



Modelowanie Wieloskalowe

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Konsultacje:
Poniedziałek – 7:30 – 8:30



| | | |
|----|------------|------------------------|
| 1 | 04.10.2019 | Wprowadzenie |
| 2 | 11.10.2019 | MES - Abaqus |
| 3 | 25.10.2019 | Mesh based / Mesh free |
| 4 | 08.11.2019 | Modele materiału |
| 5 | 15.11.2019 | CA teoria + 2D Game |
| 6 | 22.11.2019 | CA rozrost + DRX |
| 7 | 29.11.2019 | MC rozrost |
| 8 | 06.12.2019 | DMR |
| 9 | 13.12.2019 | Inverse |
| 10 | 20.12.2019 | zerówka |





Obecność na wykładach – **NIE** obowiązkowa

Warunek dopuszczenia do egzaminu: **zaliczenie z przedmiotu**

Warunek zaliczenie egzaminu: **>50% punktów**

Przywilej dopuszczenia do terminu „0”: **ocena 4.5 lub 5.0**

Nie ma zwolnień z egzaminu.

Obecność na ćwiczeniach – **obowiązkowa** (dr inż. Konrad Perzyński)

Warunek zaliczenia przedmiotu:

- maksymalnie 2 nieusprawiedliwione nieobecności
- pozytywna ocena z przeprowadzonych kolokwiów
- zaliczenie zleconych w ramach zajęć projektów
- skala ocen od 2.0 – 5.0



Egzamin

Termin zerowy – egzamin pisemny

Pierwszy termin – egzamin pisemny

TEST

Drugi termin - egzamin pisemny/egzamin ustny

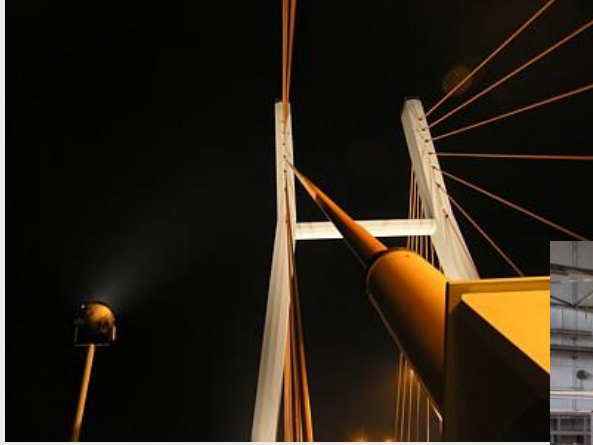
TEST

Trzeci termin - egzamin ustny



Czym jest modelowanie numeryczne?





Firma



Produkt



Dział sprzedaży



Dział produkcji



Klient





Technolog

Czy produkt jest standardowy?

TAK



Technologia



Kowal



Dostępne narzędzia – parametry procesu





Firma



Produkt



Dział sprzedaży



Produkt



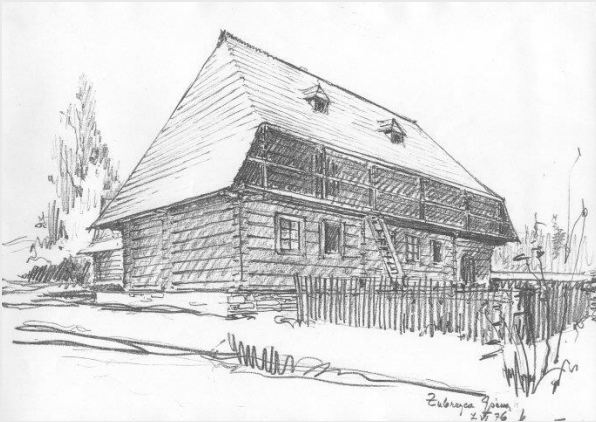
Dział produkcji



Klient



Firma



Produkt



Dział sprzedaży



Klient



Dział produkcji





Technolog

Czy produkt jest standardowy?

Kowal



NIE



Technologia



Dostępne narzędzia –
parametry procesu



Testy



Produkt



Firma



Produkt



Dział sprzedaży



Klient

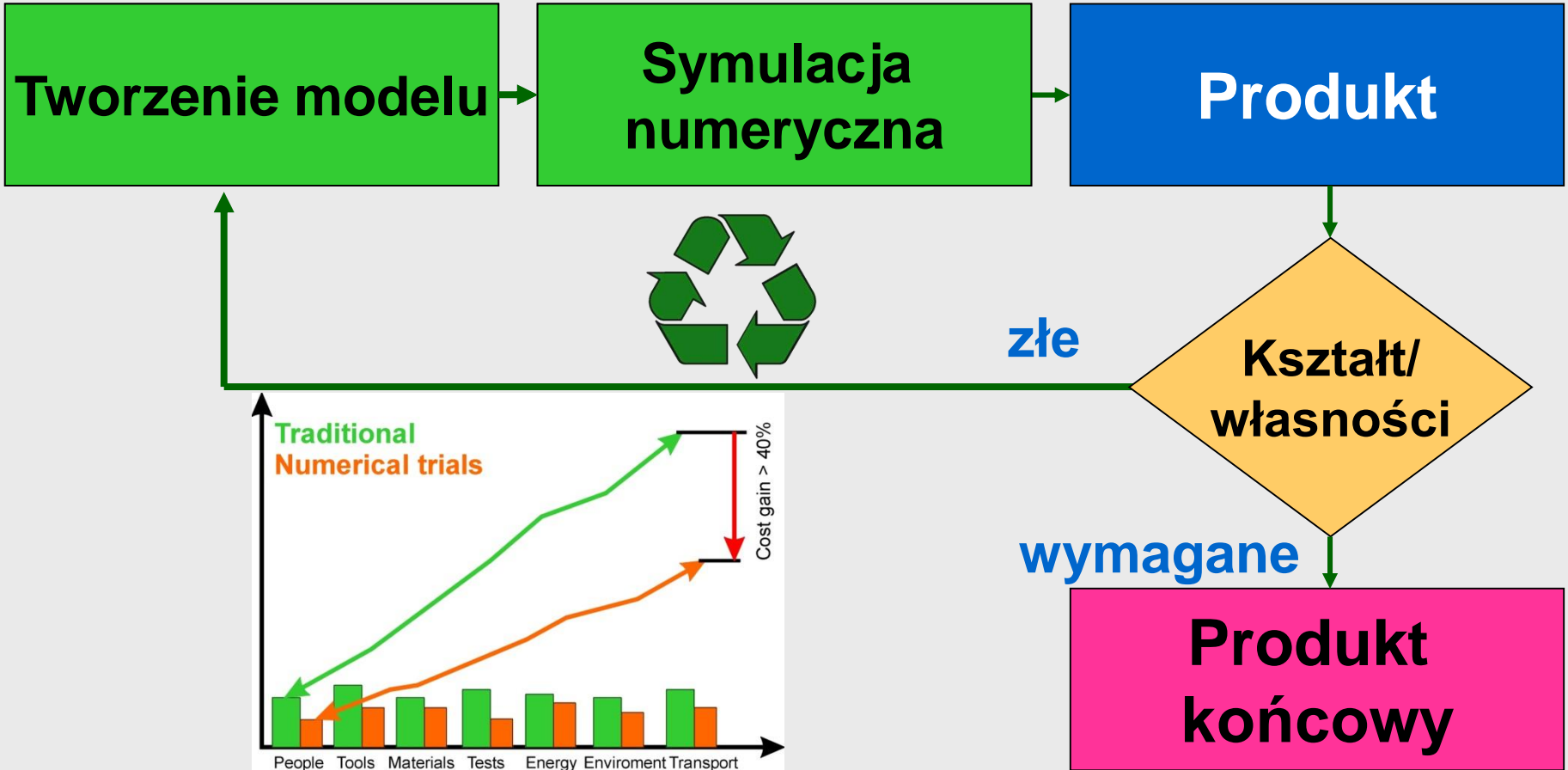


Dział produkcji



Produkt

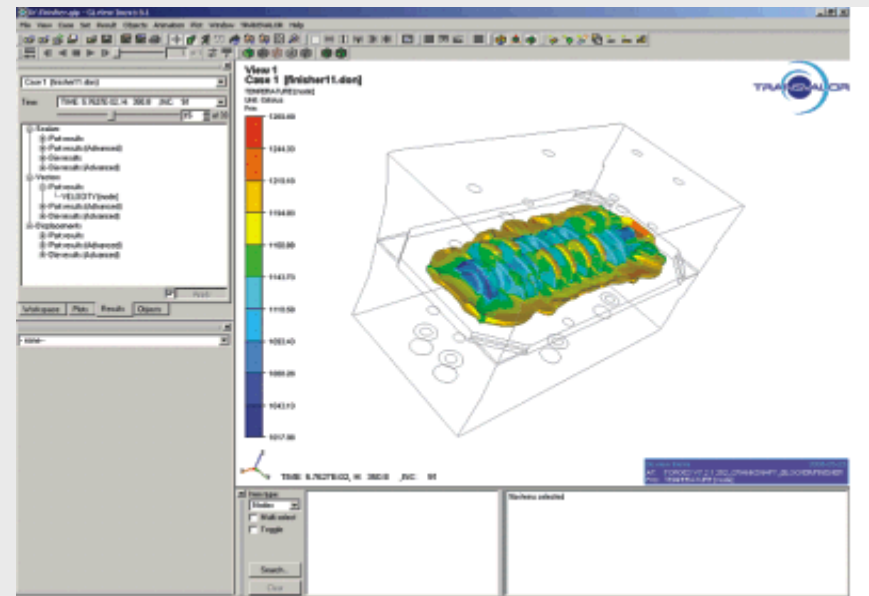
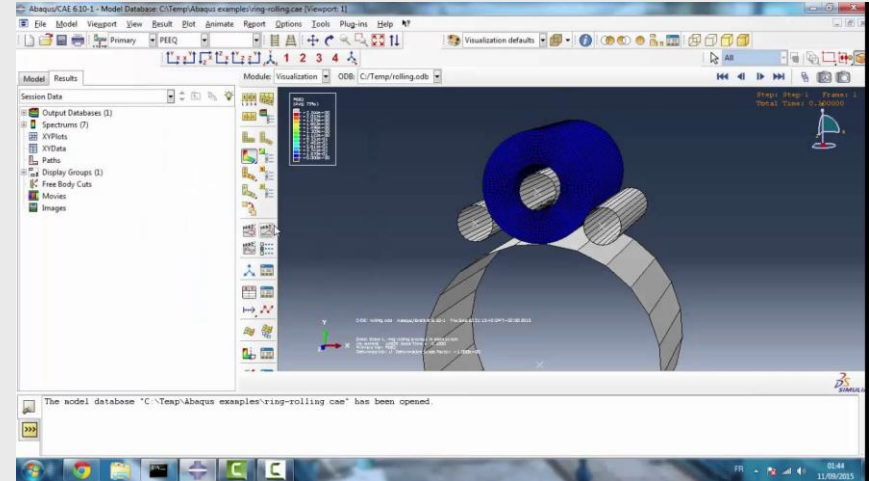






Program symulacyjny

Komputer





Program CAD – 2D lub 3D

Program MES

- **preprocesor**

- wczytanie geometrii
- dyskretyzacja problemu
- złożenie procesu
- nałożenie warunków brzegowych

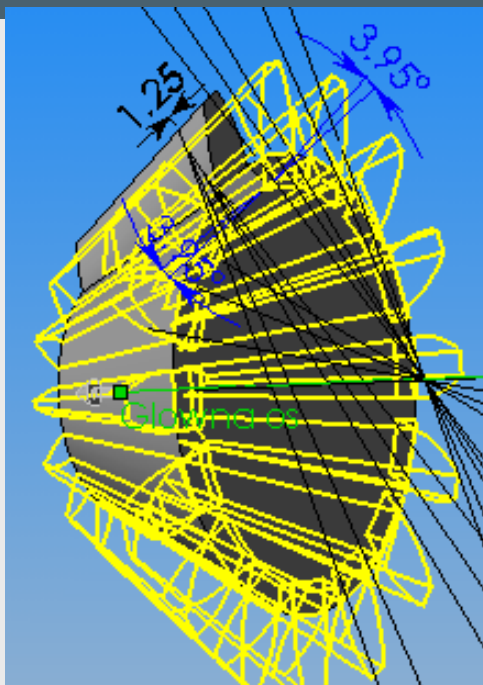
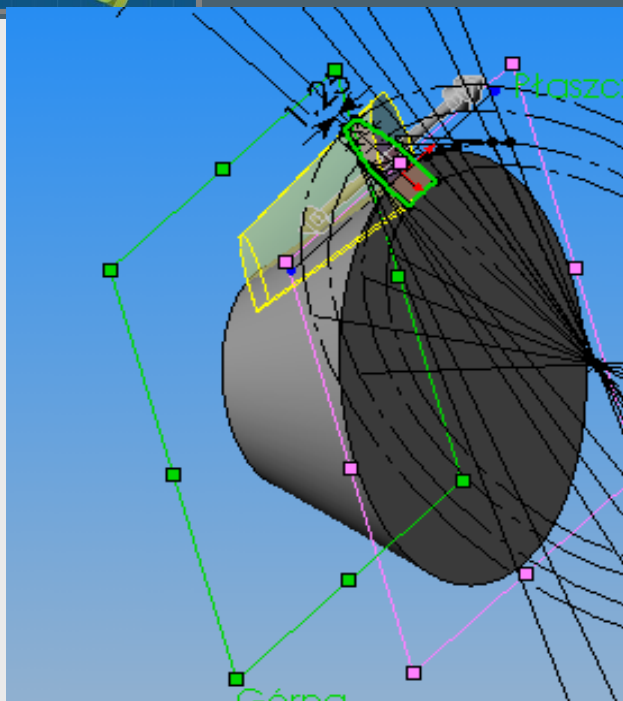
- **obliczenia**

- **postprocesor**

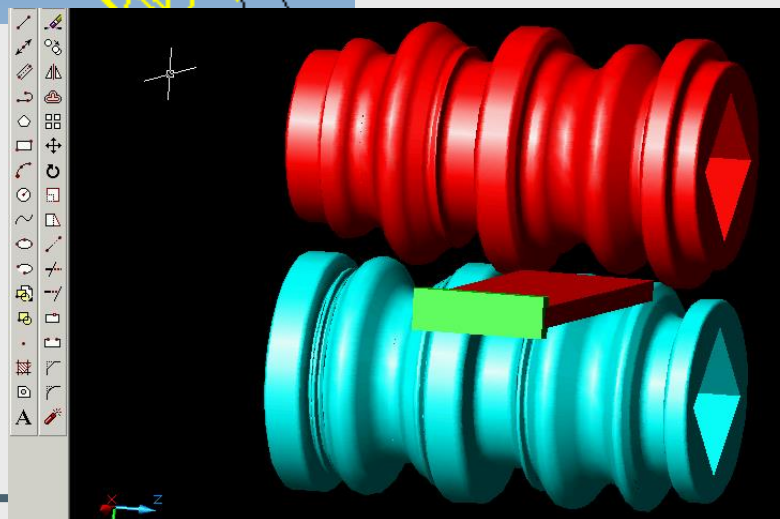
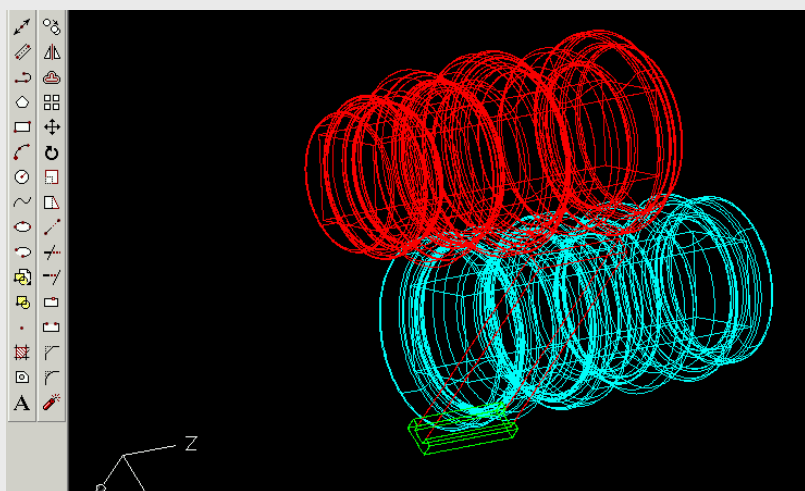
- analiza wyników



Program CAD – 2D lub 3D



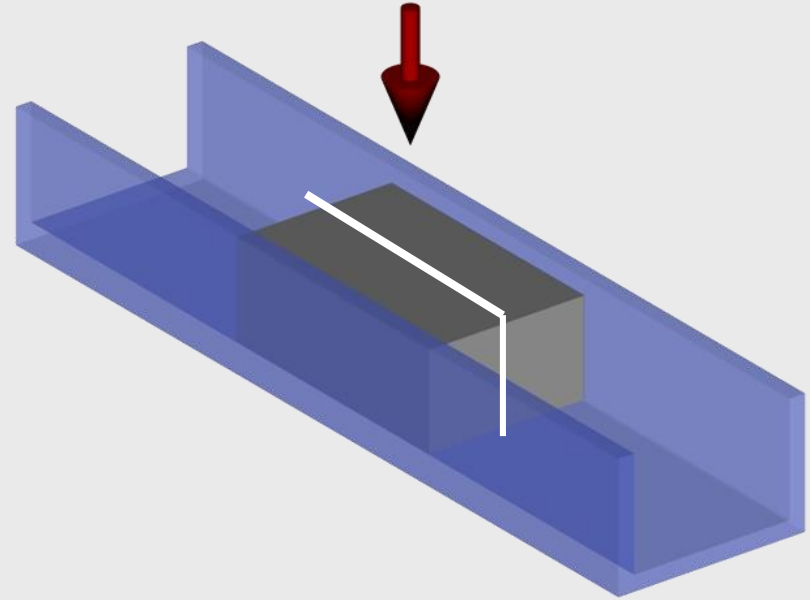
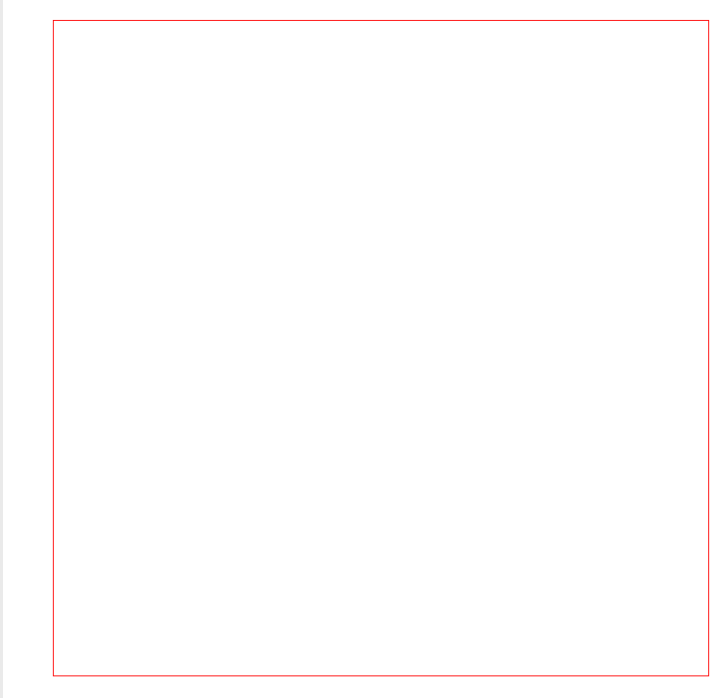
Model geometryczny





Program MES

Model geometryczny próbki



Model geometryczny narzędzi

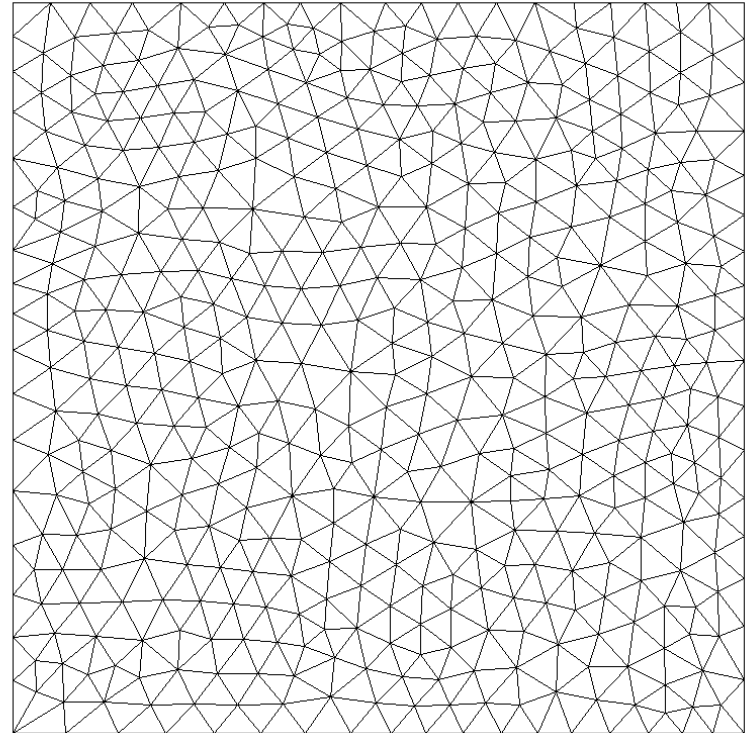




Model geometryczny

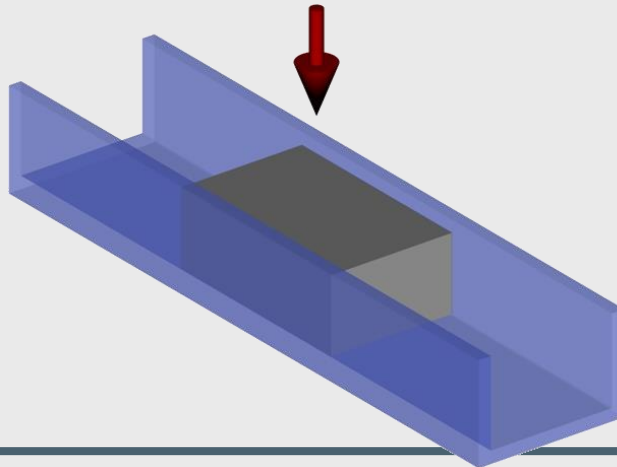
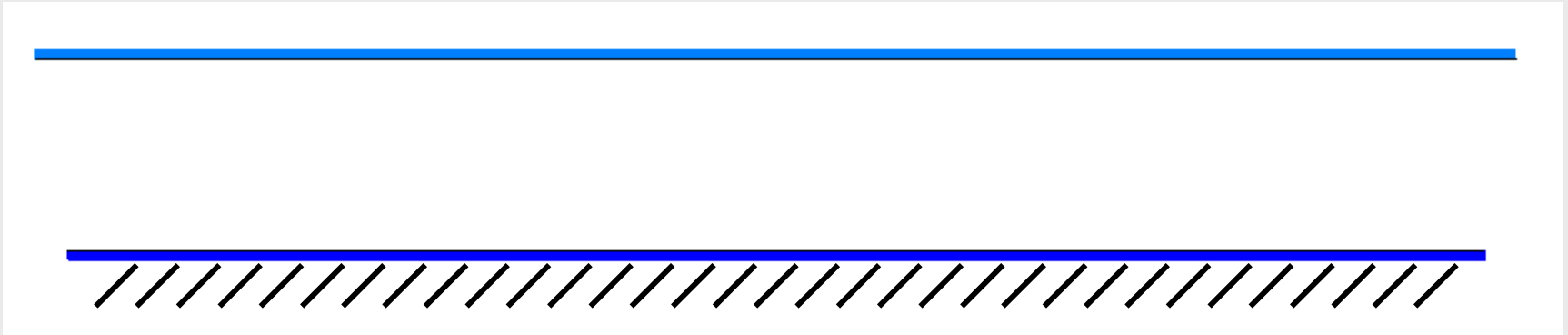
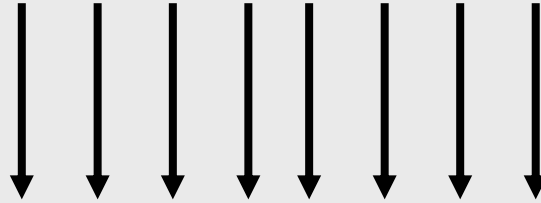


Dyskretyzacja modelu



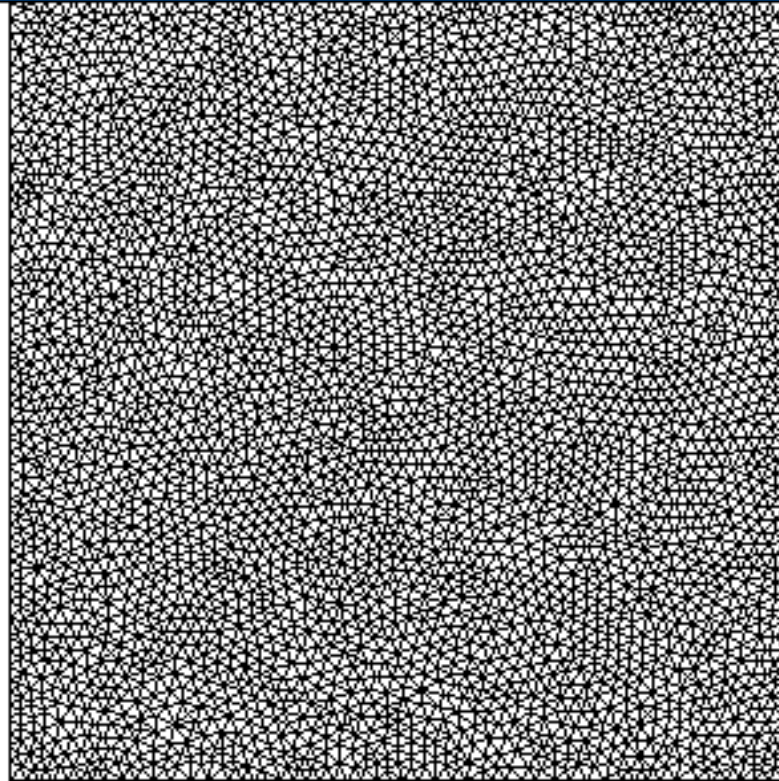


Warunków brzegowe



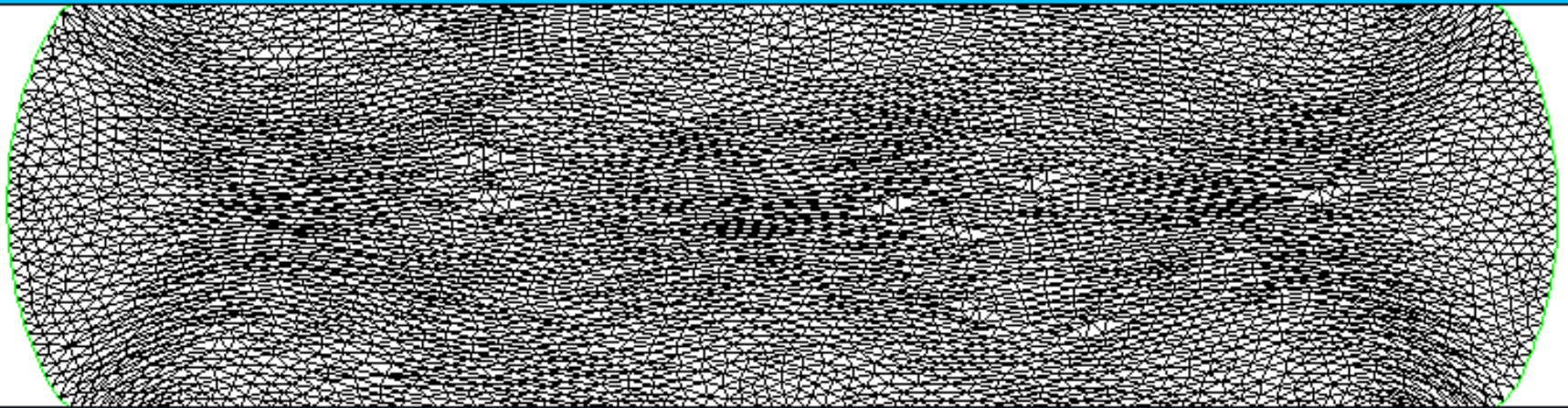


Złożenie procesu





Wynik symulacji MES



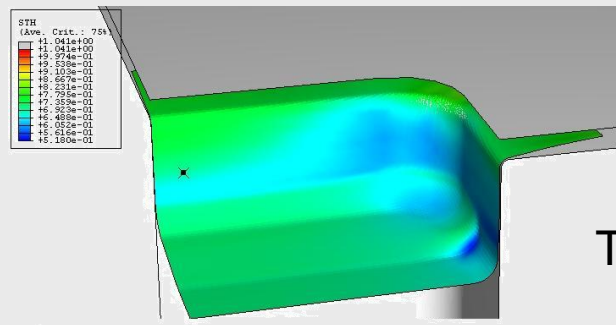
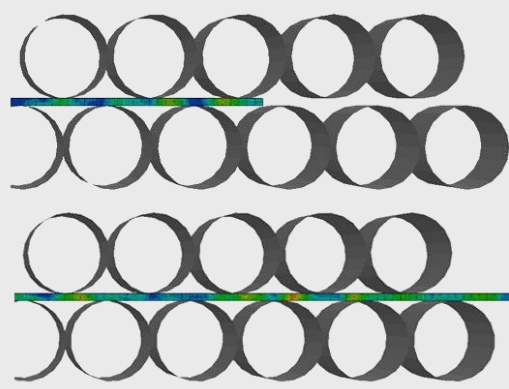
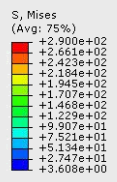
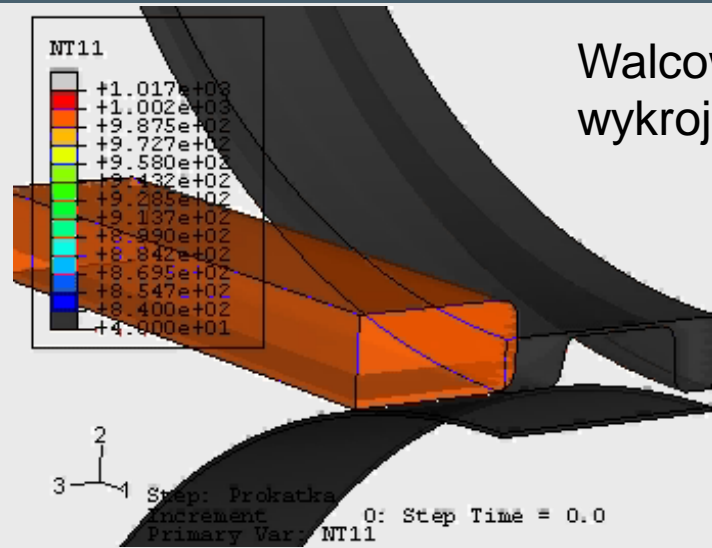


Powazniejsze problemy...☺

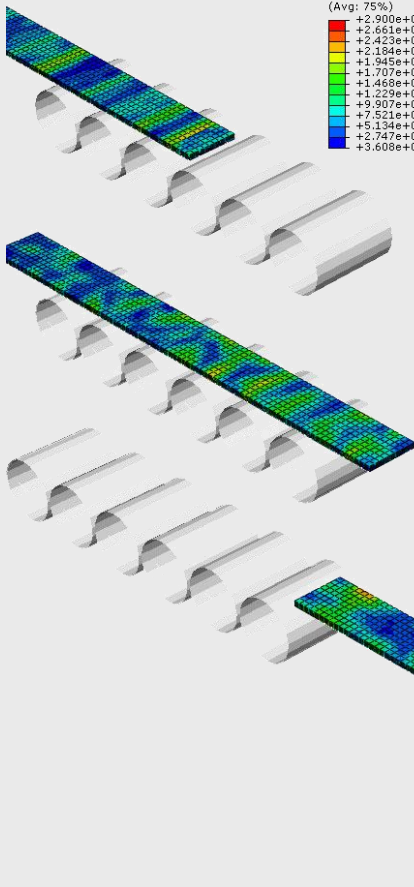
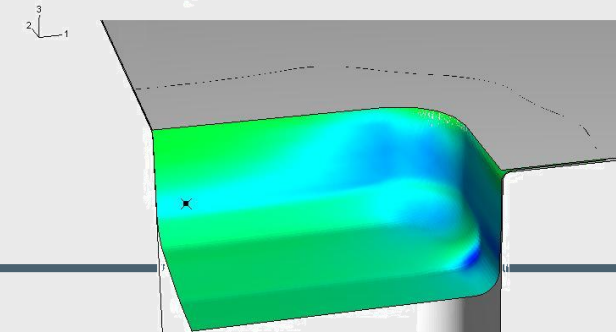


Modelowanie procesów przemysłowych

Walcowanie w wykrojach



Tłoczenie

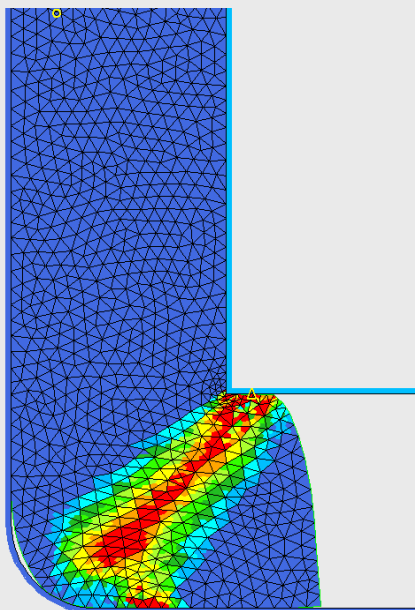
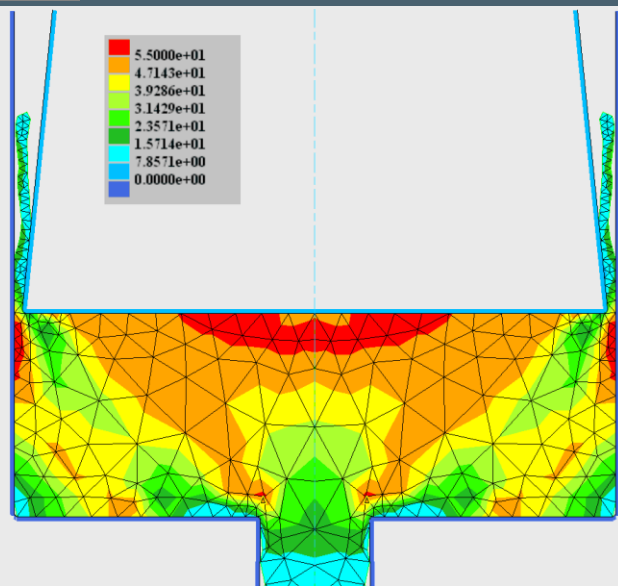


Prostowanie blach



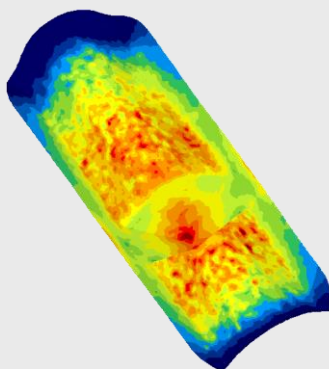
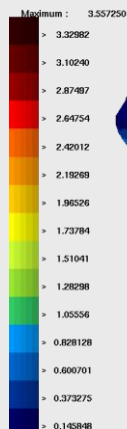
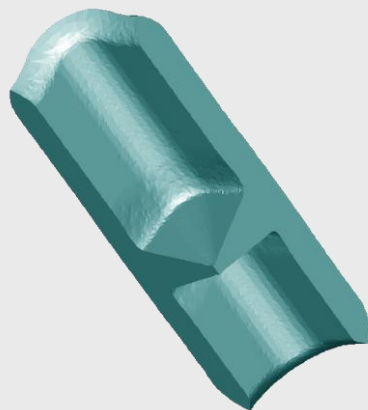


Simulation of the industrial/laboratory scale processes

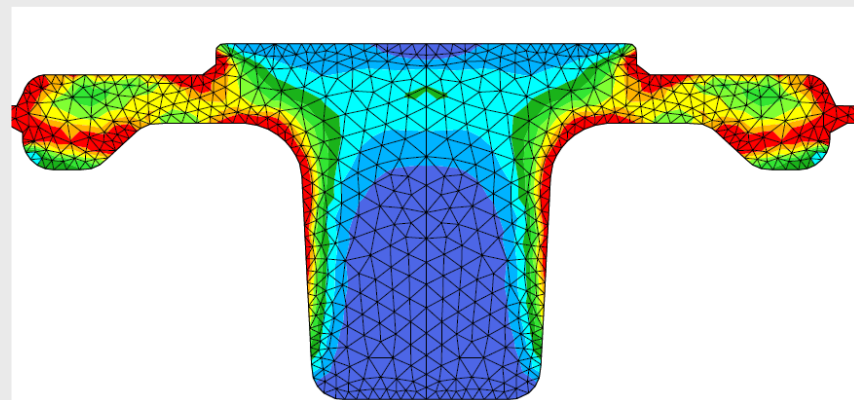


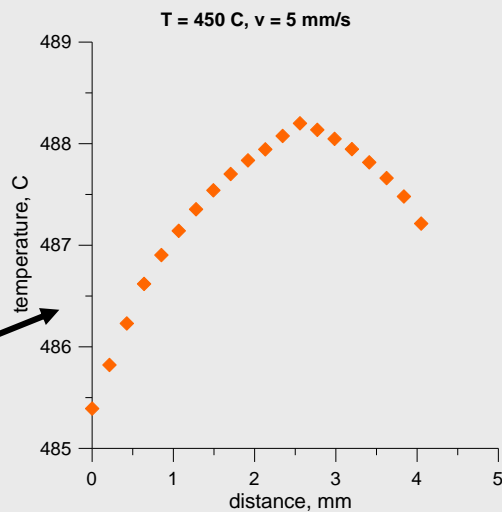
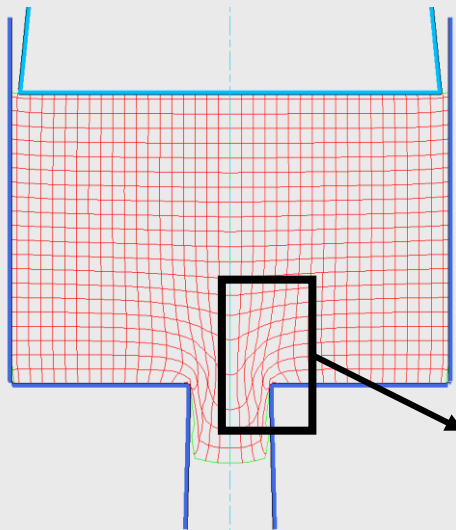
ECAP

Wyciskanie



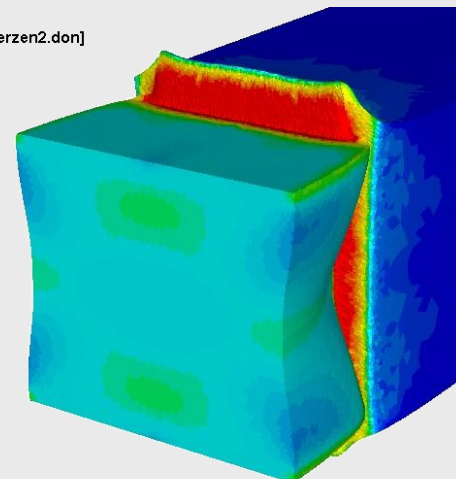
Kucie matrycowe





View 1
Case 1 [10uderzen2.don]

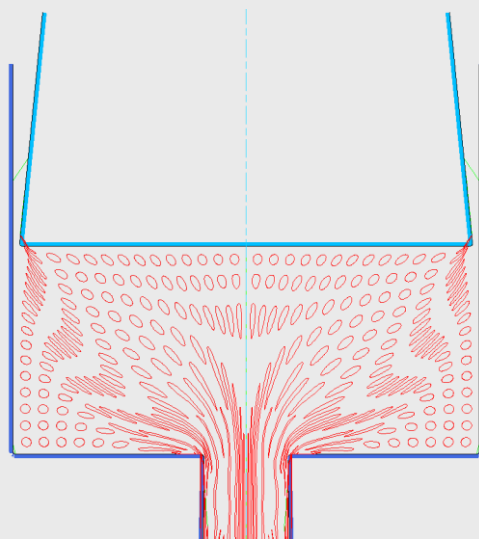
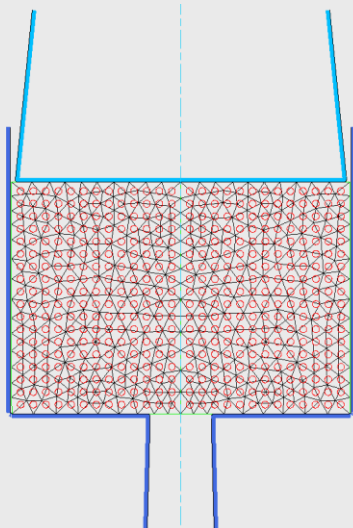
Frin [20]
S_unit



Frame: 25/88
Time: 10.91

TIME: 10.91 , H:-0.4100 , INC: 352 (2/20,1)

GLView Inova 2005-08-11
AT: FORGE3 V6.3c, DATAFILE= 10uderzen1.don
Frn EQ_STRAIN [30 element]



View 3
Case 3 [10uderzen2.don]

Parts

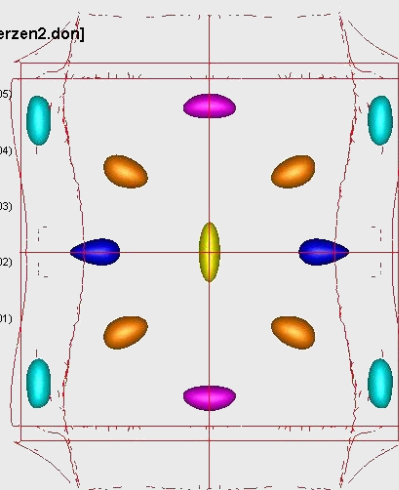
- Marking Grid (05)
- Marking Grid (04)
- Marking Grid (03)
- Marking Grid (02)
- Marking Grid (01)
- Kowadlo
- Wlead

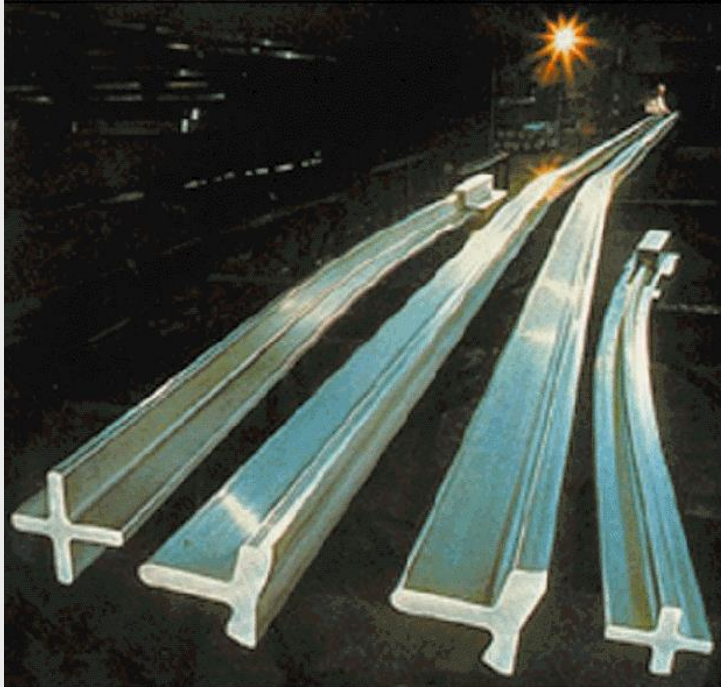
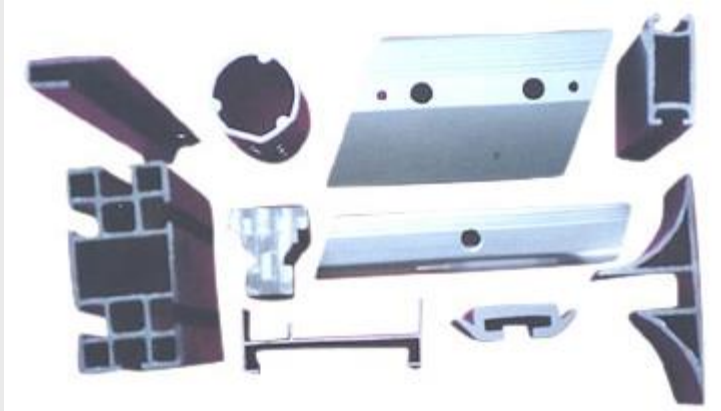
z
y

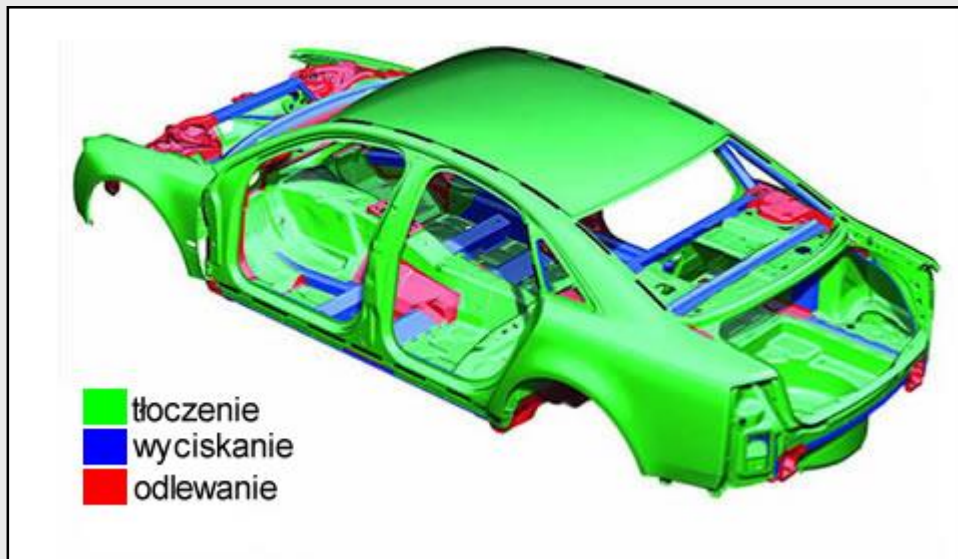
Time: 10.91
TIME: 10.91

, H:-0.4100 , INC: 352 (2/20,1)

GLView Inova 2005-08-11
AT: FORGE3 V6.3c, DATAFILE= 10uderzen1.don

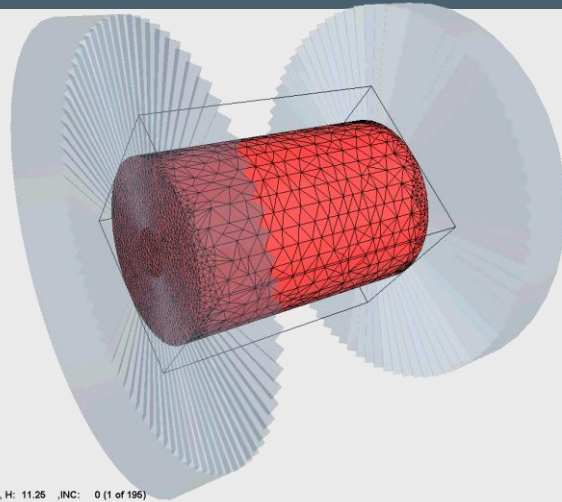




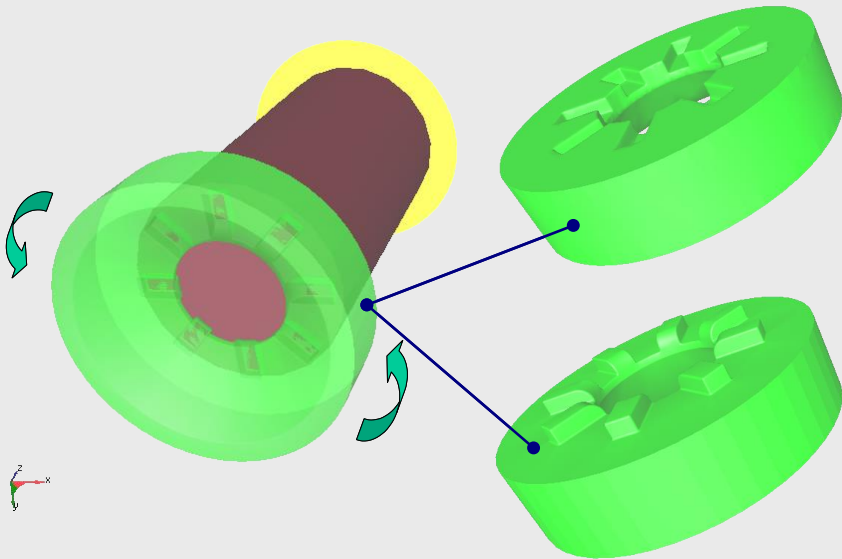




Procesy ze zmianą drogi odkształcenia

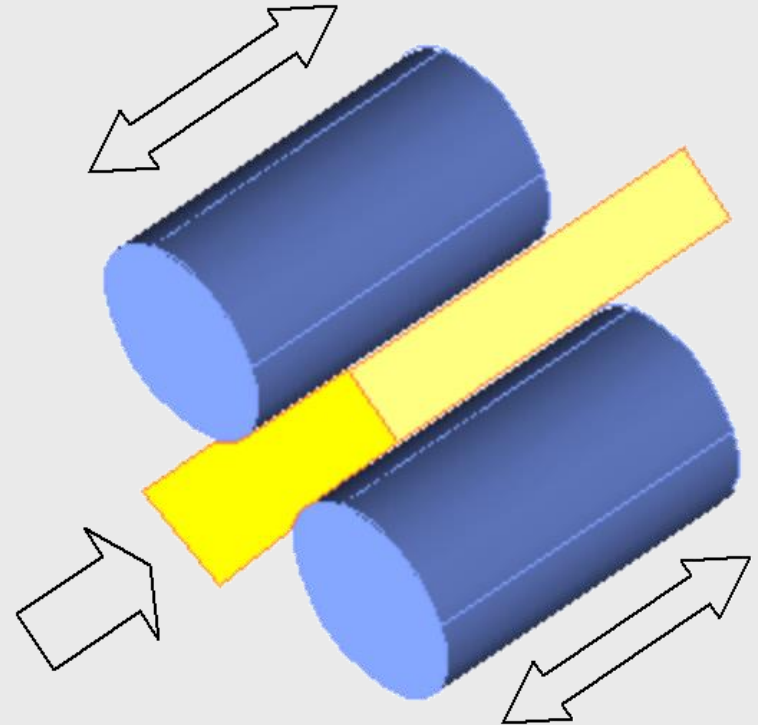


TIME: 0.000 , H: 11.26 , INC: 0 (1 of 195)

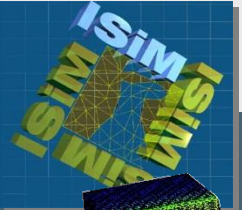


Spęszczanie z oscylacjami

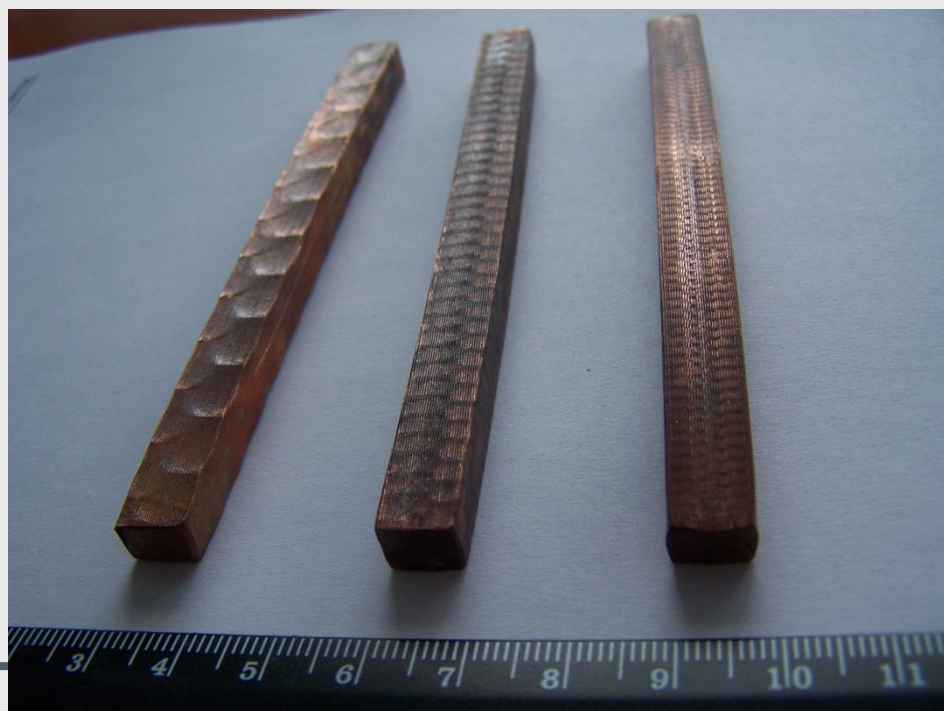
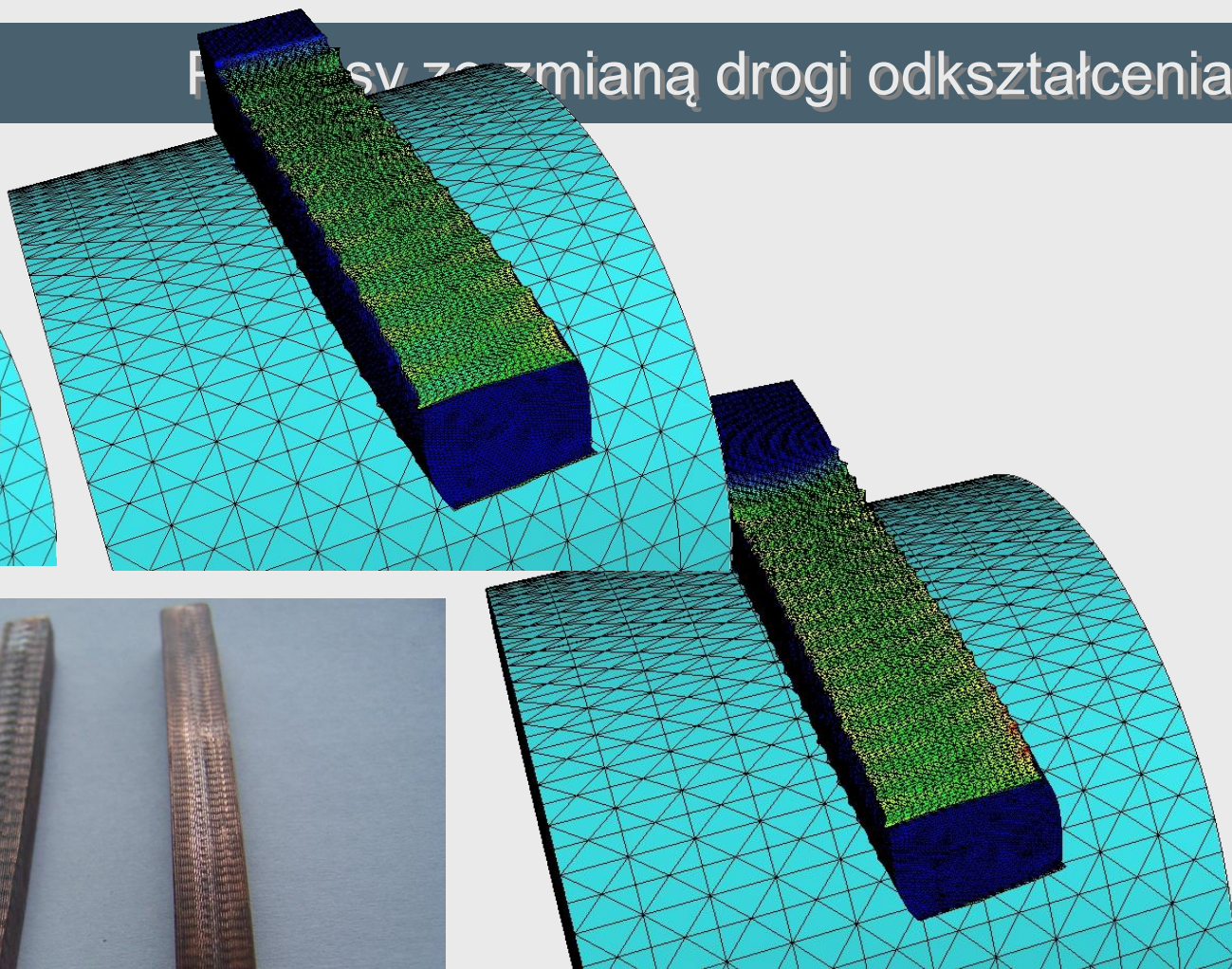
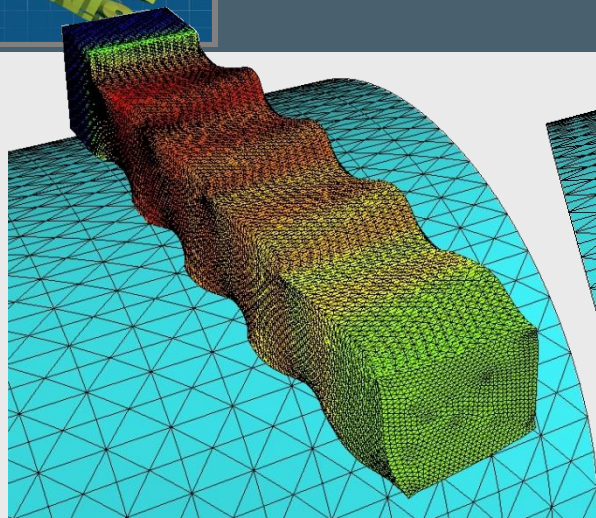
Walcowanie z poosiowym ruchem walców



Wyciskanie KOBO (KOrbel BOchniak)



Fazy zmiiany drogi odkształcenia

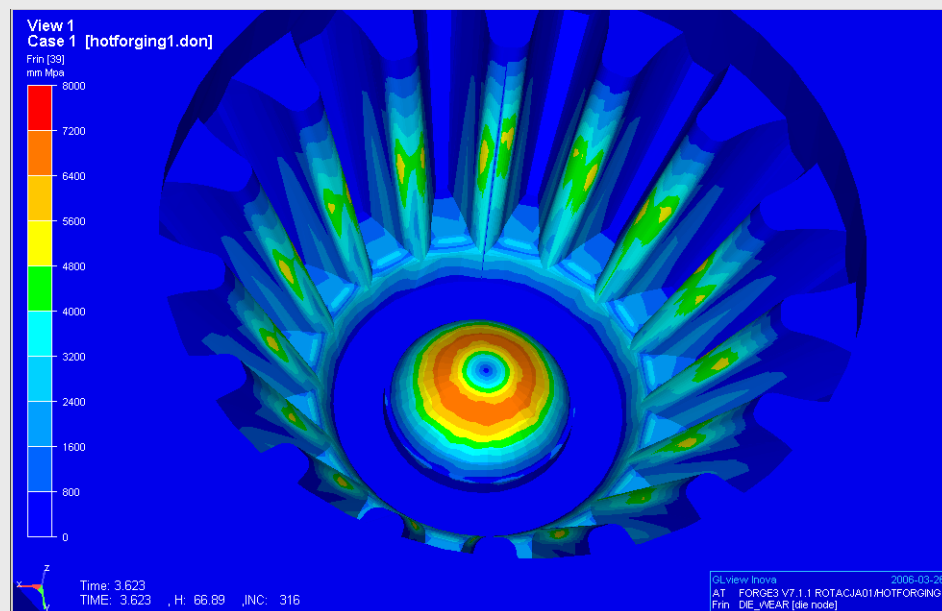
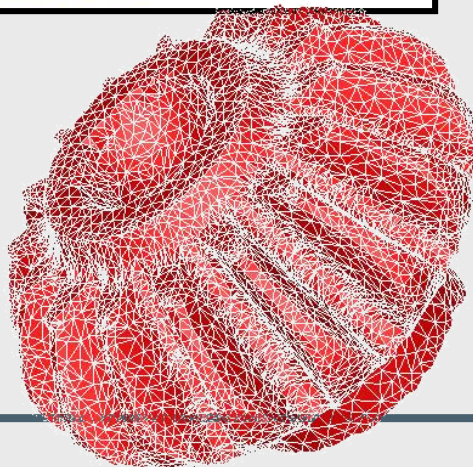
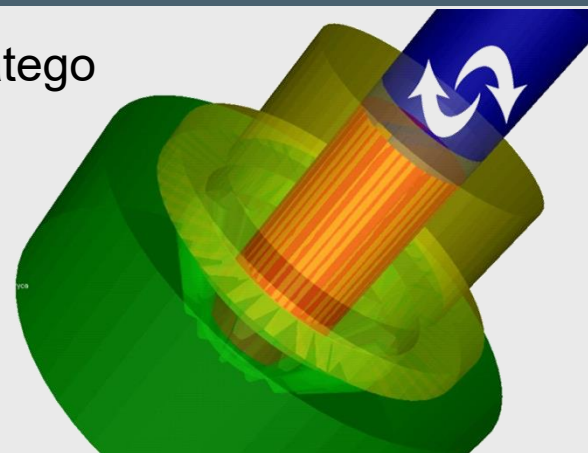
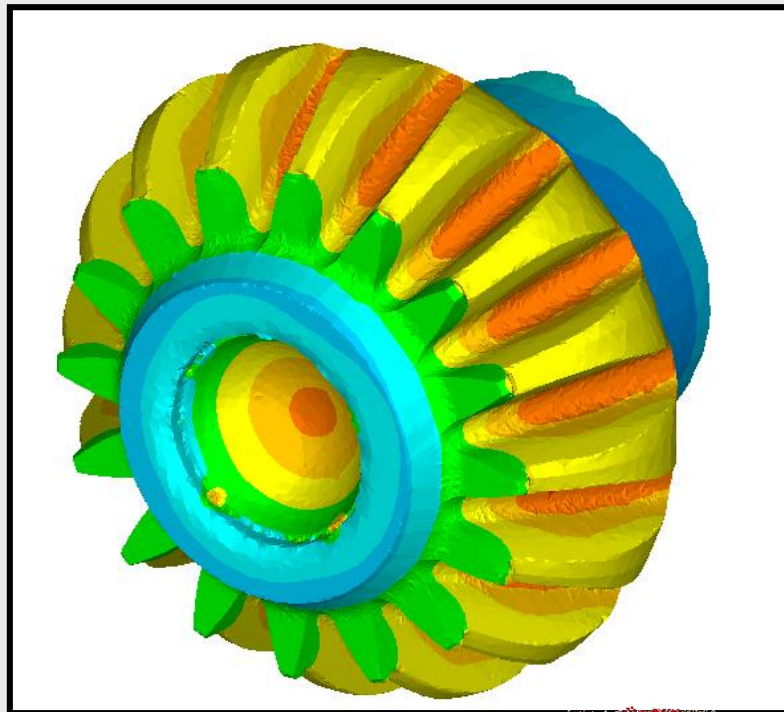


Walcowanie z poosiowym ruchem walców



Procesy ze zmianą drogi odkształcenia

Kucie koła zębatego





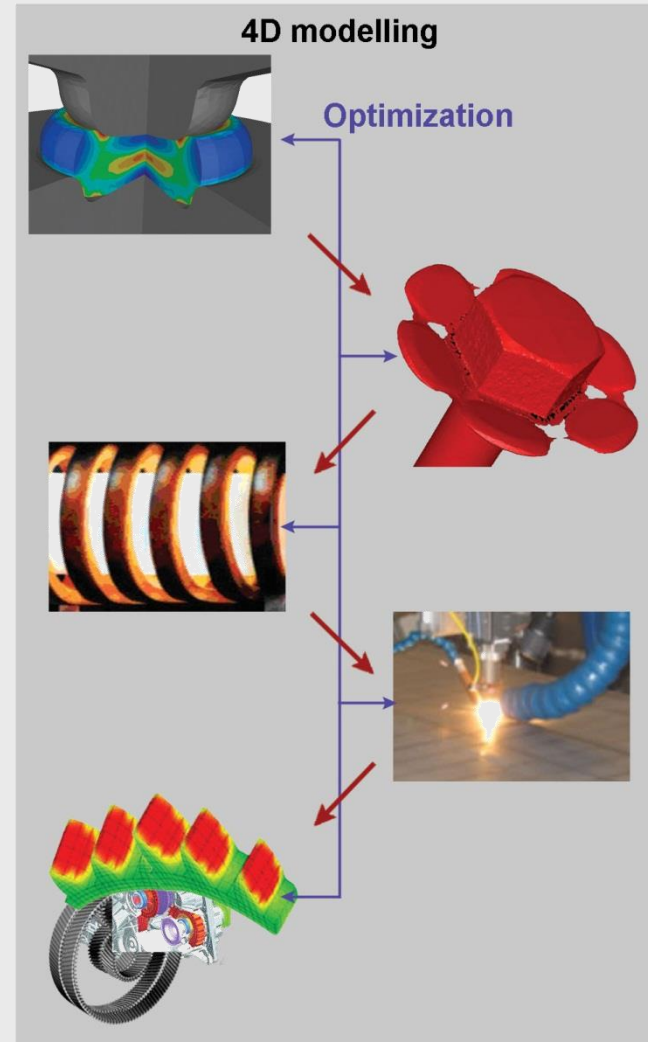
Modelowanie cyklu życia – modelowanie 4D



MODELOWANIE 4D

Przykład: kucie elementów łącznych

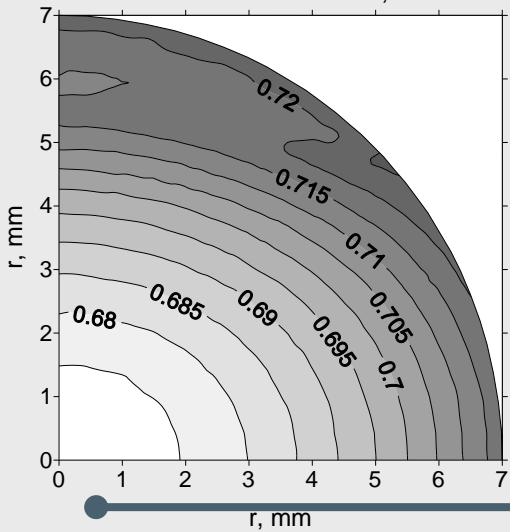
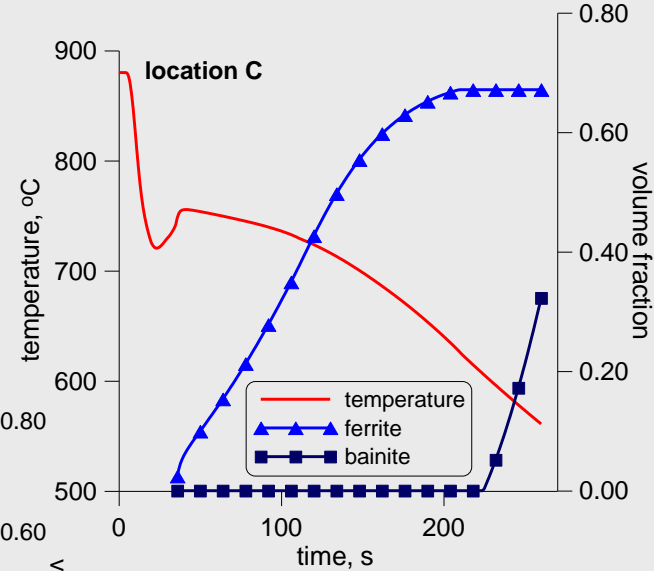
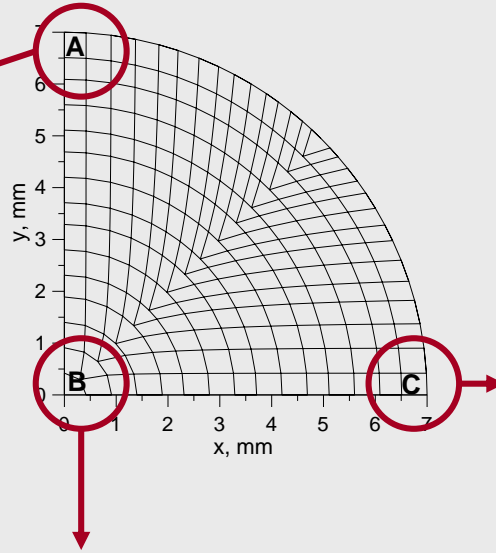
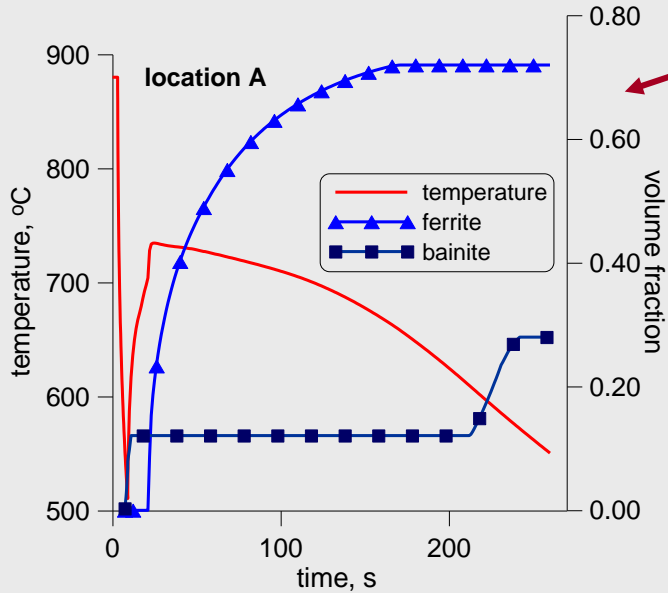
- Badania laboratoryjne
- Walcowanie drutów
- Obróbka cieplna
- Ciągnienie
- Kucie
- Skrawanie
- Nawalcowanie gwintu
- Testowanie



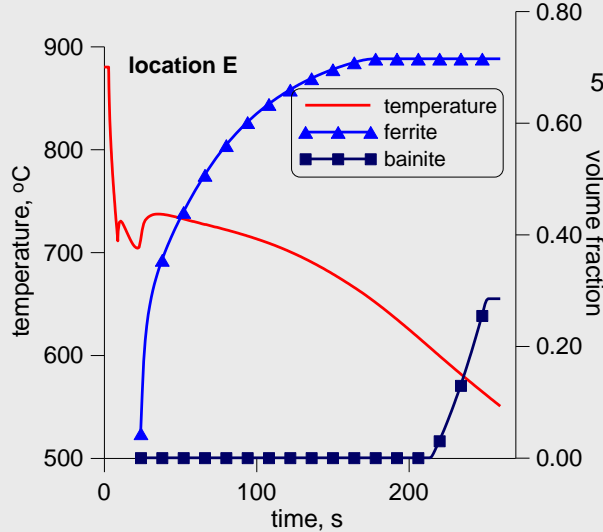


MODELOWANIE 4D

Chłodzenie po walcowaniu drutów



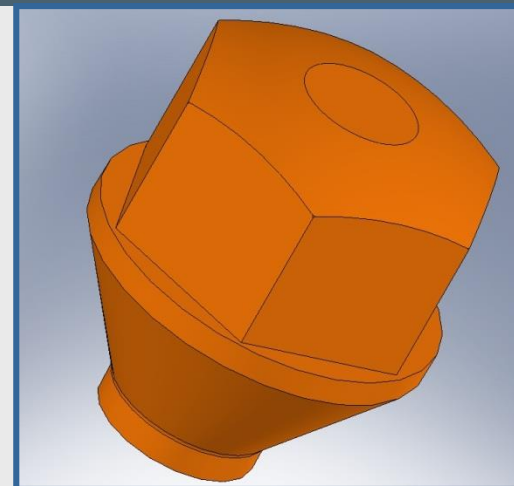
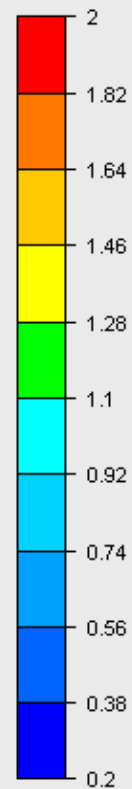
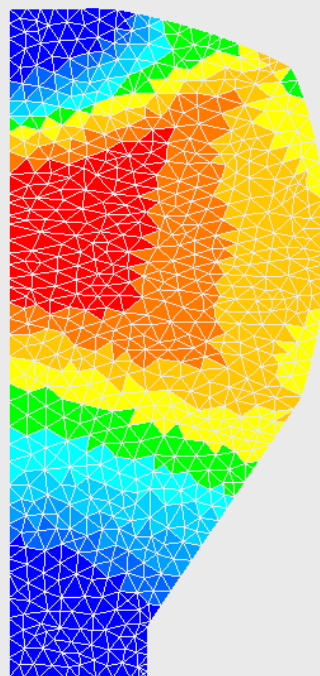
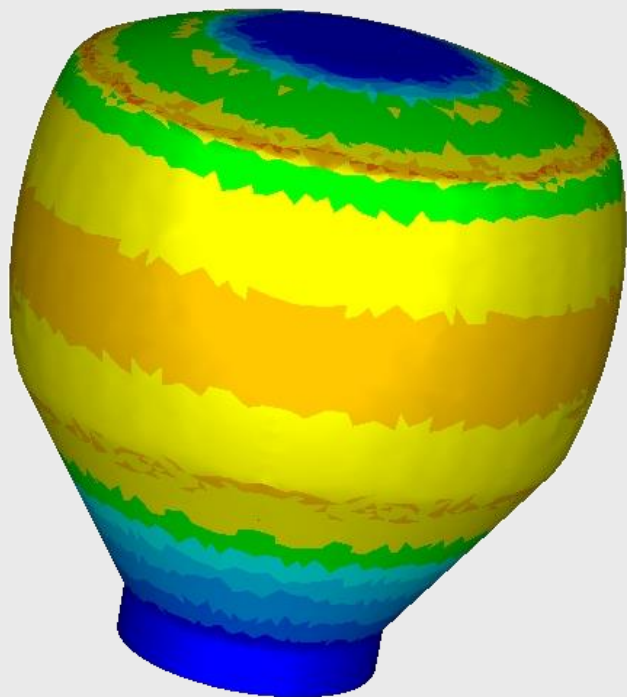
Ułamek ferrytu na przekroju





MODELOWANIE 4D

Kucie

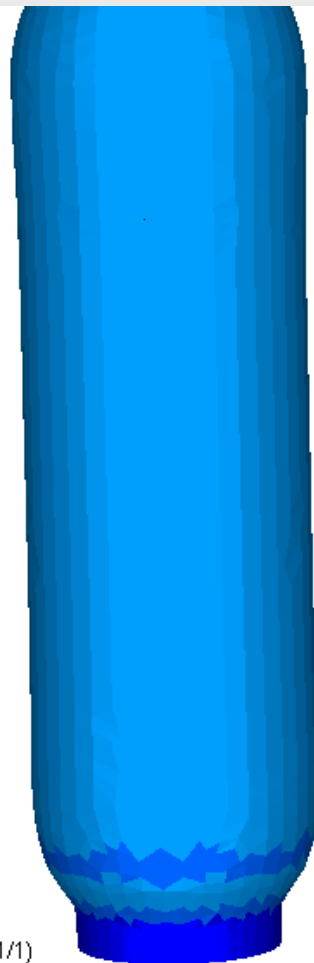
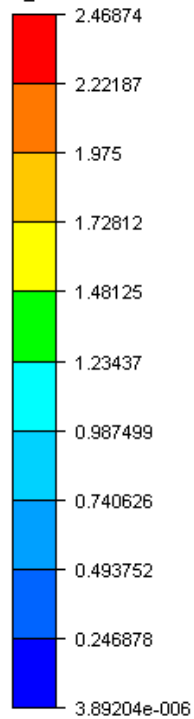




MODELOWANIE 4D

View 1
Case 1 [3d_cold_forging.don]

Frin [26]
S_unit



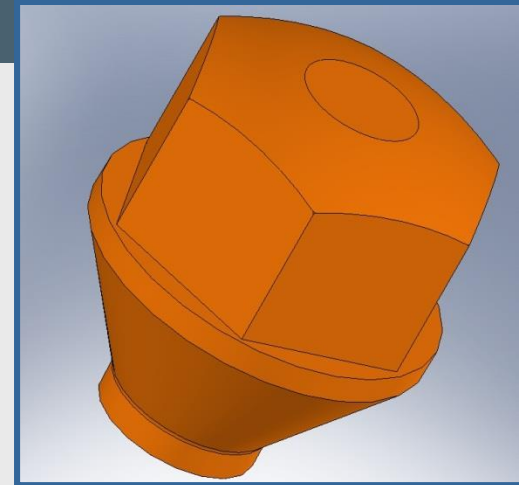
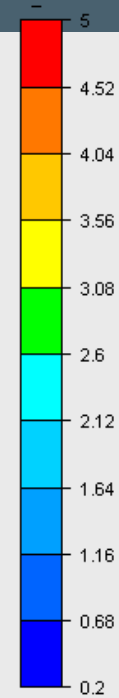
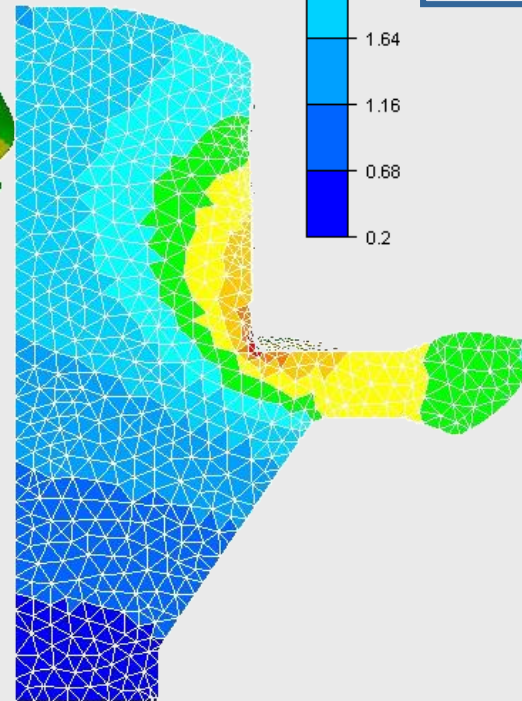
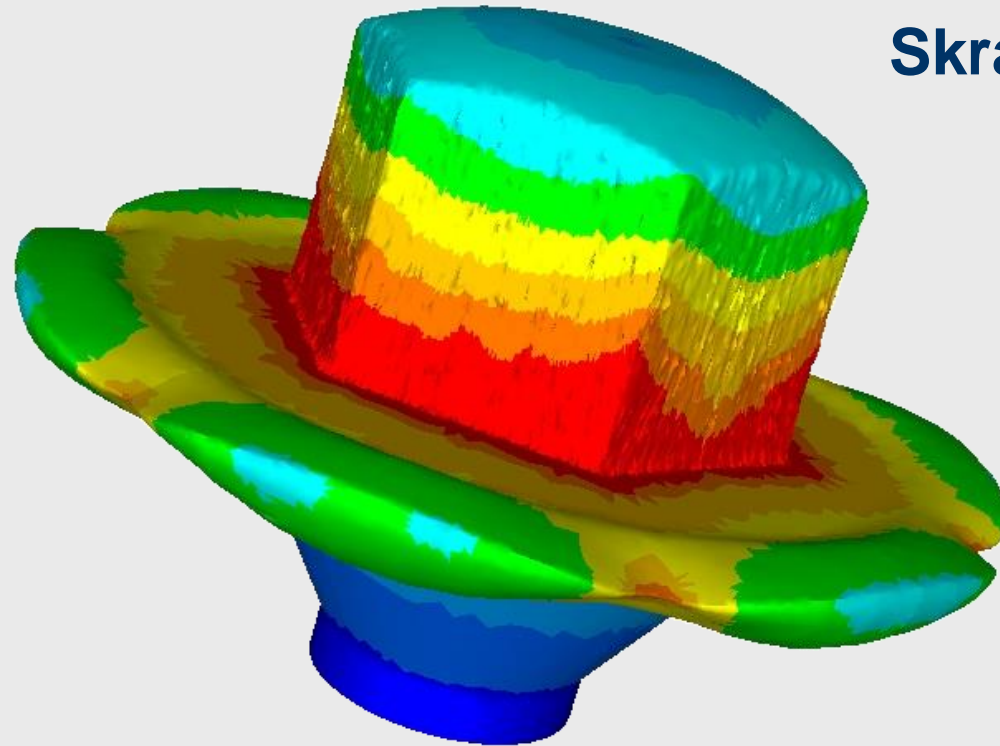
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Time: 0.029613
TIME: 2.9613E-02, H: 51.50 ,INC: 177 (1/1,1/1)

GLview Inova 2006-09-07
AT: FORGE3 V7.1.1 SRUBA/3D_COLD_FORGING
Frin: EQ_STRAIN [3D element]



MODELOWANIE 4D

Skrawanie



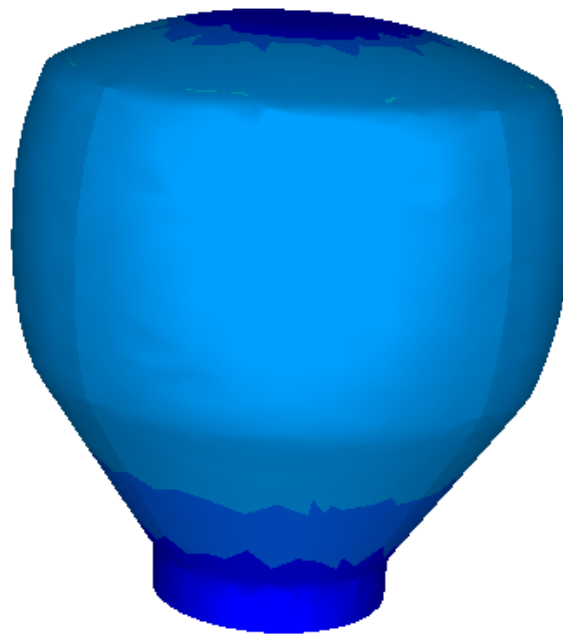
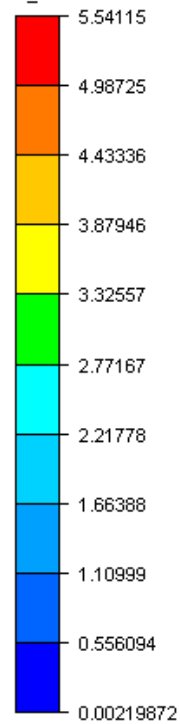


MODELOWANIE 4D

View 1
Case 1 [3d_cold_forging_1.don]

Frin [26]

S_unit

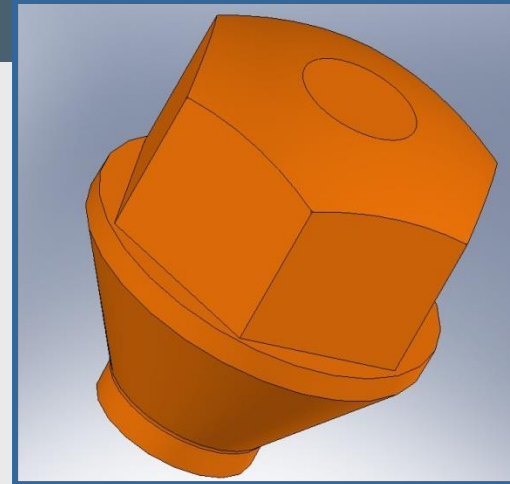
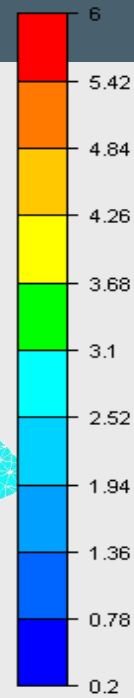
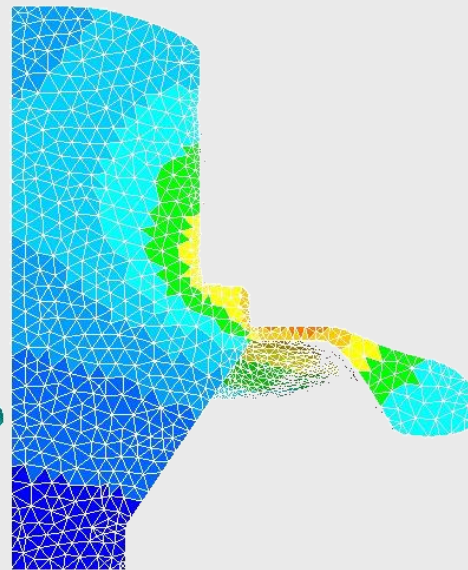
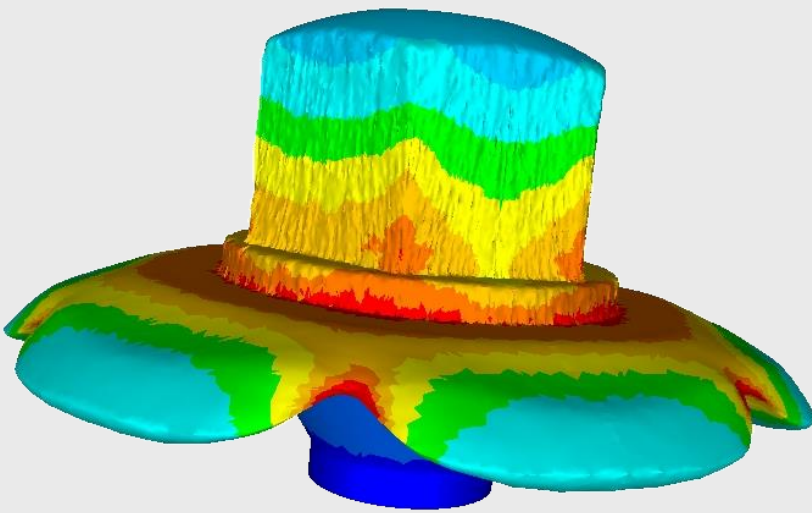


Frame: 1/16
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TIME: 0.000 , H: 14.13 , INC: 0 (1/1,1/1)

GLview Inova 2006-09-07
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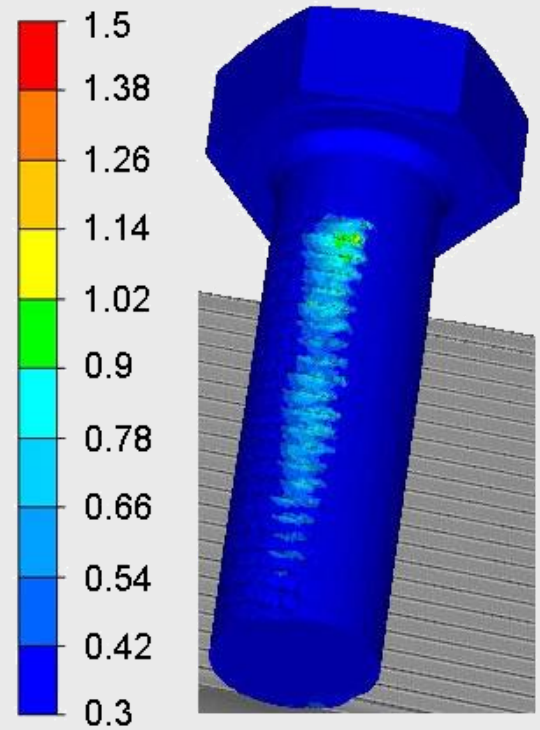
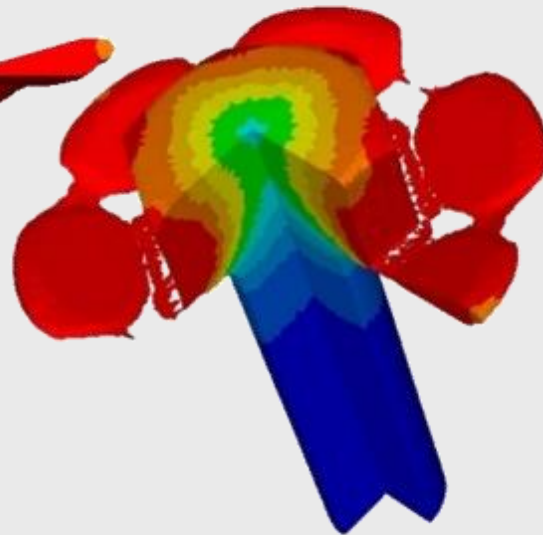
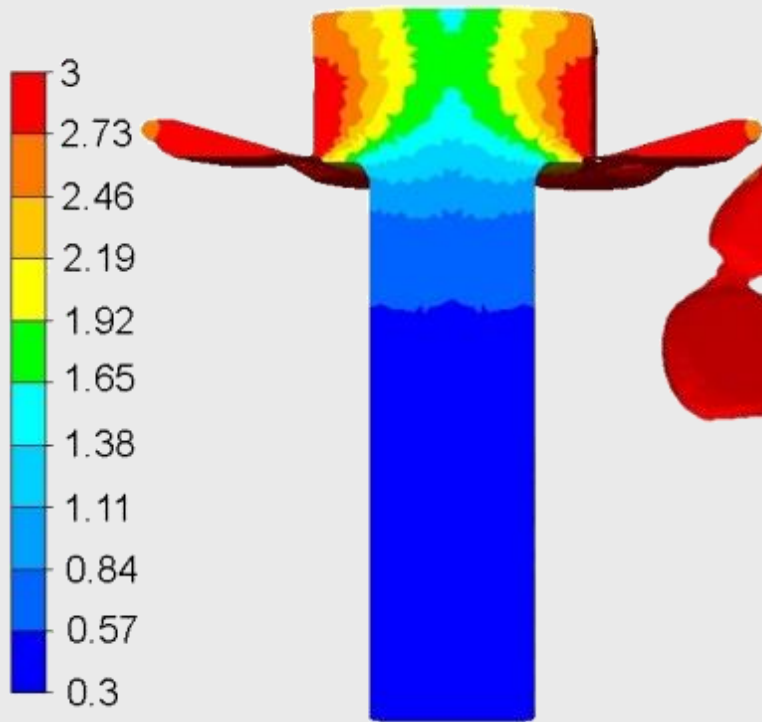


MODELOWANIE 4D



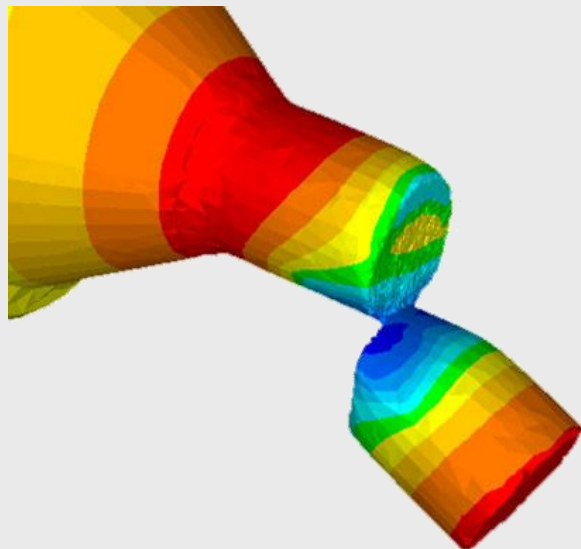
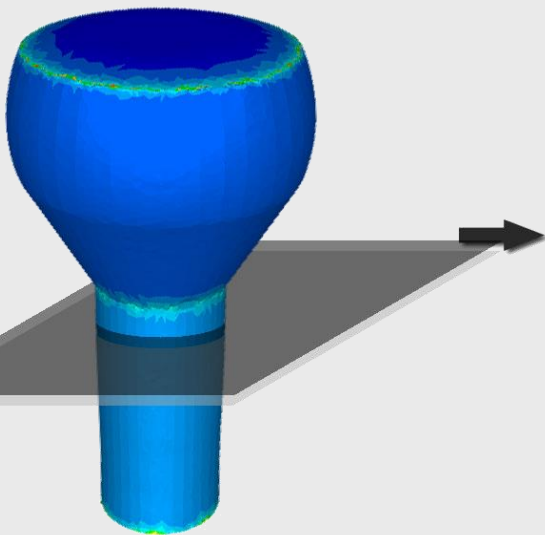
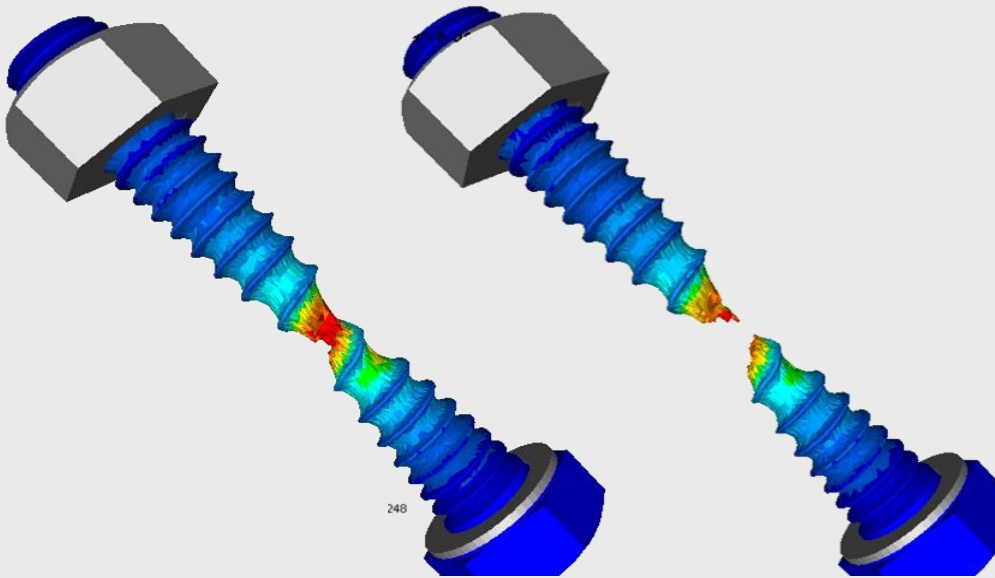


MODELOWANIE 4D





MODELOWANIE 4D



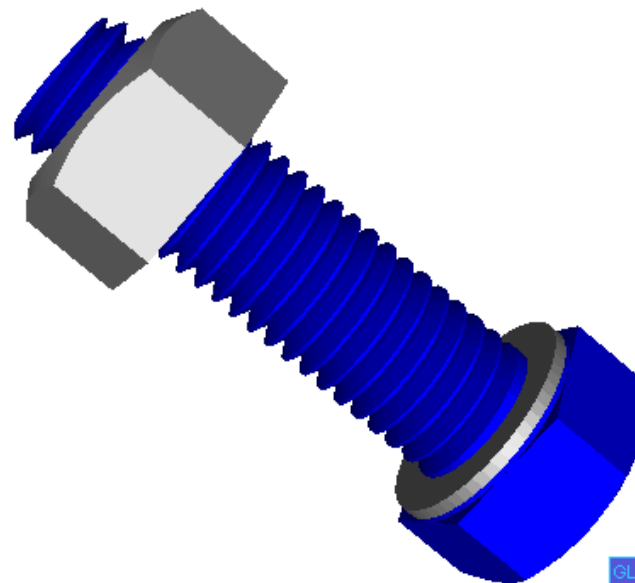
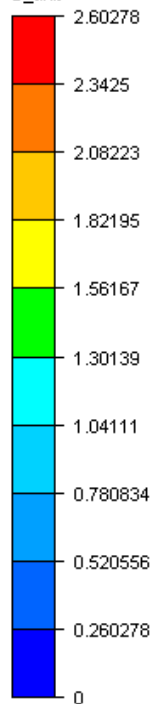


MODELOWANIE 4D

View 1
Case 1 [zrywanie.don]

Frin [25]

S_unit



Frame: 1/65
Time: 0
TIME: 0.000 , H: 72.50 , INC: 0

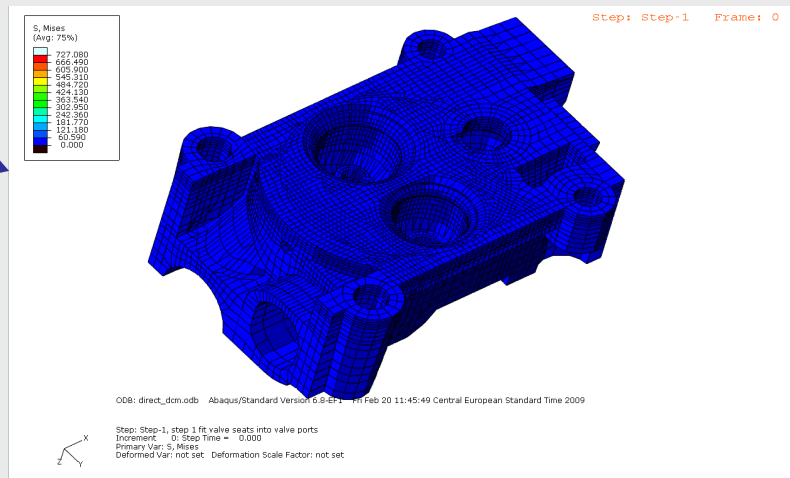
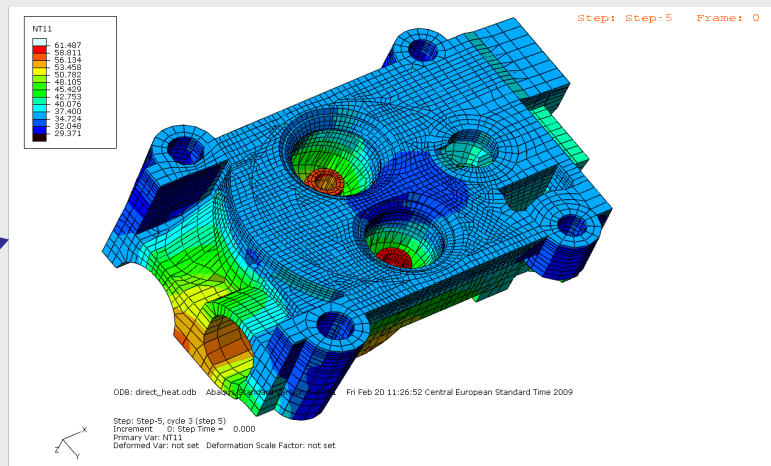
GLview Inova 2006-09-07
AT: FORGE3 V7.1.1 ZRYWANIE_LM_2/ZRYWANIE
Frin: EQ_STRAIN [3D element]



Modelowanie warunków eksploatacji

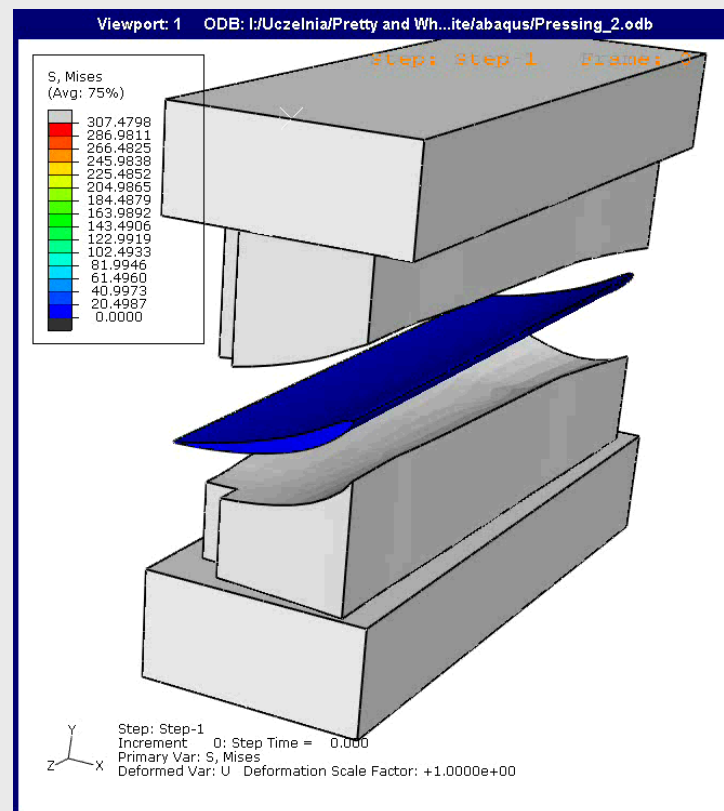
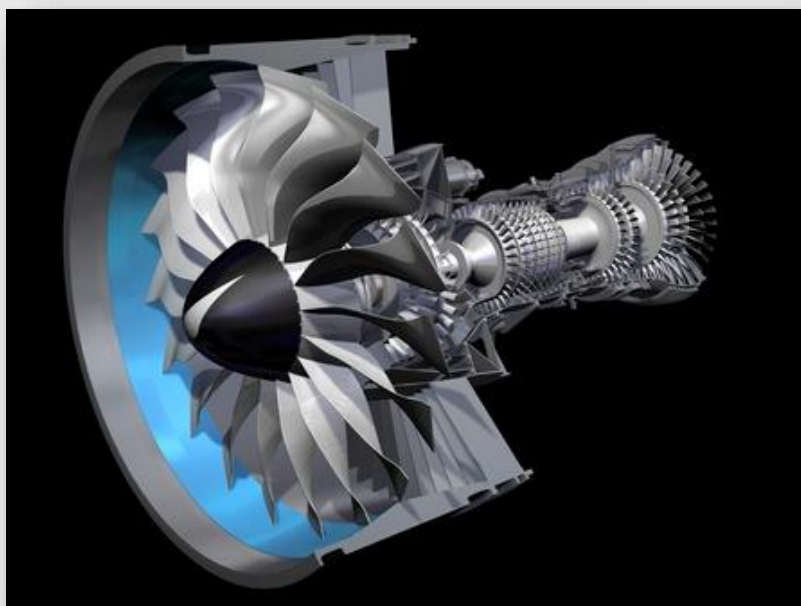


Motor i naprężenia termiczne





Tłoczenie płatów silnika odrzutowego

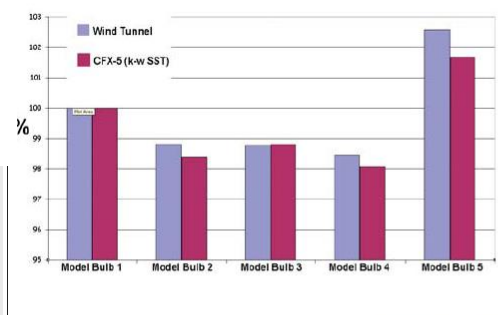
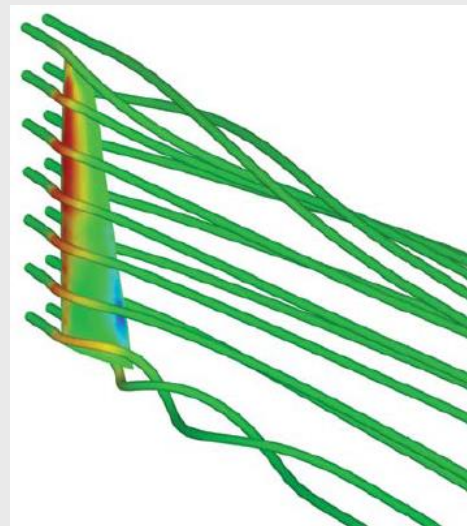




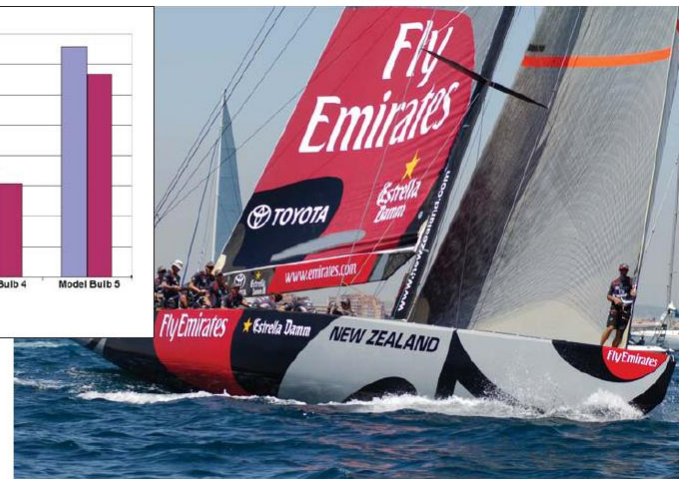
American Cup – modelowanie przepływów



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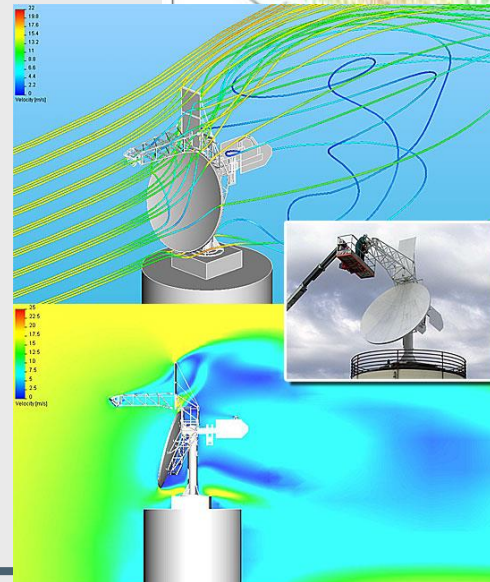
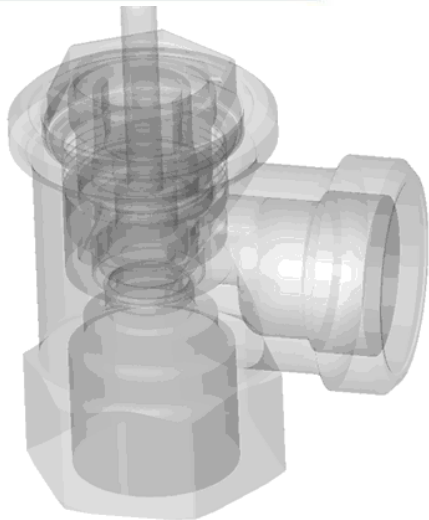
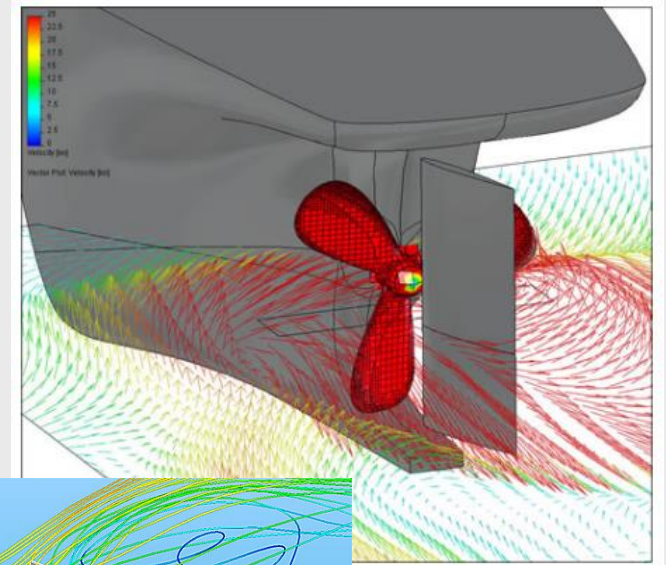
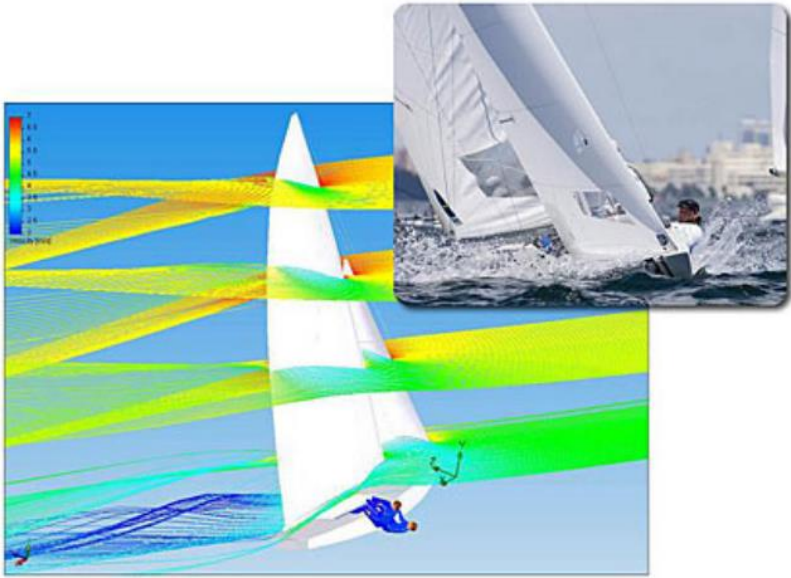


Comparisons of CFX predictions with wind tunnel data for drag forces on different designs of bulb.





Other flow models– modelowanie opływów





SLK 320 CDI
TRITURBO

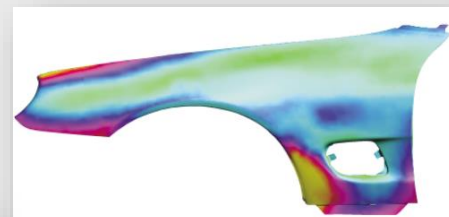
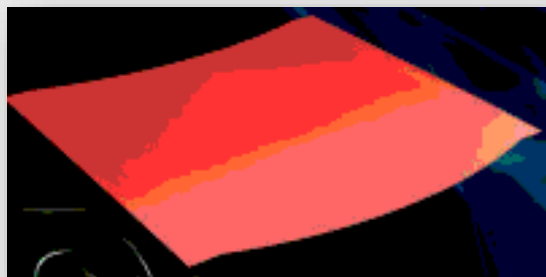
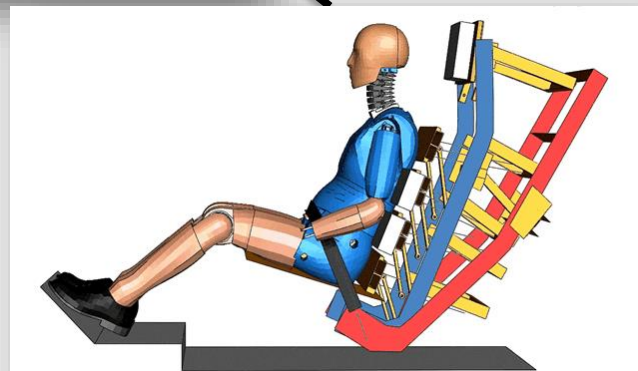
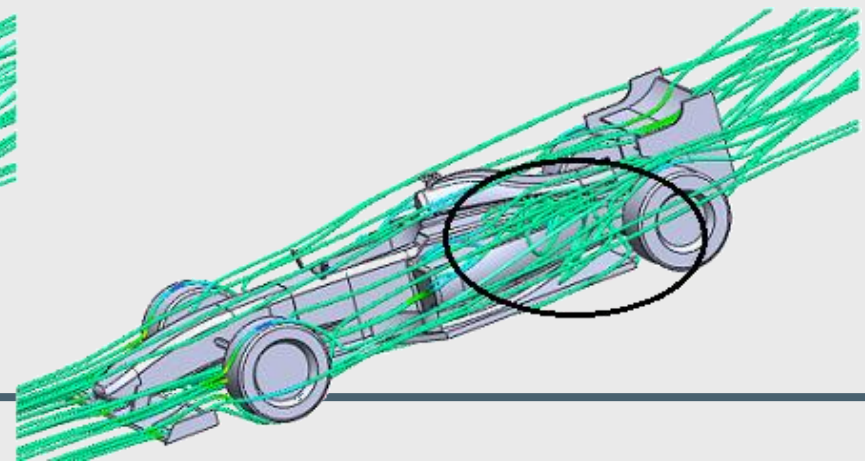
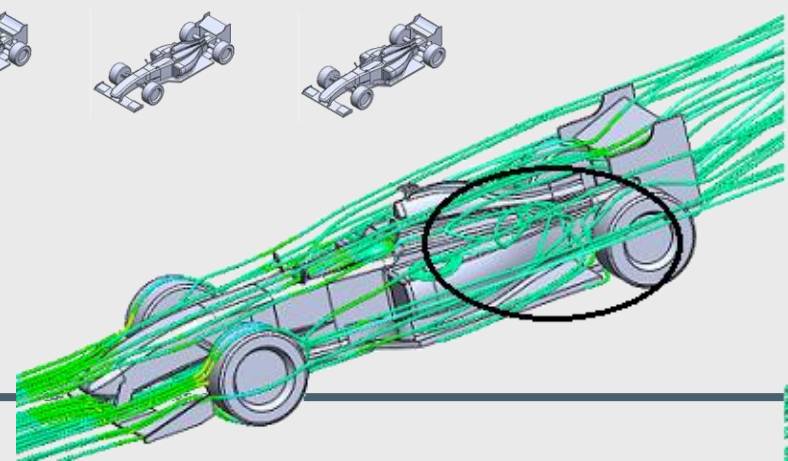
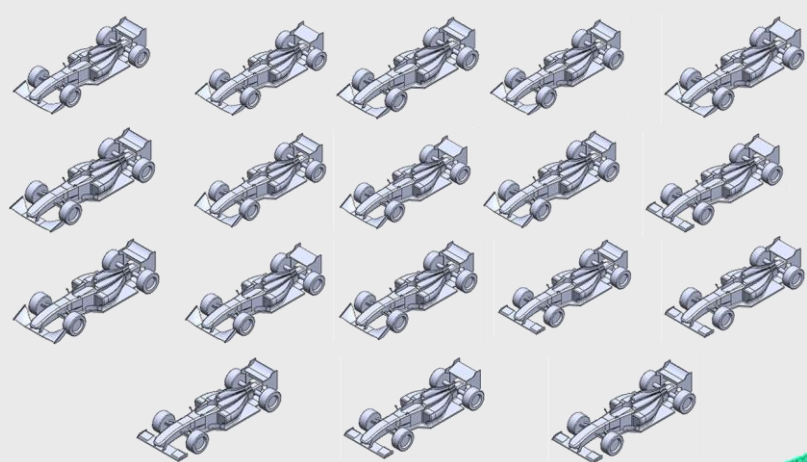
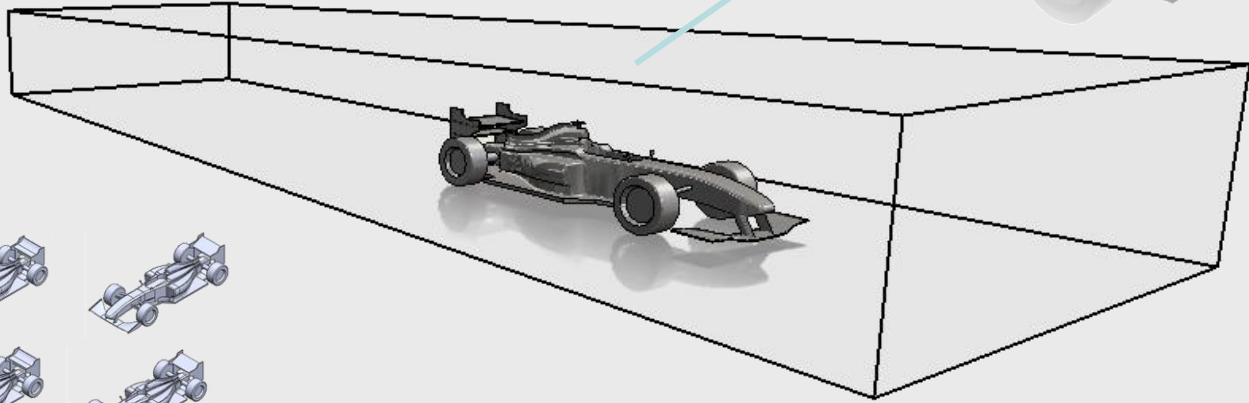
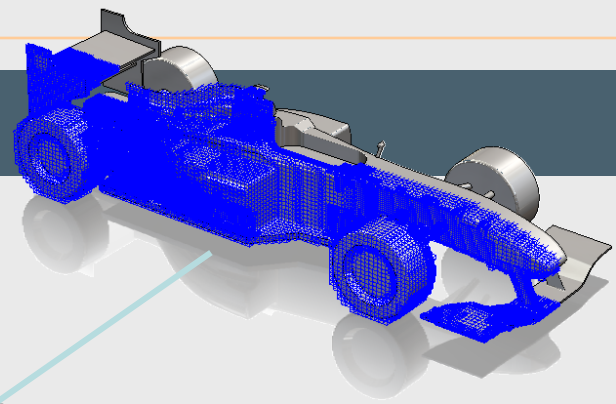
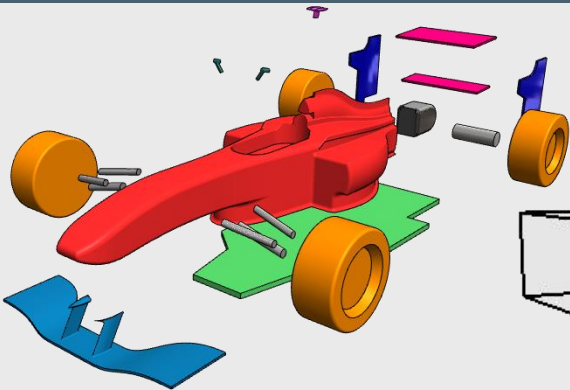


Figure 7. Unconstrained springback: variation of normal displacement on front fender (Courtesy of DaimlerChrysler)



Figure 8. Process capability Cpk, with respect to defined tolerance limits for acceptable springback







https://www.youtube.com/watch?v=xoVMQgH_qYc

<https://www.youtube.com/watch?v=Fyd8ld2s76A>

<http://euroforge-confair.com/>

<https://youtu.be/uo0HpFmPuqs>



Błędy modelowania





Jak opisać zachowanie się różnych materiałów?

Metody rozwiązywania
Modele materiałowe

