità
- Sisma
- Condotta interrata
- Vento
- Pressione
- Sottovuoto
- Reazioni dei vincoli
- Neve e ghiaccio
- Azioni non lineari
- Temperatura ambiente
- Carichi esterni aggiuntivi
- Alte temperature
- Colpo d'ariete
- Condotte criogeniche
- Condotta sommersa
- Spostamenti indotti
- Usure localizzate

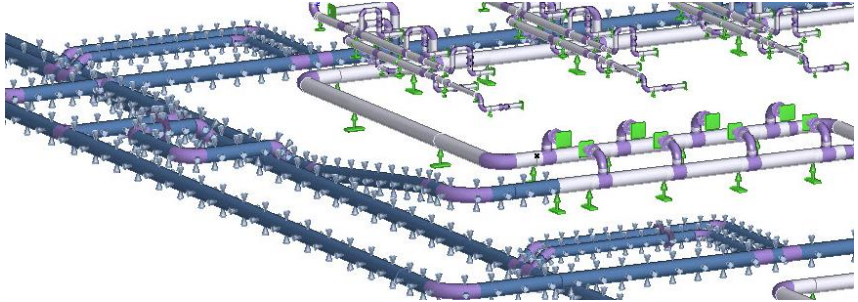


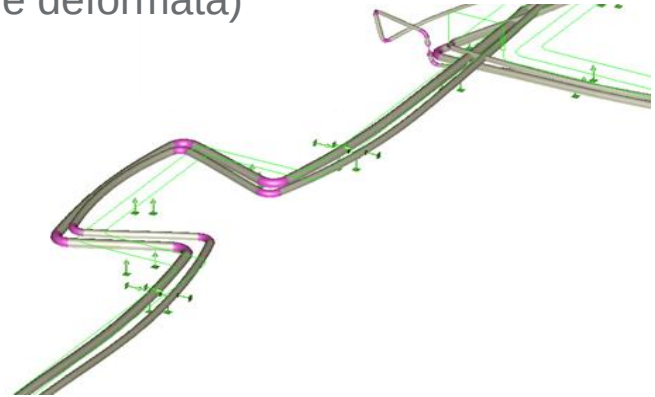


Calcolo sistemi non lineari

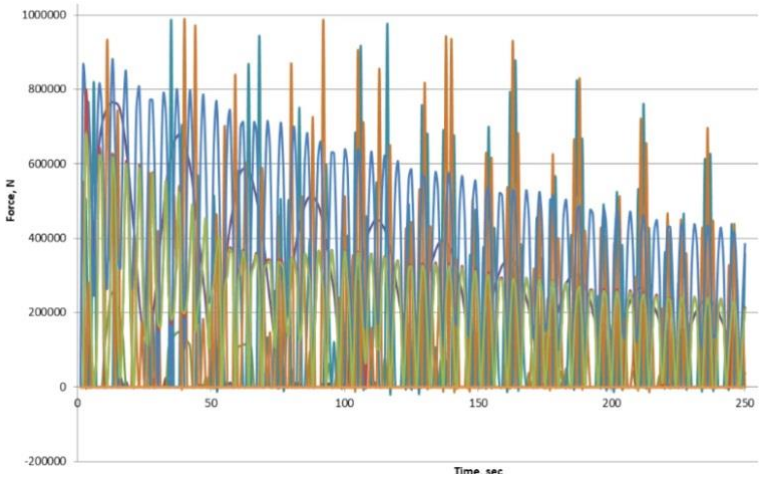
- Attrito nei supporti
- Gaps
- Vincoli monodirezionali
- Selezione automatica degli appoggi con molla
- Effetti del secondo ordine (calcolo nella configurazione deformata)

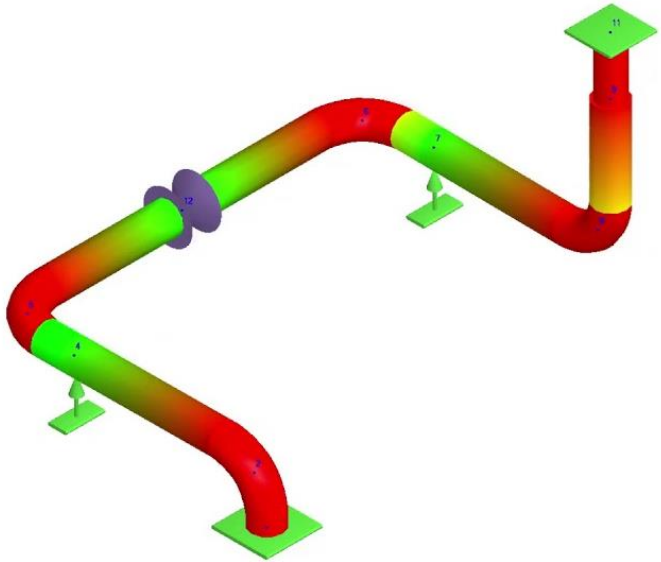




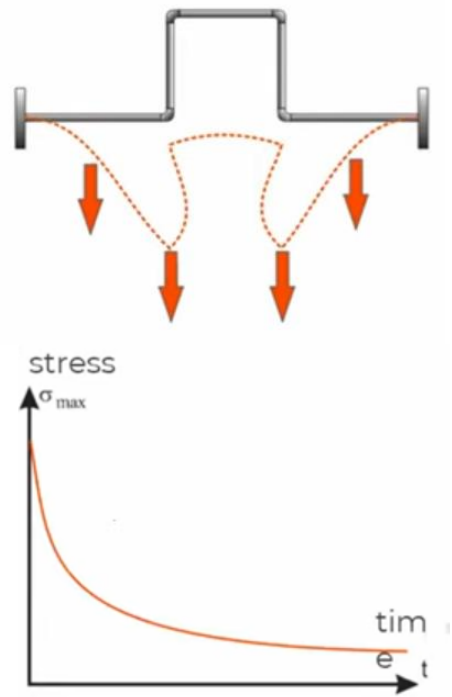


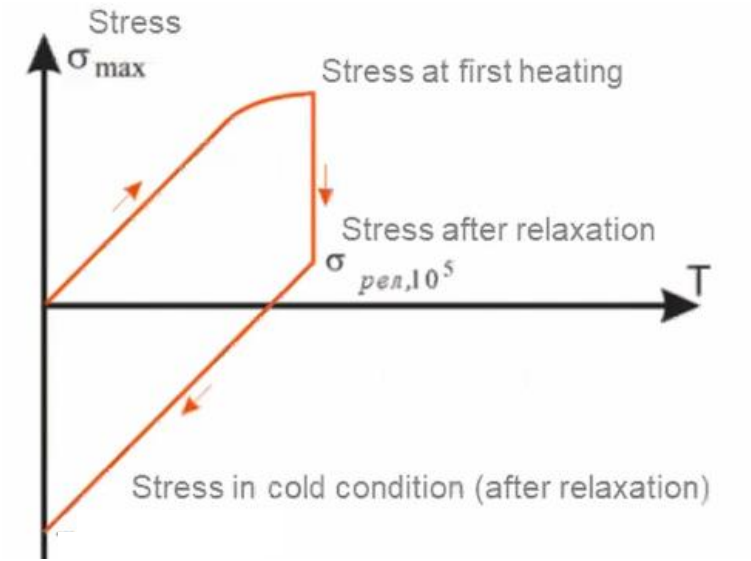
Colpo d'ariete





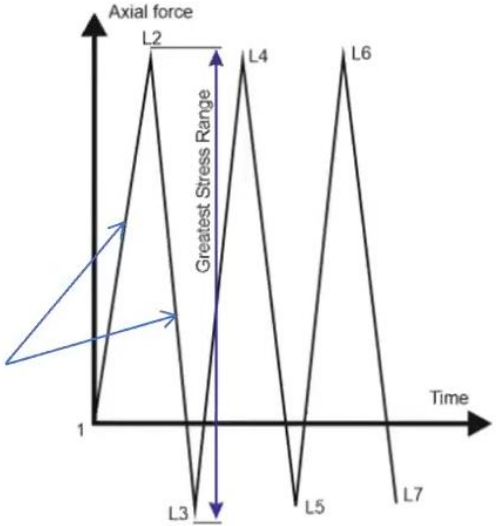
Creep in condotte ad alta temperatura

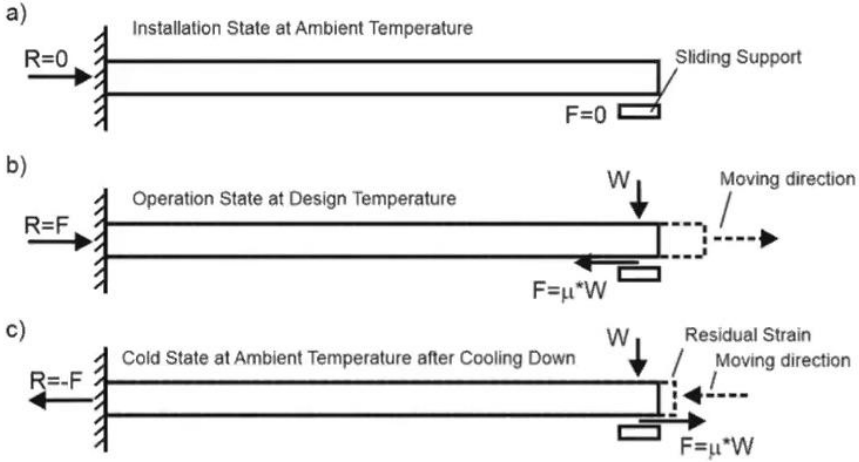




Cicli termici ai vincoli

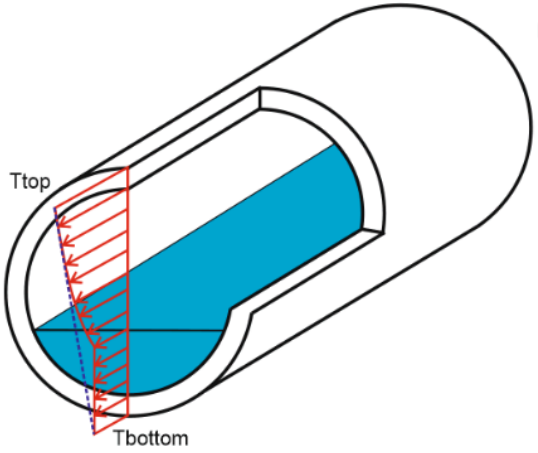
PASS/START-PROF

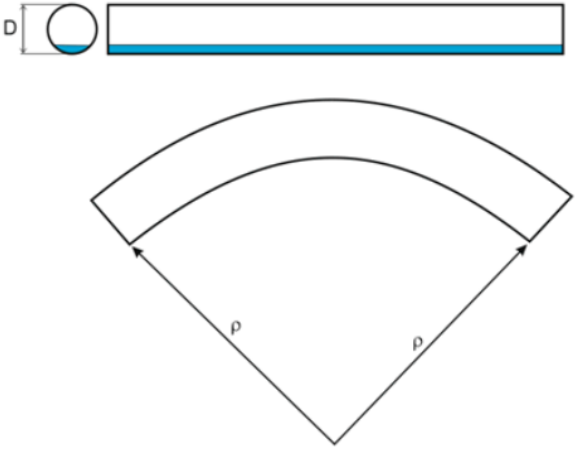




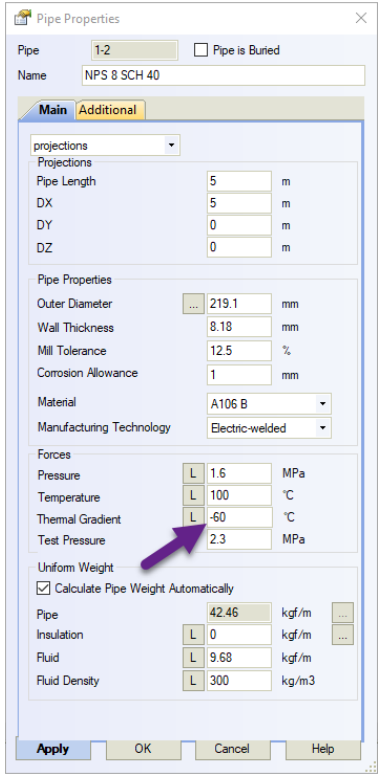
Arco termico

Condotte soggette a elevato grandiente termico sulla sezione





$$\frac{1}{\rho} = \frac{\alpha(T_{top} - T_{botton})}{D}$$

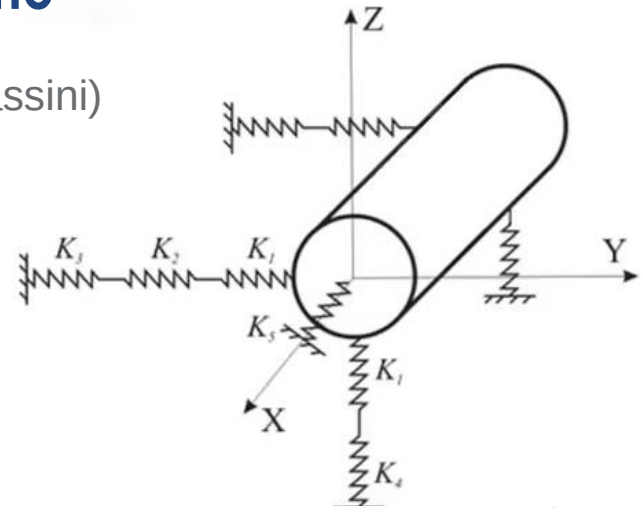


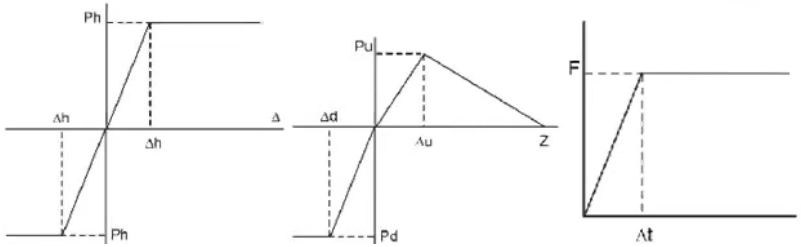
Condotta interrata, modellazione del terreno

Molle orizzontali K_1 (terreno), K_2 (isolamento), K_3 (materassini)

Molle verticali K_1 (terreno), K_4 (isolamento)

Molle longitudinali K_5 (terreno)



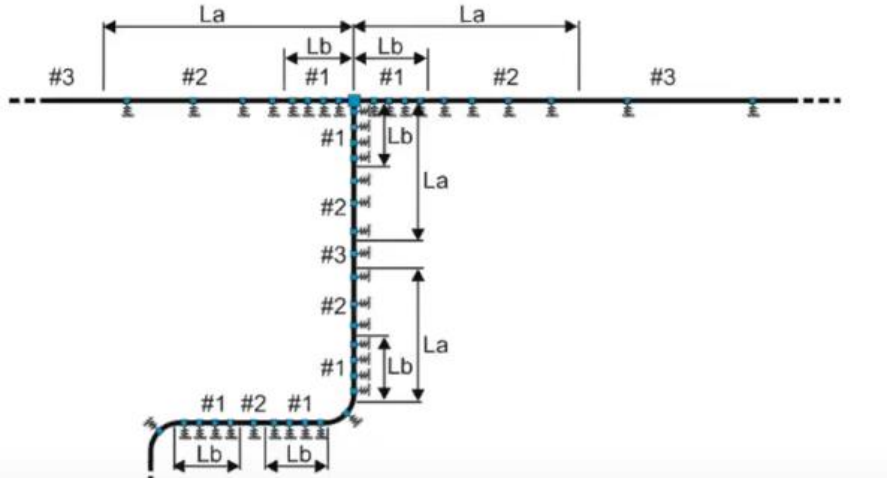


Condotta interrata

Zona #1: flessione laterale della condotta

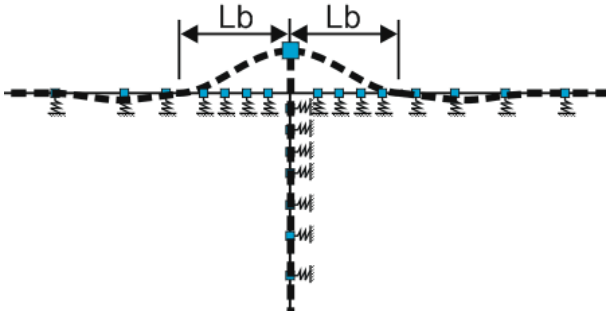
Zona #2: scorrimento assiale

Zona #3: condizioni di vincoli al contorno



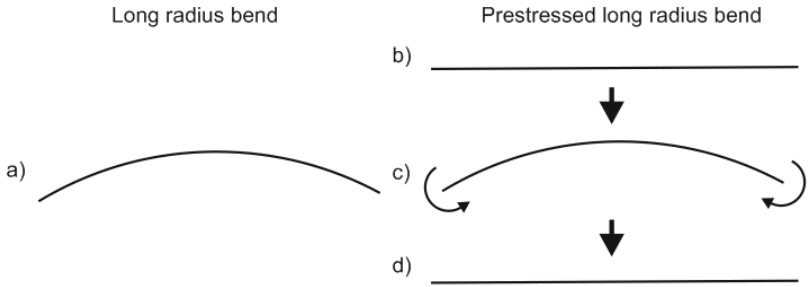
$$L_b = \frac{3\pi}{4}\sqrt[4]{\frac{4EI}{k}}$$

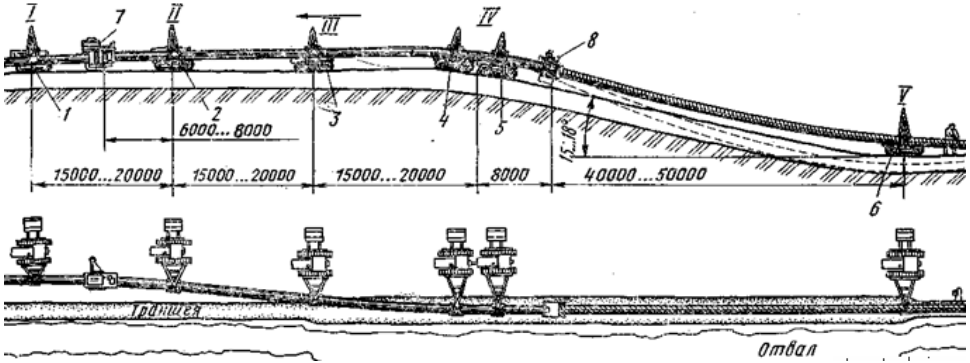
$$L_a = \frac{\alpha \Delta T E A + (0.5 - \nu) S_h A}{q} + 3\sqrt{\frac{EA}{\pi D C_{x0}}}$$



Condotta interrata

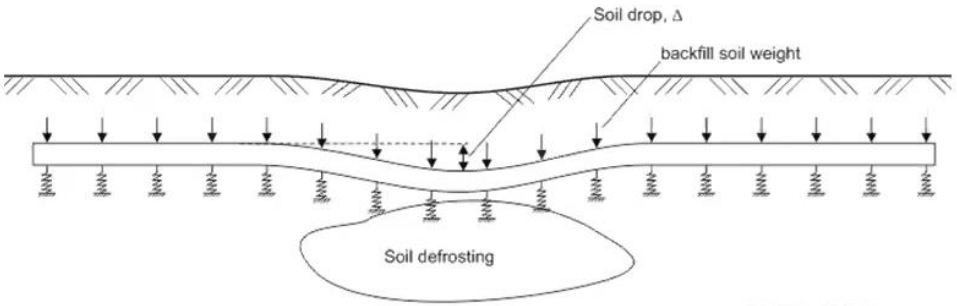
- Curve a lungo raggio
- Curve a raggio elevato con deformazione imposta

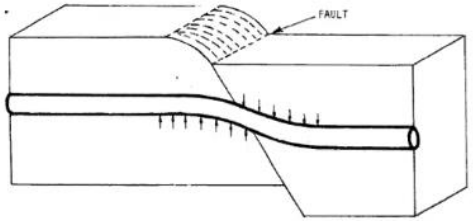




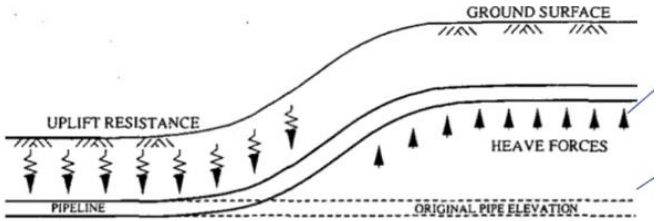
Condotta interrata, modellazione del terreno

Spostamenti imposti: Fenomeni di subsidenza, faglie sismiche, scavi, formazione e scioglimento di ghiaccio ecc..



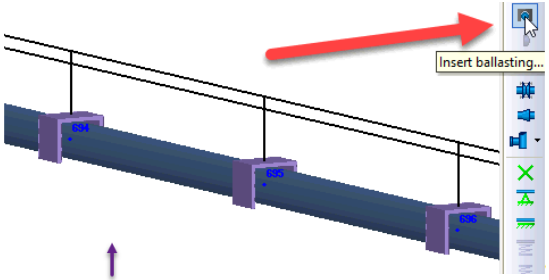


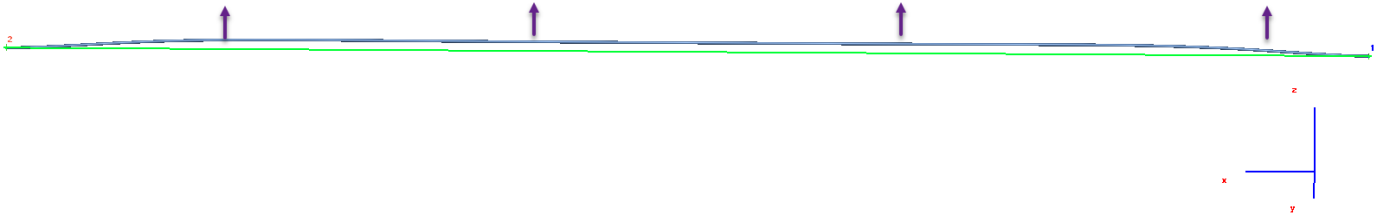
(A) ACTUAL GEOMETRY



Condotta interrata, suolo bagnato

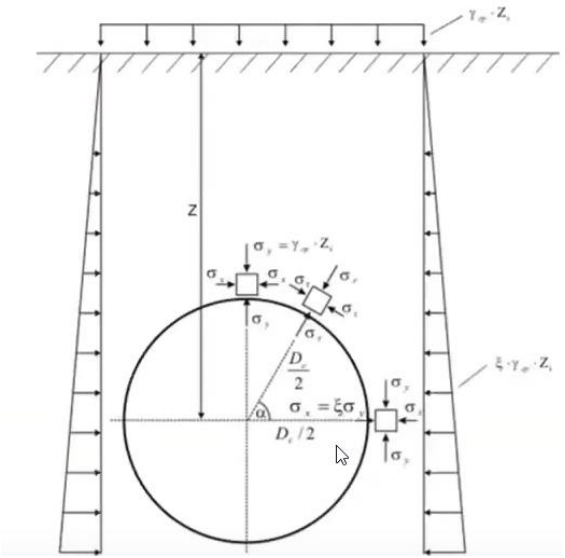
- Molle terreno ogni 5D;
- Peso della condotta, isolamento e apparecchiature non trascurati;
- Pesi di zavorra;
- Galleggiamento;
- Liquefazione del terreno

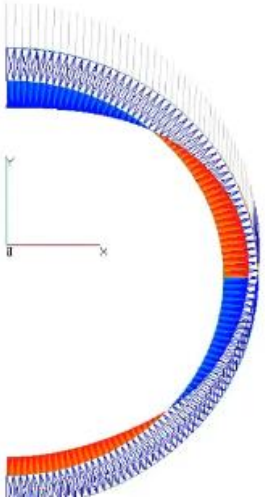


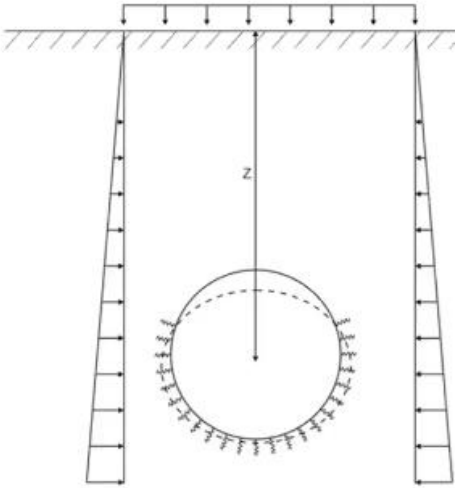


Condotta interrata, interazione piana

Lo stato di stress piano sulla sezione della condotta è calcolato con metodo FEM



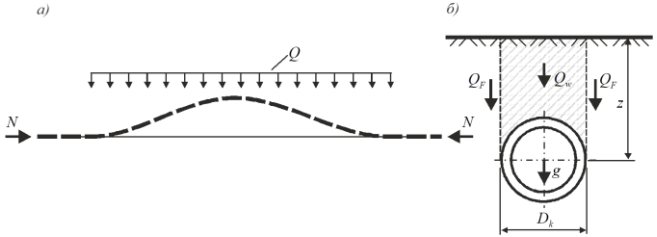




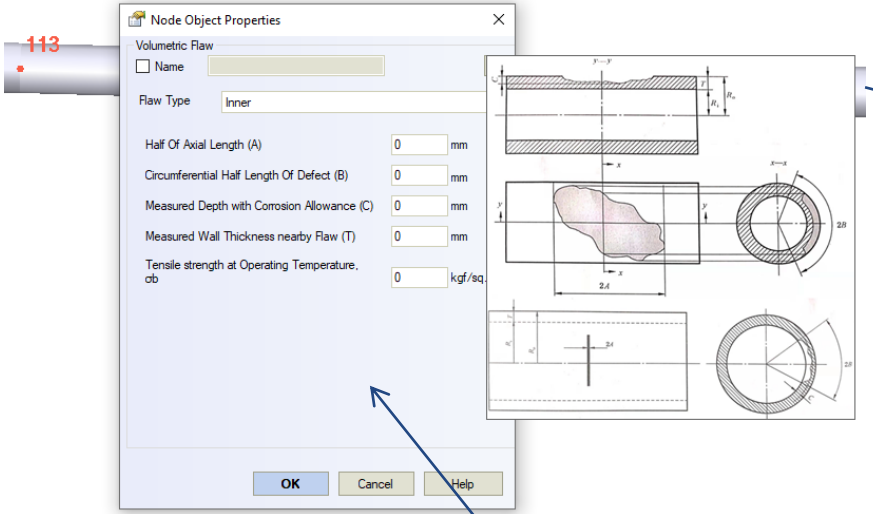
Buckling

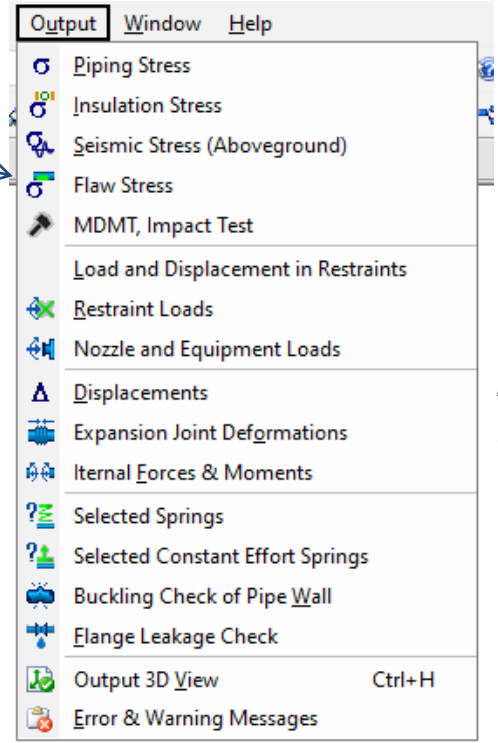
Buckling in accordo a ASME B31.8-2018, EN 13941-2019 7.2.4.2 e GOST 32388

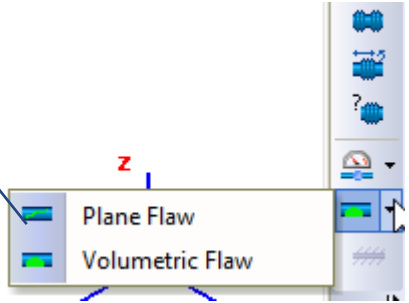
Upheaval buckling, instabilità laterale, instabilità locale, ecc…

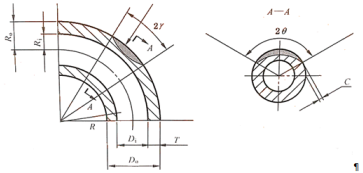


Imperfezioni locali









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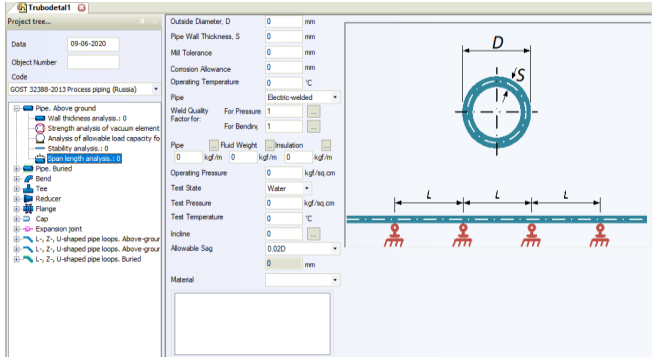
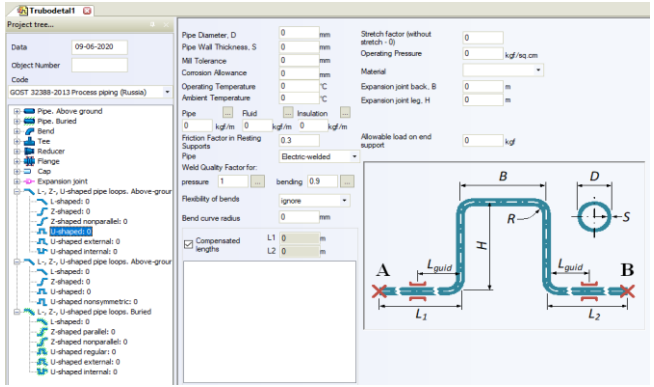
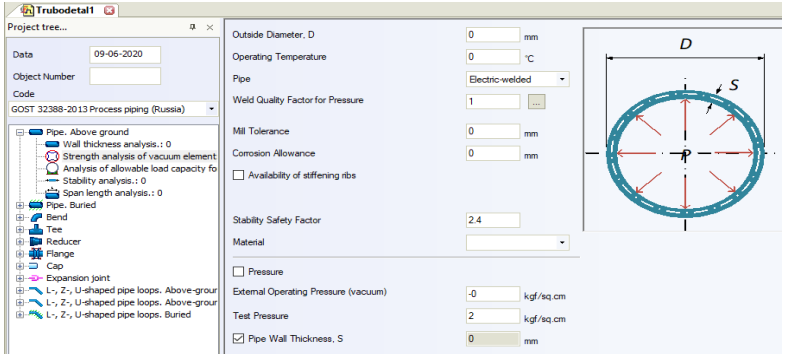
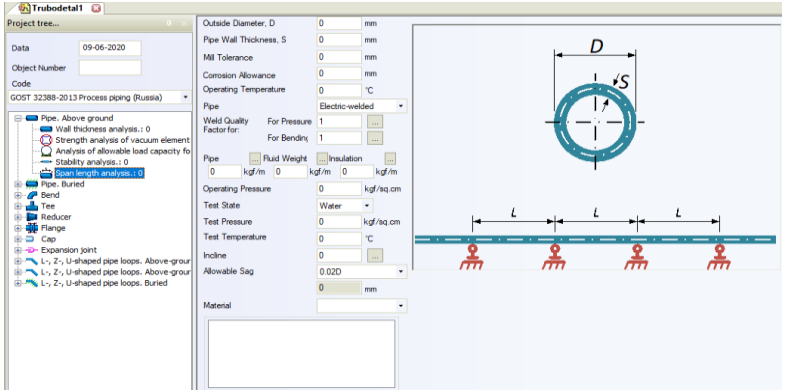
Strumenti calcolo automatico









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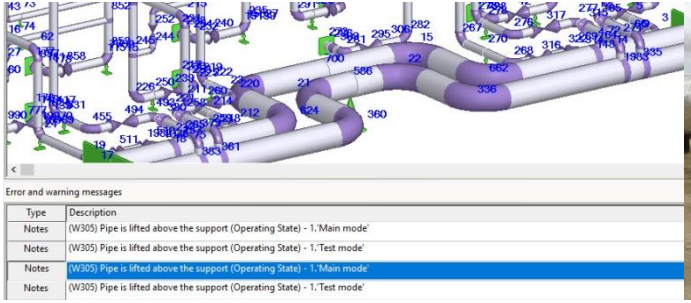
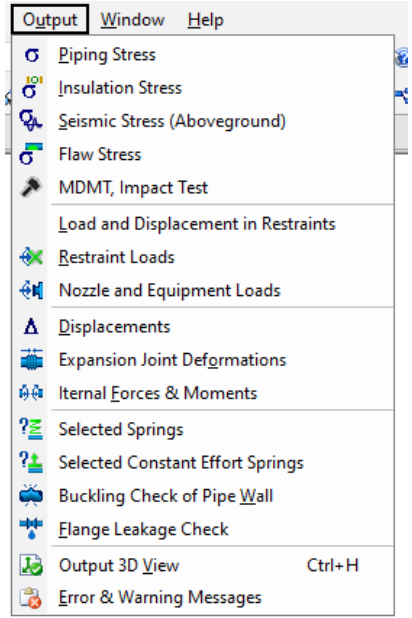
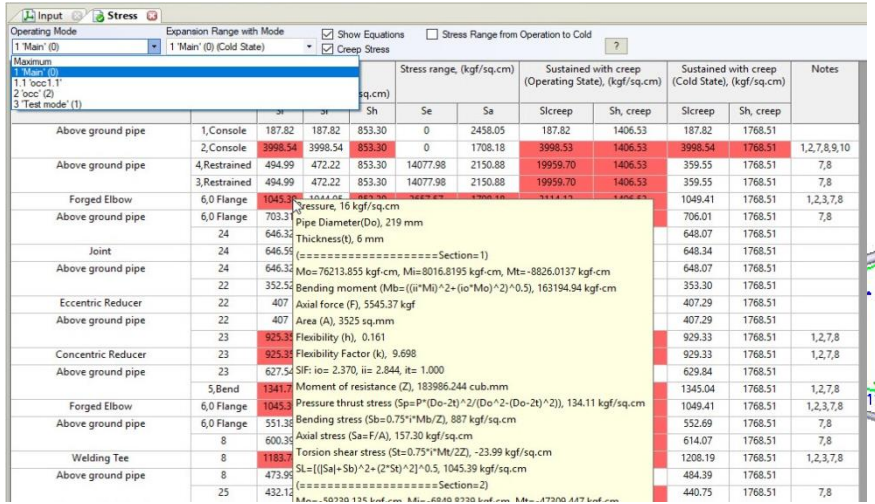
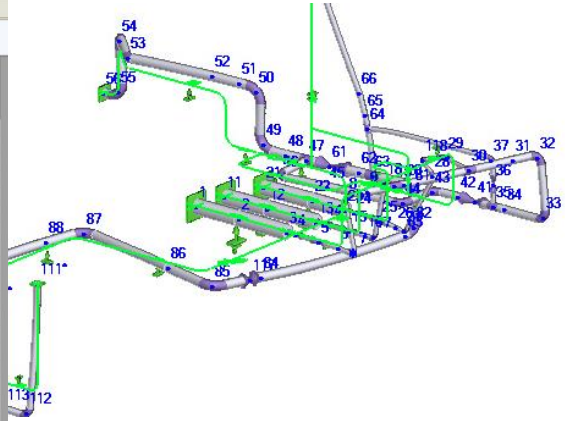
Analisi dei risultati

- Messaggi di warning
- Visualizzazione interattiva dei risultati









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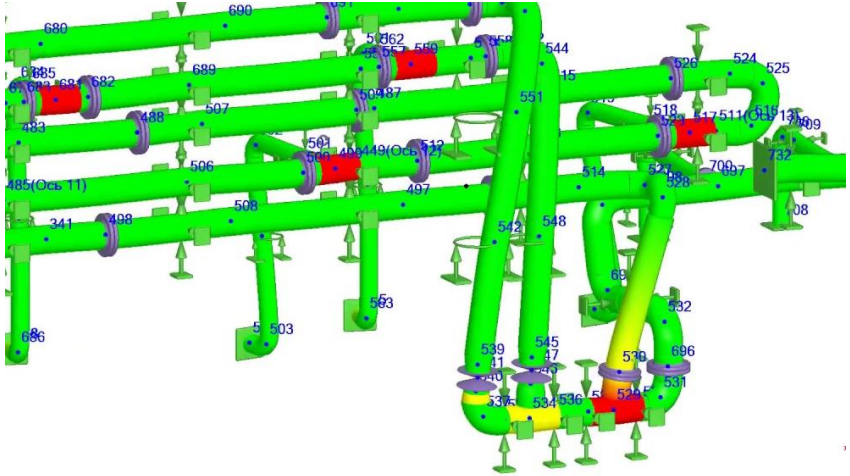
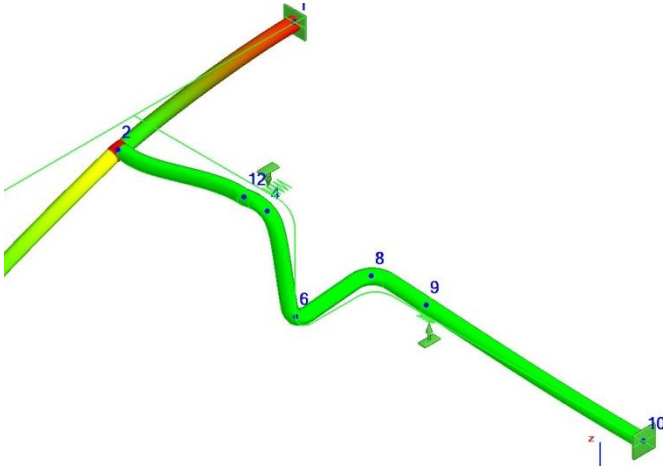
Analisi dei risultati ed esportazione

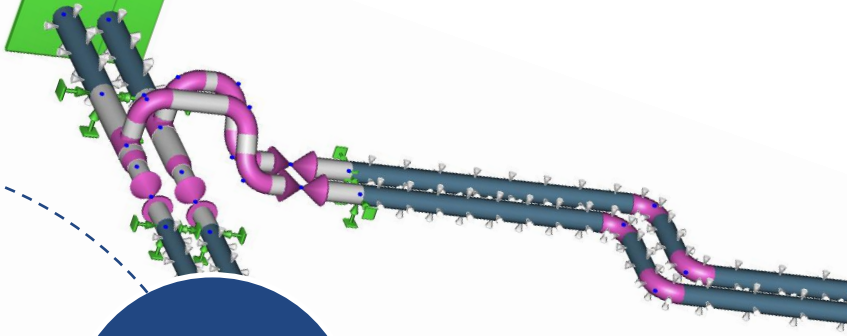
- Risultati visualizzabili sul modello
- Esportazione del modello

Esportazione con Start-Prof	
PASS/Hydrosystem	AVEVA PDMS and E3D
AutoCAD	Neutral Format





Vantaggi di Start-Prof

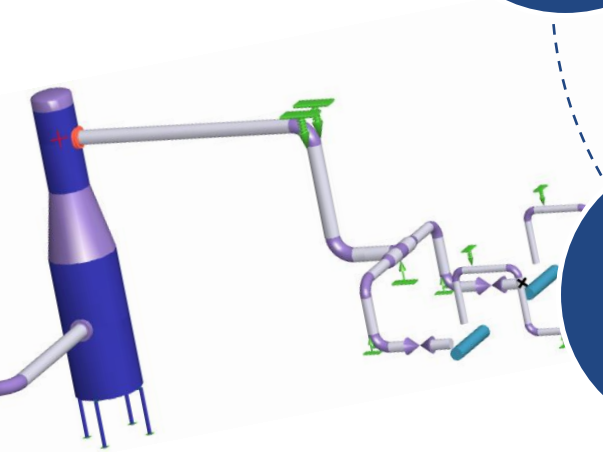


FACILE E VELOCE

PREZZO CONVENIENTE

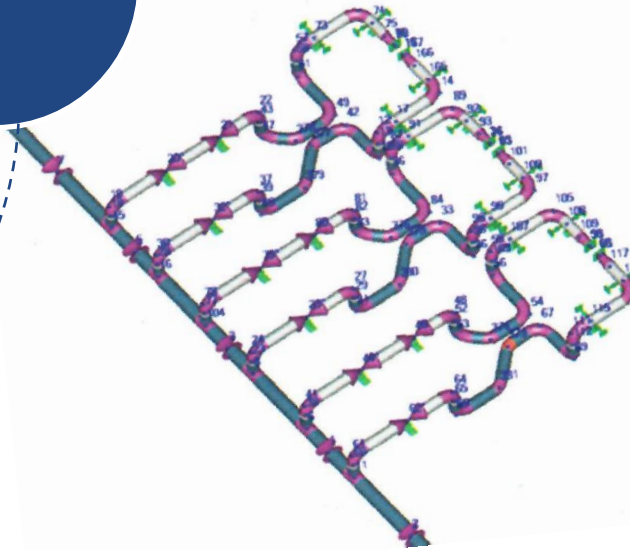
VERSATILITÀ

PASS START-PROF



LICENZA FLESSIBILE

NORME RUSSE E CINESI



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Informazioni utili

- Versione di prova scaricabile dal sito: www.passuite.com

- Videolezioni dei software al link: www.youtube.com/passuite

- ANDREA SILVESTRI e-mail: a.silvestri@enginsoft.com

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Thank you!

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