DIPARTIMENTO DI INGEGNERIA INDUSTRIALE

1222·2022 800 ANNI

Università degli Studi di Padova – Dipartimento di Ingegneria Industriale

Corso di Laurea in Ingegneria Meccanica

Relazione per la prova finale

Analisi agli elementi finiti di un albero per riduttore mediante Solidworks Simulation

Tutor universitario : *Prof. Campagnolo Alberto*

Laureando*: Chiandotto Stefano*

Padova, 14/07/2022

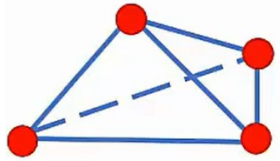
Obbiettivi:

- Mostrare l'implementazione del metodo dell'analisi agli elementi finiti attraverso il software SolidWorks
- Valutare il metodo FEM attraverso dei casi studio e confrontando i risultati ottenuti con risultati derivanti da metodi grafici o analitici basati su prove sperimentali

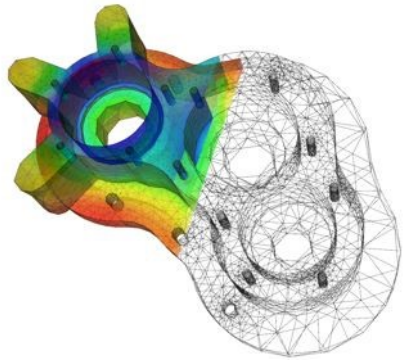
Analisi agli elementi finiti

FEM: Tecnica dell'analisi numerica che discretizza i vari modelli in domini piccoli a piacimento e ne risolve le equazioni.

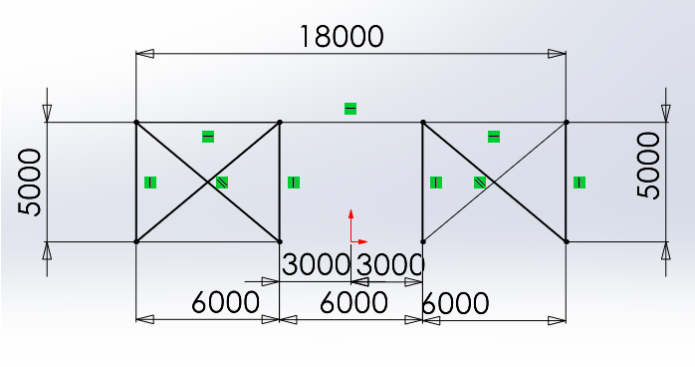
Elementi



Mesh

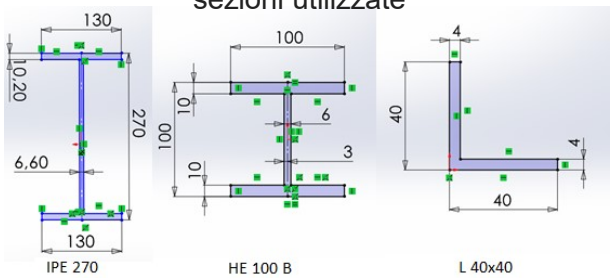


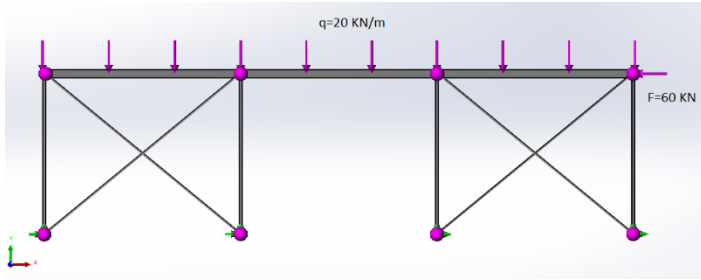
ANALISI STATICA DI UN TELAIO PIANO



Materiale: S 275 (Fe430)

sezioni utilizzate

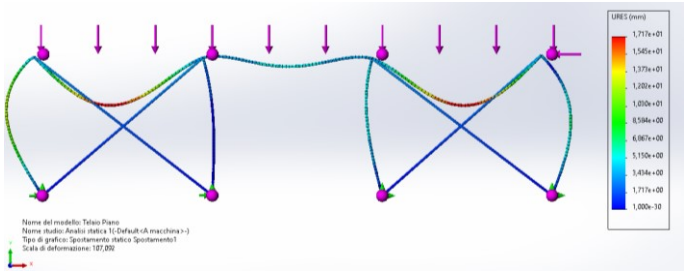




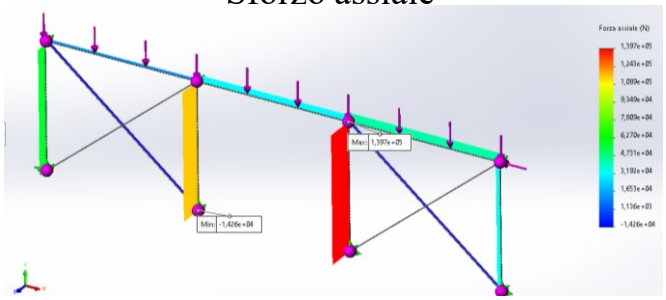
CARICHI APPLICATI:
Carico distribuito di 20KN/m
Carico concentrato di 60KN

VINCOLI:
Vincolo fisso alla base
Vincolo lungo l'asse z sui nodi delle travi orizzontali

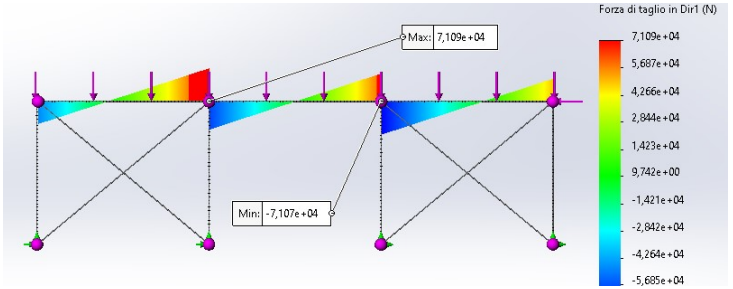
Deformata

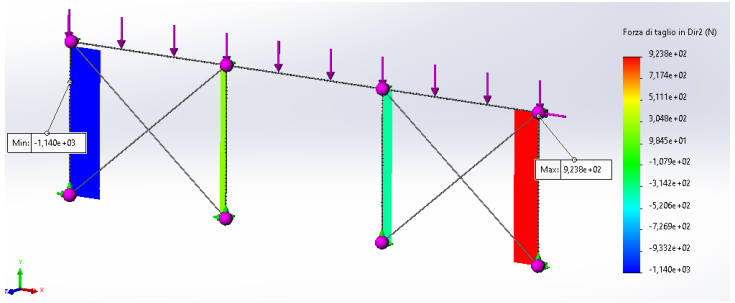


Sforzo assiale

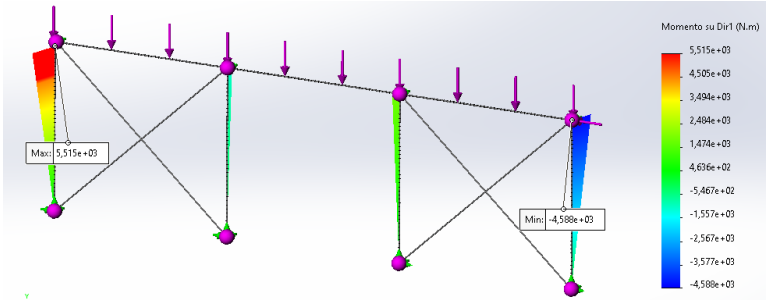


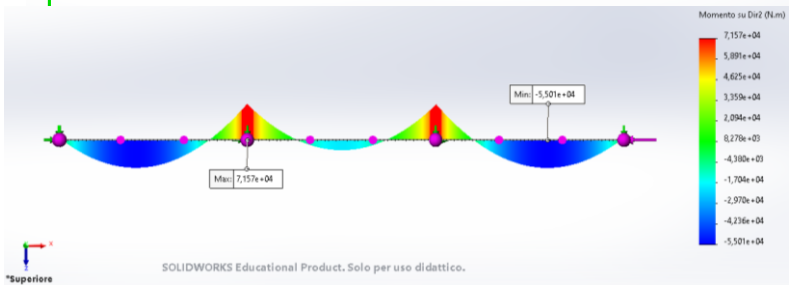
Grafici del taglio





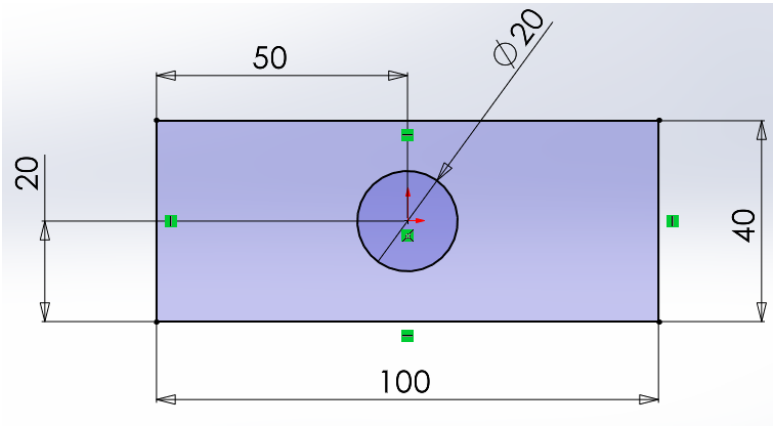
Grafici del momento flettente



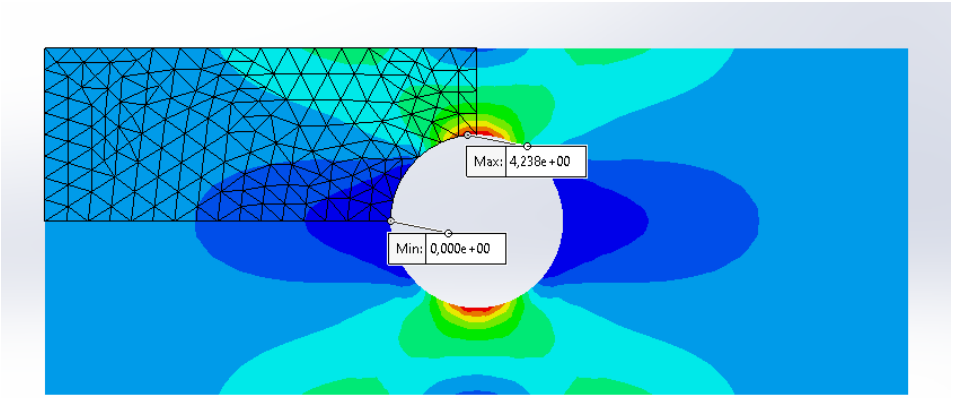


ANALISI STATICA DI UNA PIASTRA FORATA SOLLECITATA A TRAZIONE

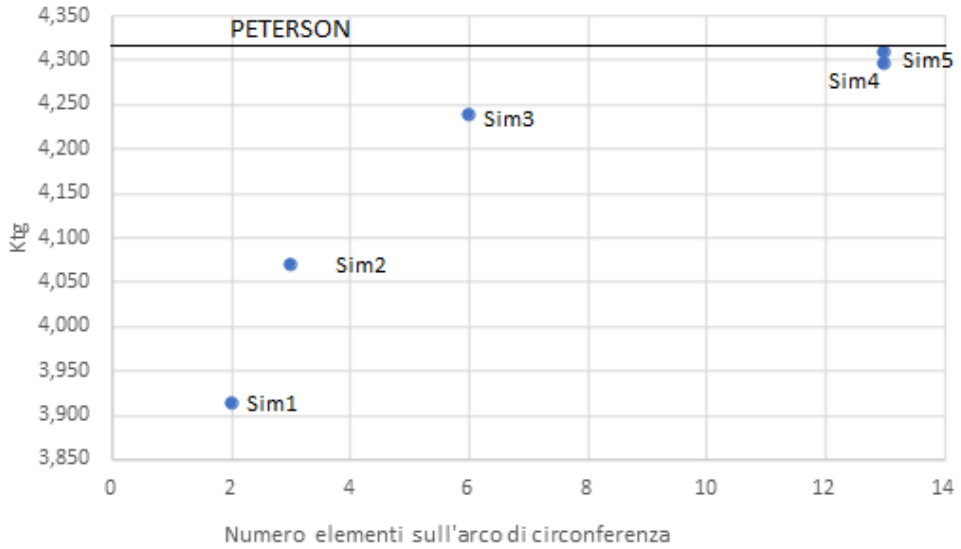
Modello



Simulazione

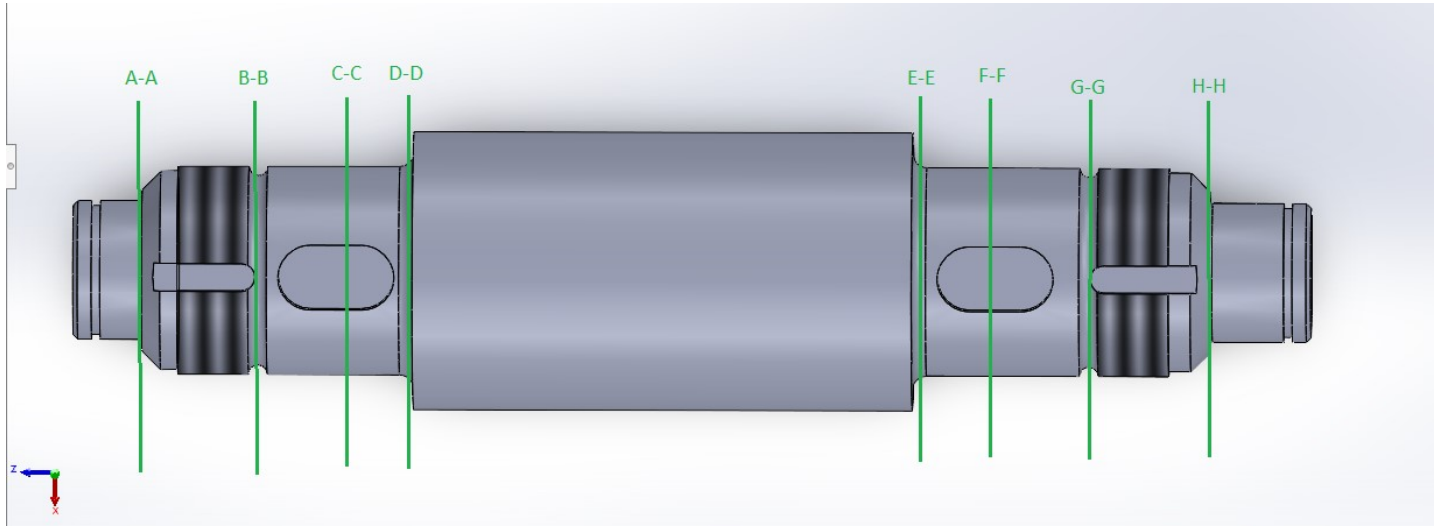


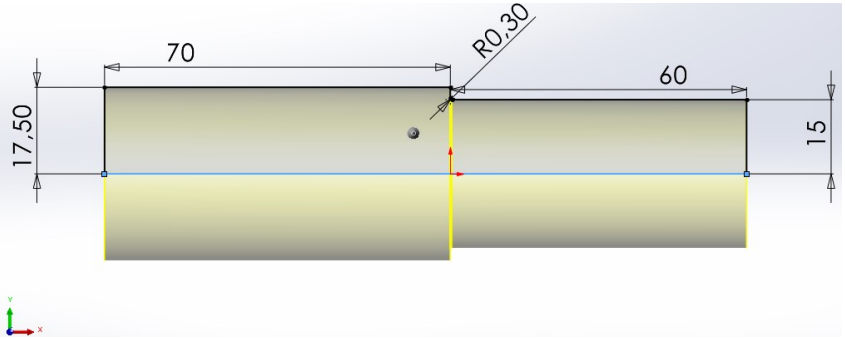
Materiale: S235 (ex-Fe360)



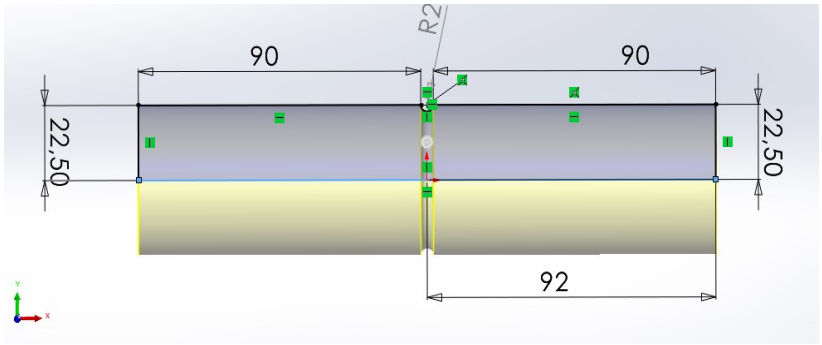
	Ktg	n elem	Dev %
simulazione 1	3,914	2	9,27
simulazione 2	4,071	3	5,63
simulazione 3	4,238	6	1,76
simulazione 4	4,296	13	0,41
simulazione 5	4,310	13	0,092
peterson	4,314		

ANALISI DELL'INDICE KT DI UN ALBERO INTERMEDIO DI UN RIDUTTORE

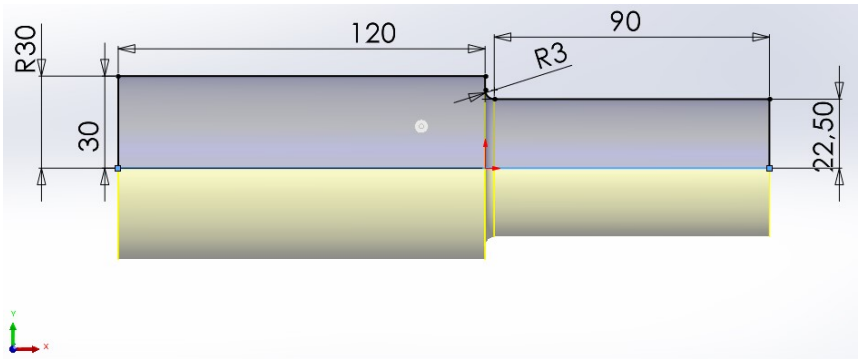




Sez A-A



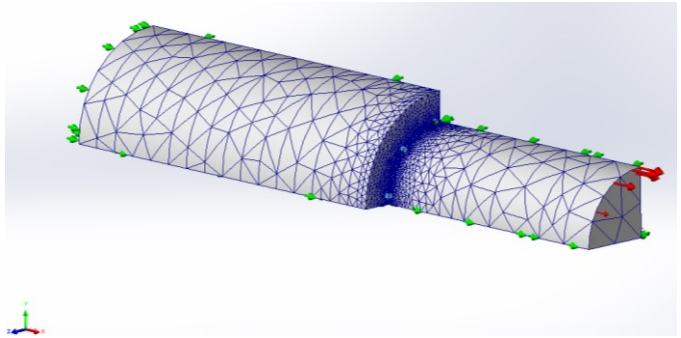
Sez B-B

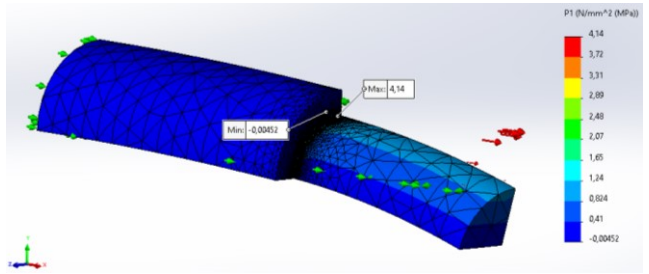


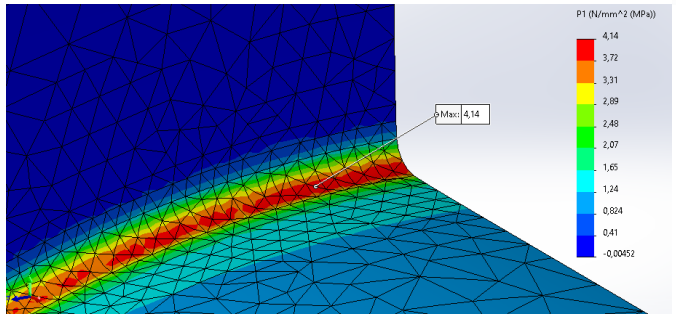
Sez D-D

ANALISI FEM PER IL CALCOLO DEL KT

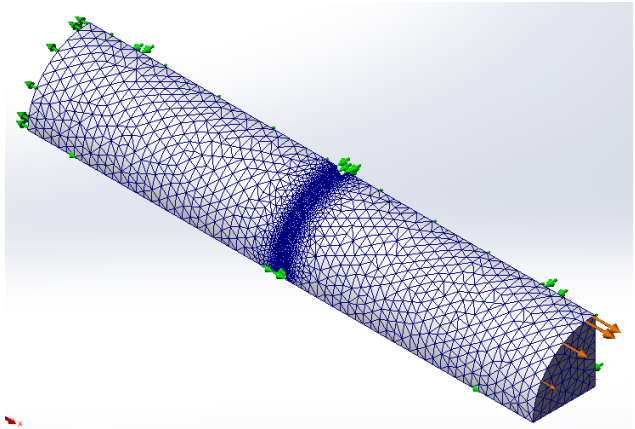
Spallamento cuscinetto sinistro

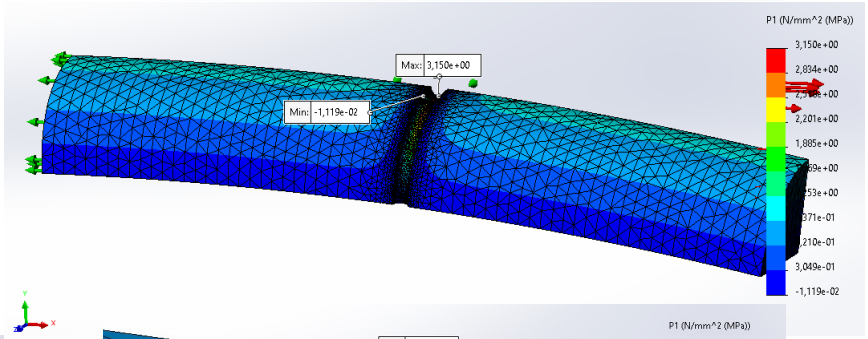


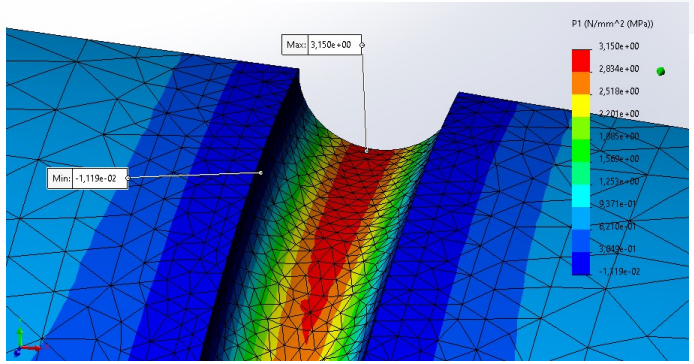




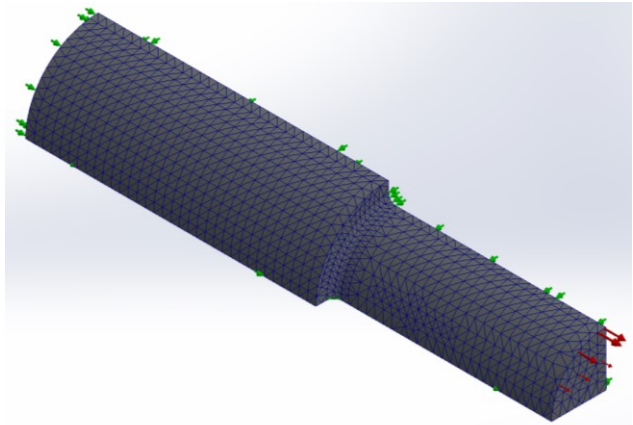
Gola di scarico

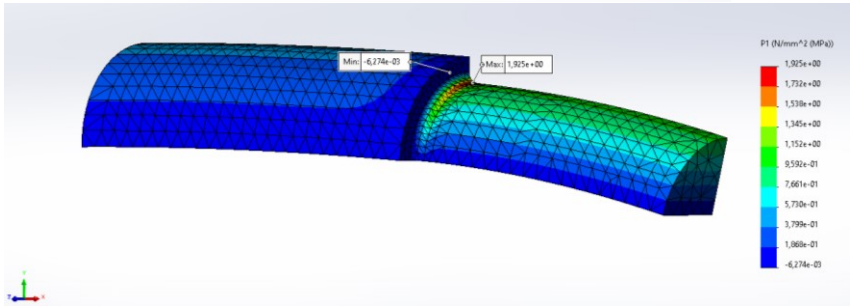


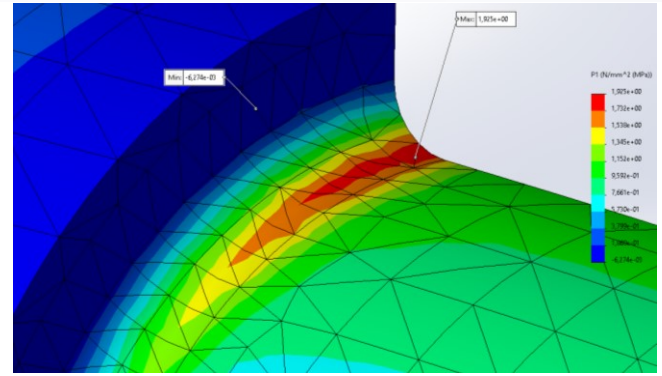




Spallamento ruota dentata



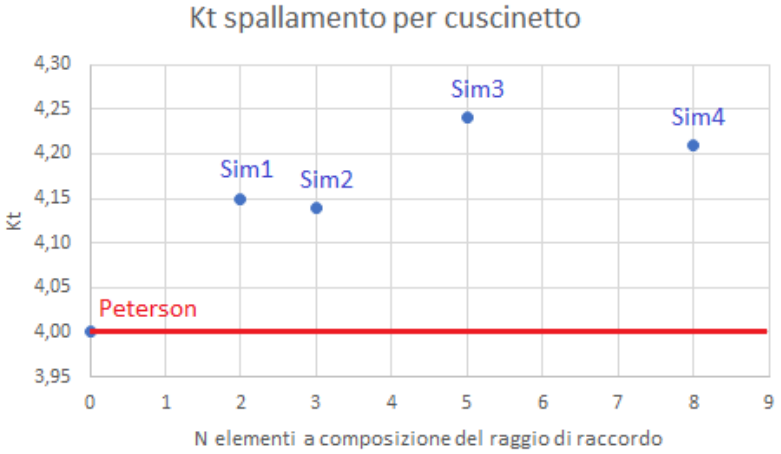




RISULTATI E CONFRONTO CON PETERSON

Spallamento cuscinetto sinistro

	Kt	n elem	Dev%
sim1	4,150	2,000	3,75
sim2	4,140	3,000	3,5
sim3	4,240	5,000	6
sim4	4,210	8,000	5,25
pet	4,000	-	-

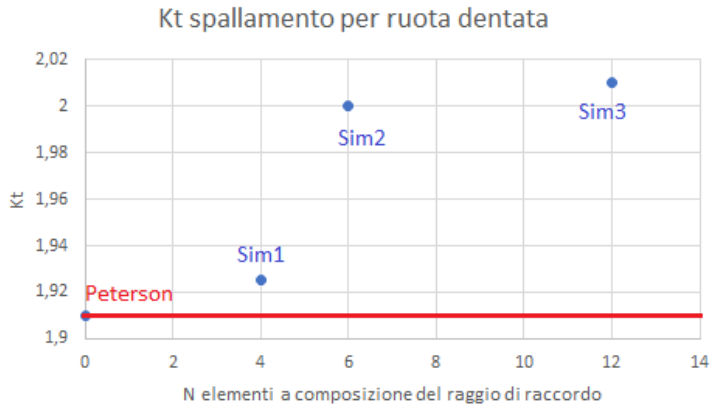


Gola di scarico

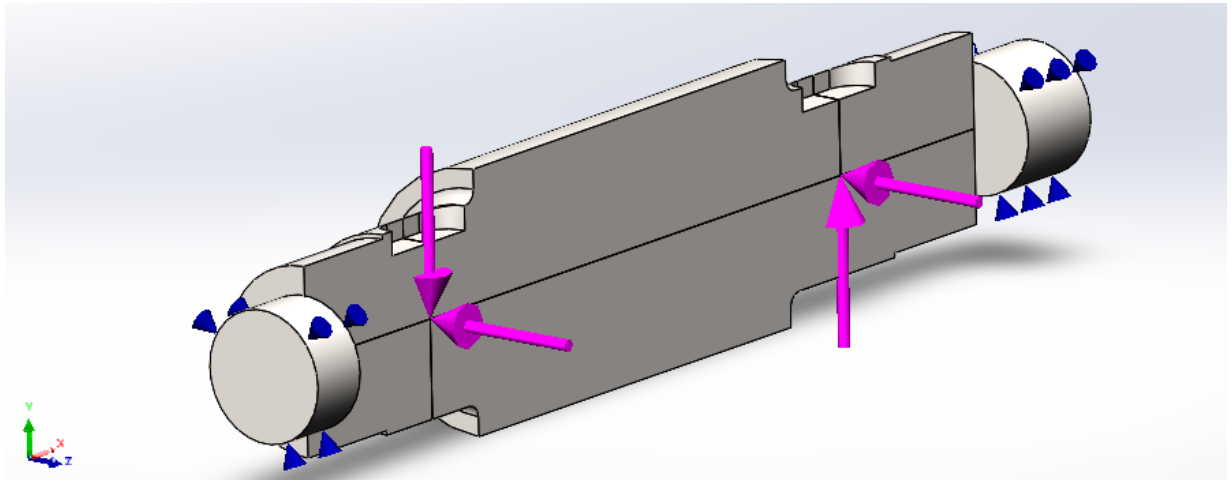
	Kt grez	Kt net	n elem	Dev% net
sim1	3,223	2,437667	8,000	0,503398
sim2	3,150	2,382454	15,000	2,756966
sim3	3,142	2,376404	30,000	3,003933
Pet		2,450		

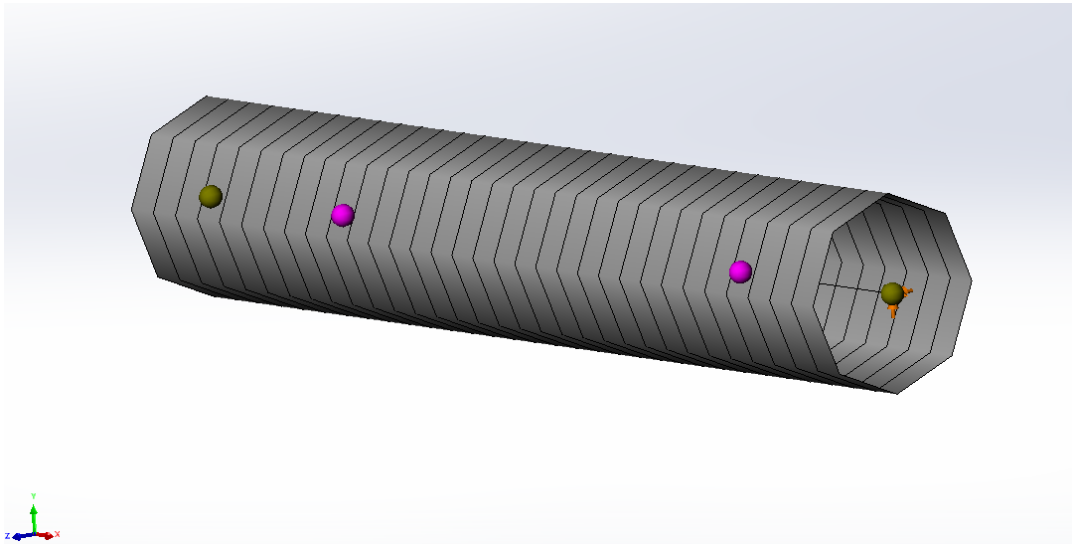
Spallamento ruota dentata

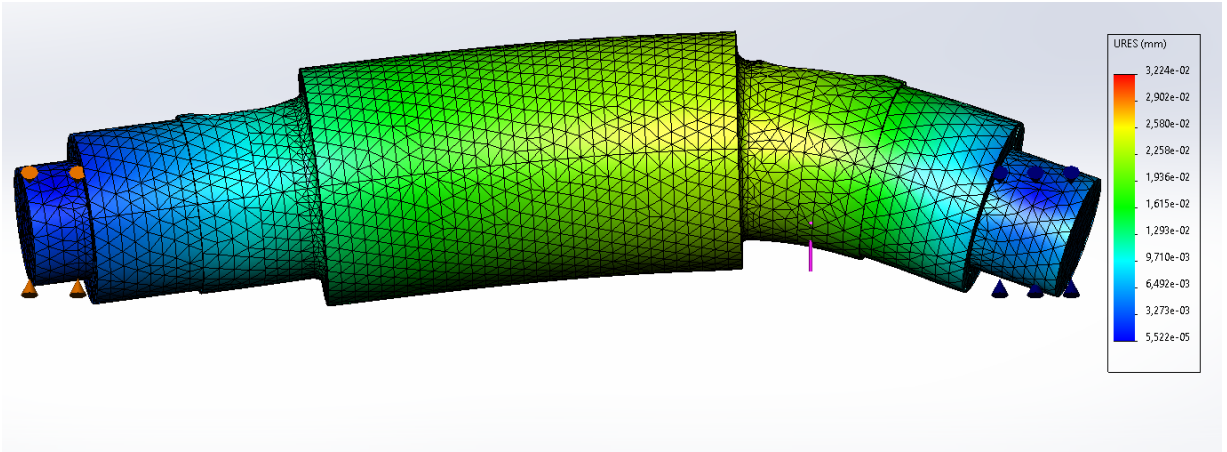
	Kt	n elem	Dev%
sim1	1,925	4,000	0,78534
sim2	2,000	6,000	4,712042
sim3	2,010	12,000	5,235602
pet	1,910	0,000	

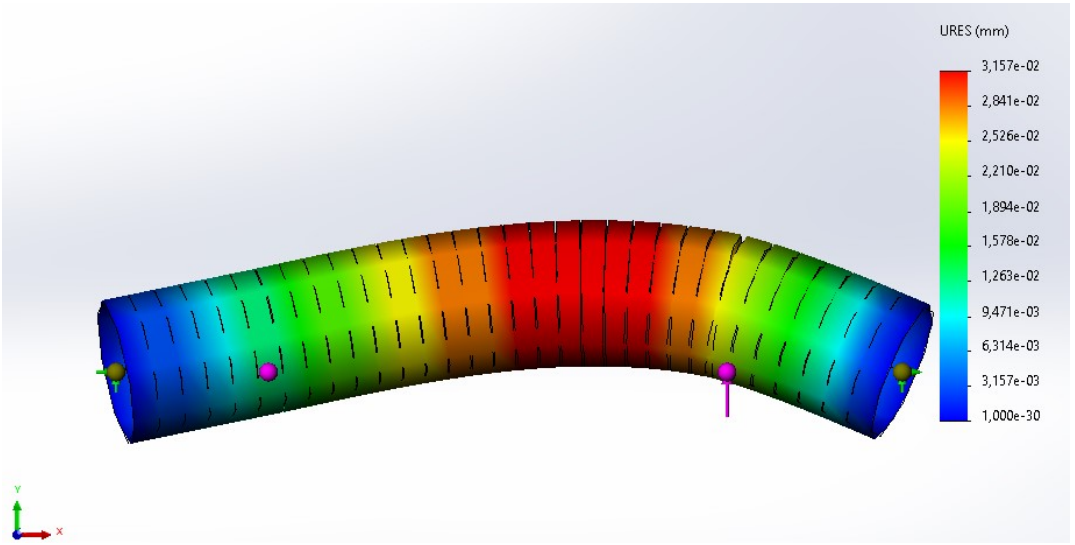


VERIFICA DEFORMABILITÀ FLESSIONALE – CALCOLO FRECCE E ROTAZIONI

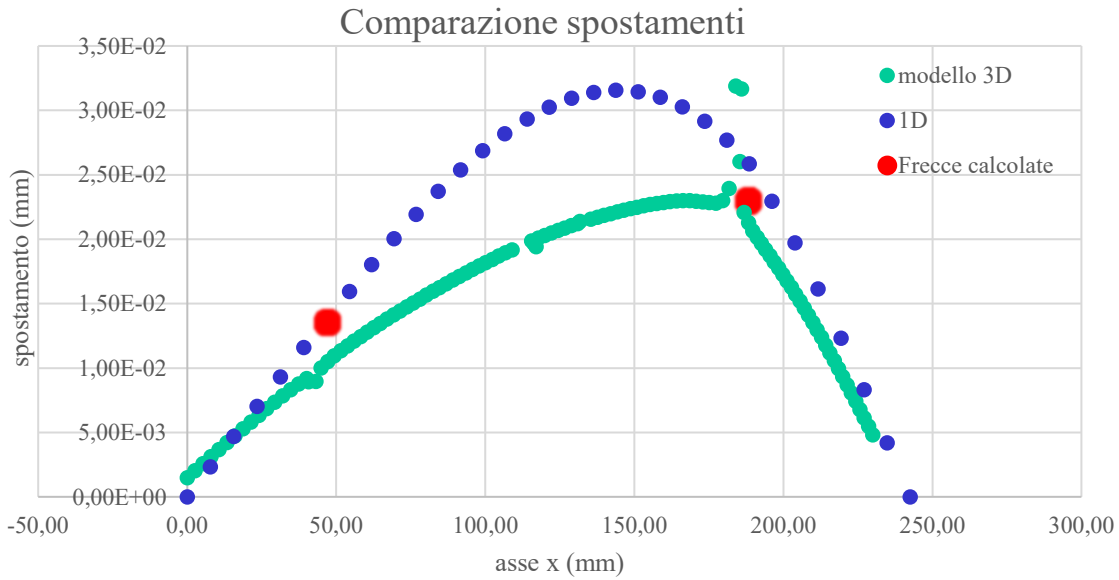


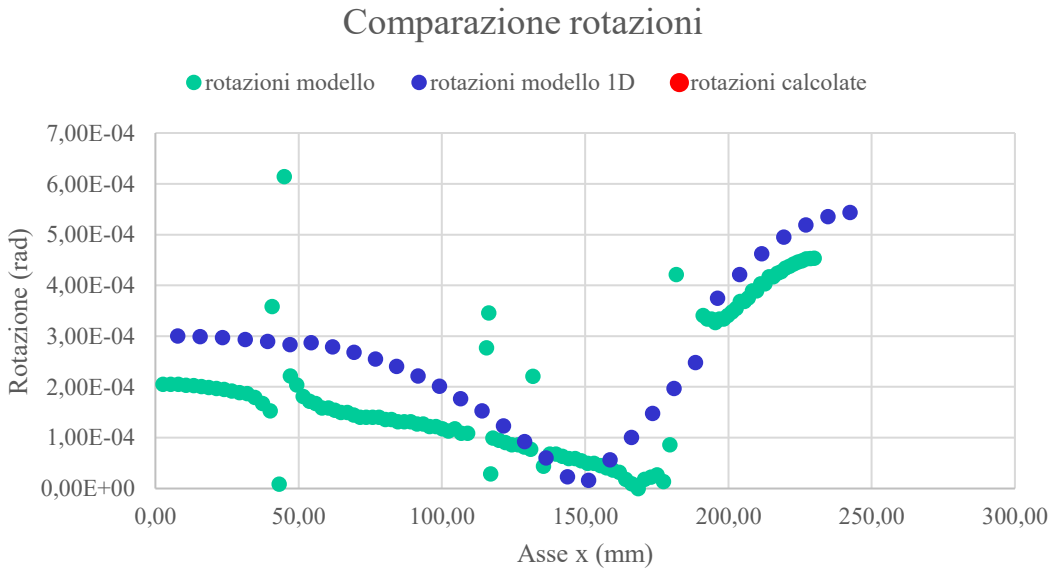






VERIFICA DEFORMABILITÀ FLESSIONALE – CALCOLO FRECCE E ROTAZIONI





$$\varphi(x) = \frac{d\eta(x)}{dx} \approx \frac{\Delta f(x)}{\Delta x}$$

	F tot ruota sx	θ tot ruota sx	F tot ruota dx	θ tot ruota dx
Modello 3D	1,05E-02	0,000222	0,02604	0,01
Modello 1D	0,01382	0,000283	0,02586	0,000248
Calcoli progetto	0,017663225	0,000277377	0,023018087	0,000277377

CONCLUSIONI

Da questa relazione abbiamo potuto verificare

- Applicabilità del metodo FEM su casi statici lineari in ambito meccanico/strutturale
- Buona precisione del metodo confrontato con risultati analitici e derivanti da grafici sperimentali
- E’ pur sempre un’analisi numerica e si deve sempre avere un occhio critico sui risultati per capire se sono congrui a quelli che ci si aspetta o meno.