

Uniwersytet Przyrodniczy w Poznaniu
Wydział Technologii Drewna
Katedra Meblarstwa
 www.up.poznan.pl/km

CAX w przemyśle meblarskim

prof. dr hab. inż. JERZY SMARDZEWSKI

1

Wytwory natury



2

Venus paleolityńska – Kostienki (Ukraina) 19000 p.n.e.



3

Scara Brae – Szkocja 4500 p.n.e.



4


Tron Tutenchamona 1325 p.n.e.

DREWNO, ZŁOTA BLACHA, SREBRO, PASTA SZKLANA
 I PÓLSZACHETNE KAMIEŃ. WYSOKOŚĆ 102 CM,
 DŁUGOŚĆ 94 CM, SZEROKOŚĆ 80 CM



5

Grecja, klismos i thronos 430 – 50 p.n.e.



6

Georg Happlewhite 1794 r.



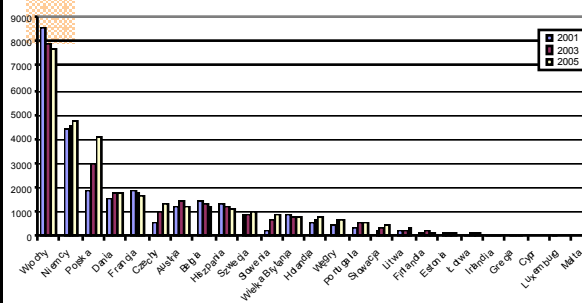
7

Fotel Barcelona, Ludwig Mies Van der Rohe 1927 r.



8

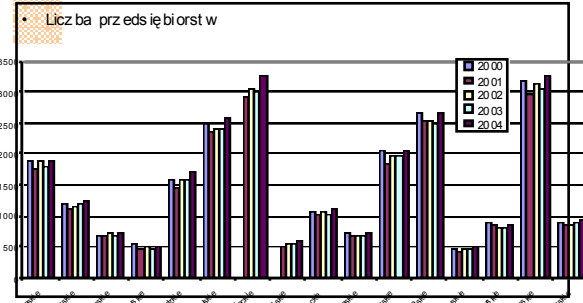
Eksport mebli mieszkaniowych [mln. euro]



Źródło: Eurostat, 2006

9

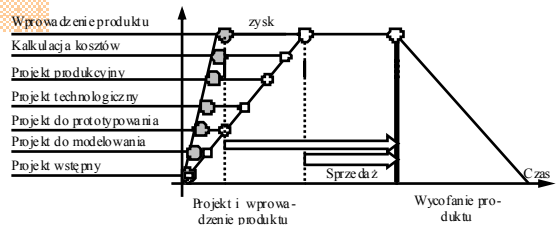
Przemysł meblarski w Polsce



Źródło: Eurostat 2006

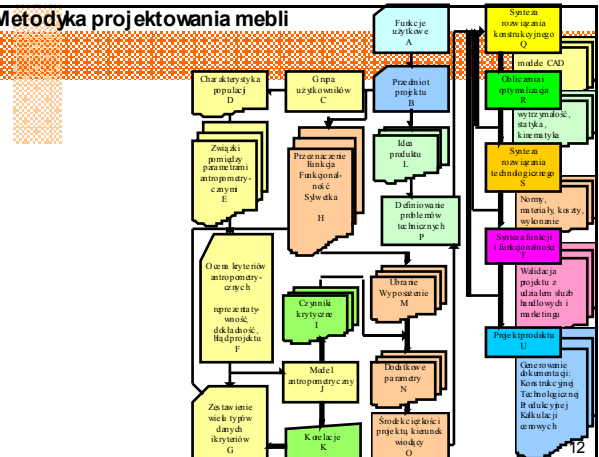
10

Zysk w projektowaniu nowych produktów

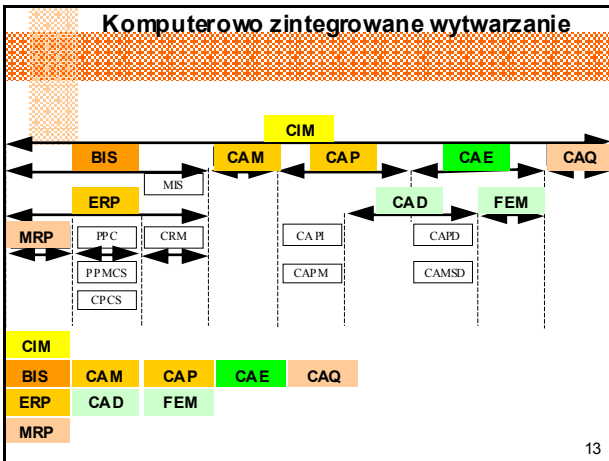


11

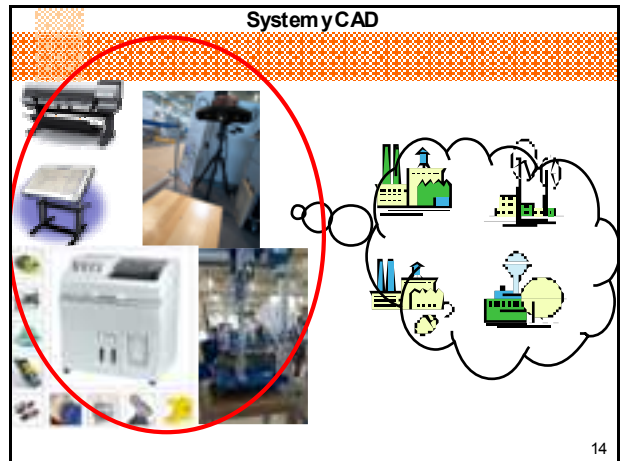
Metodyka projektowania mebli



12



13



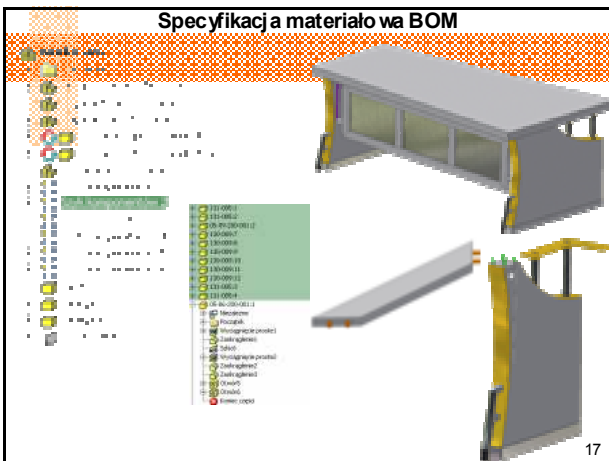
14



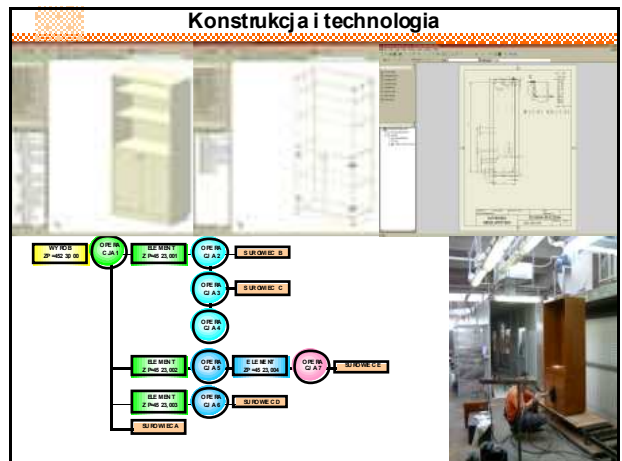
15



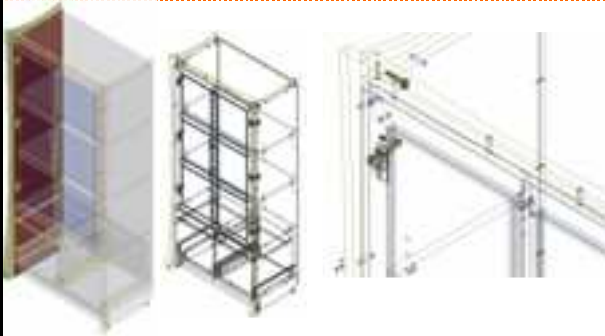
16



17



Więzy parametryzacja



19

Systemy CAD – wersje produktów

Efekt parametryzacji wyrobów gotowych



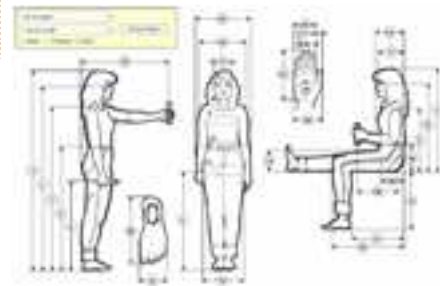
20

Systemy CAD – ergonomia



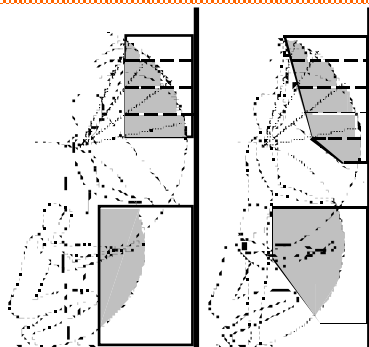
21

Systemy CAD – ergonomia



22

Systemy CAD – ergonomia

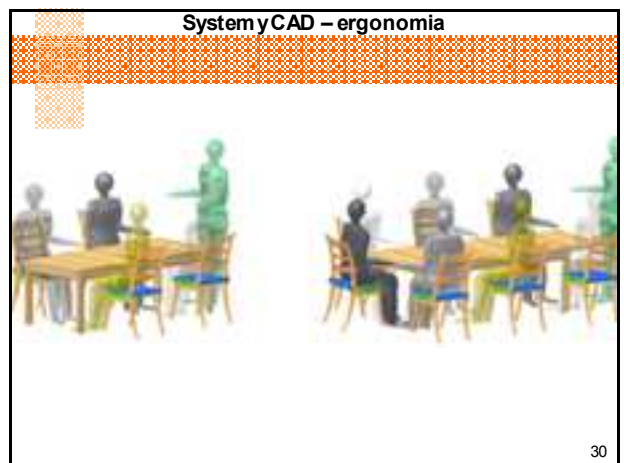
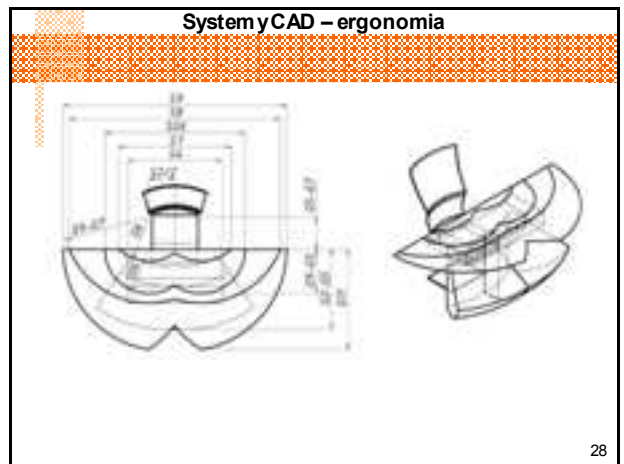
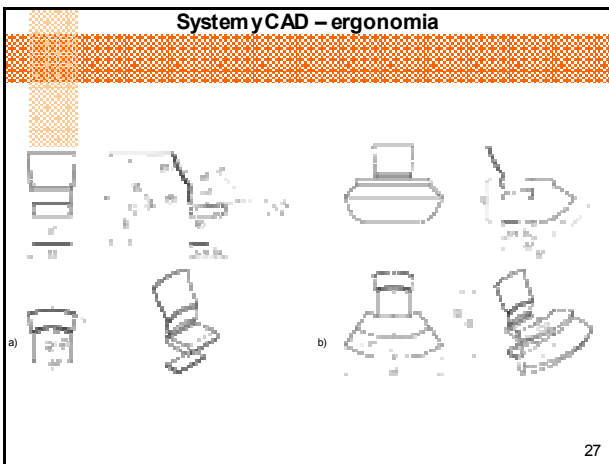
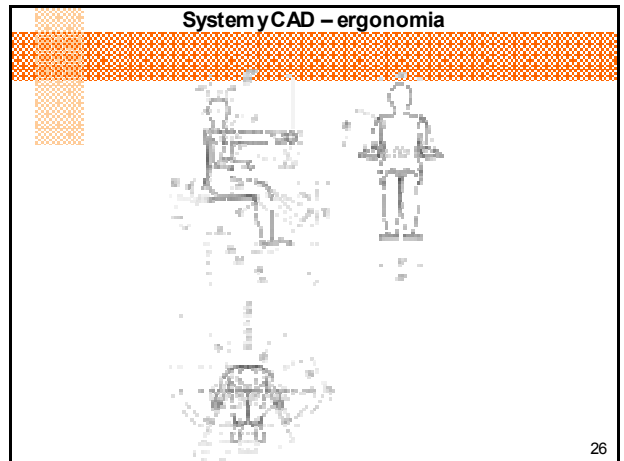
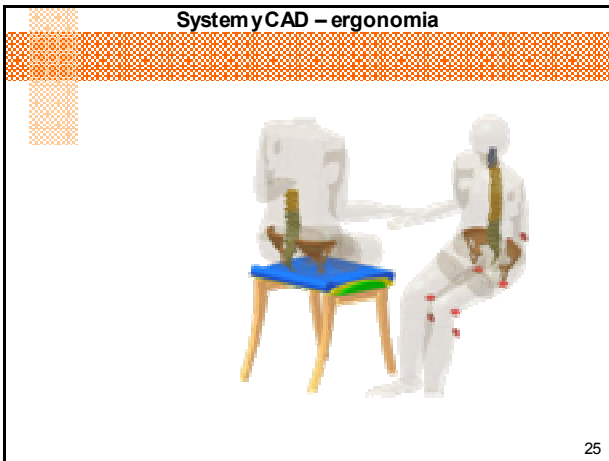


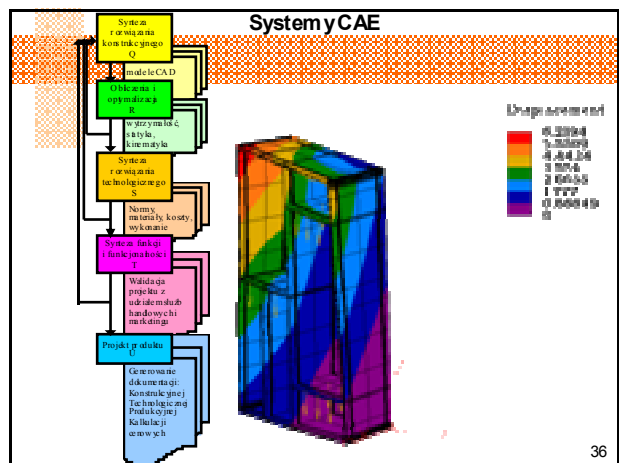
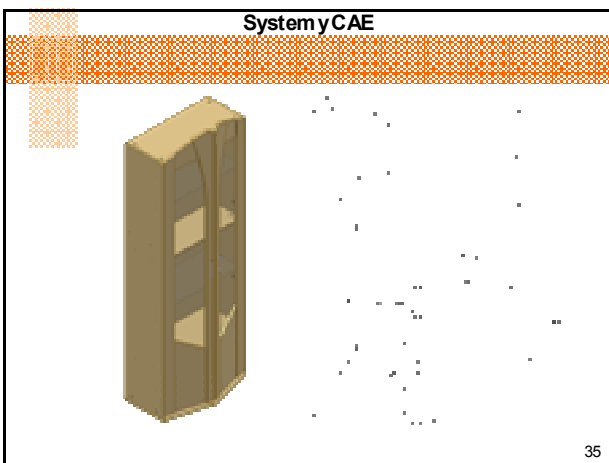
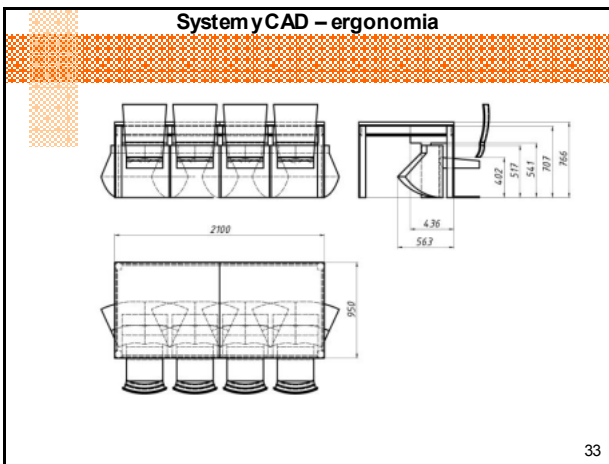
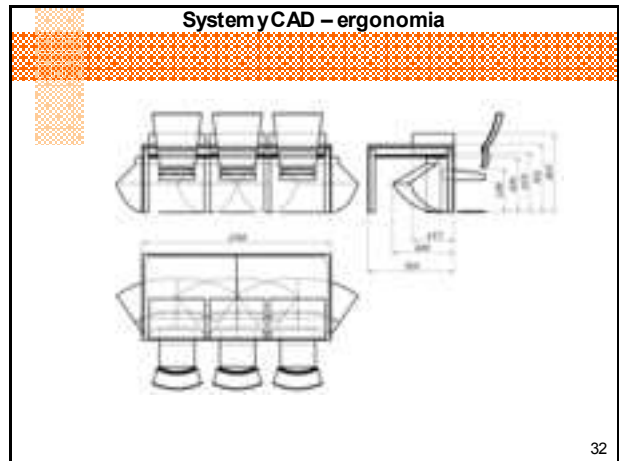
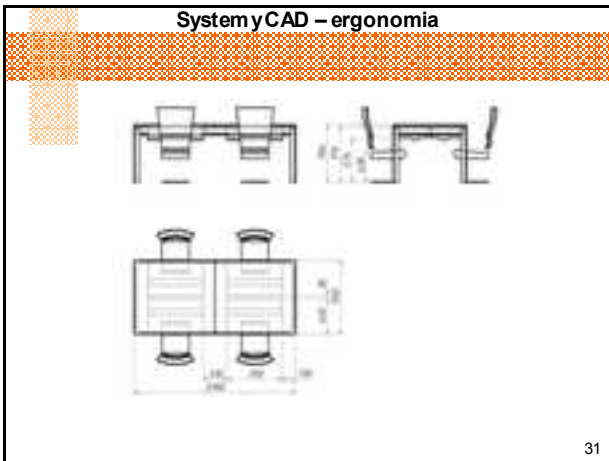
23

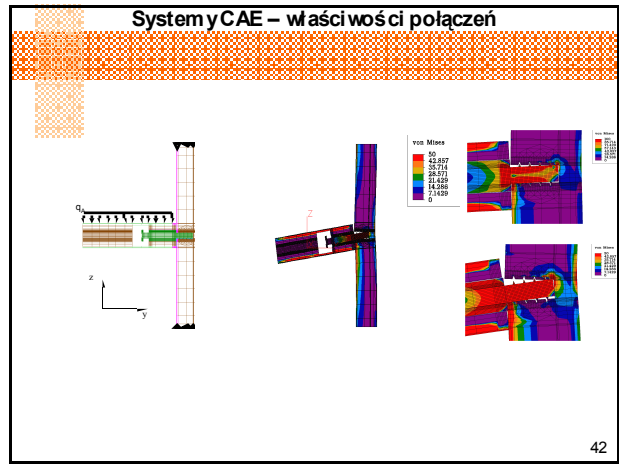
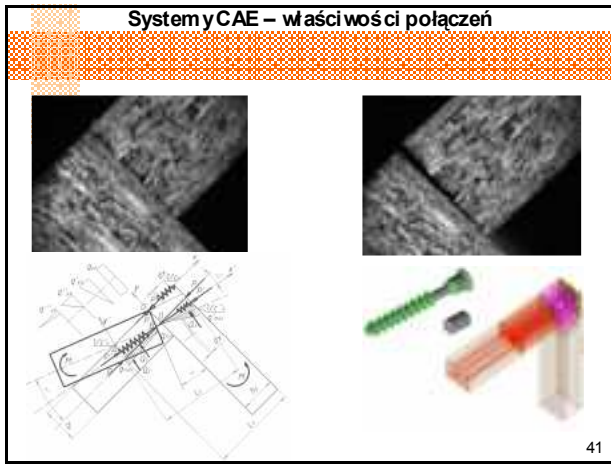
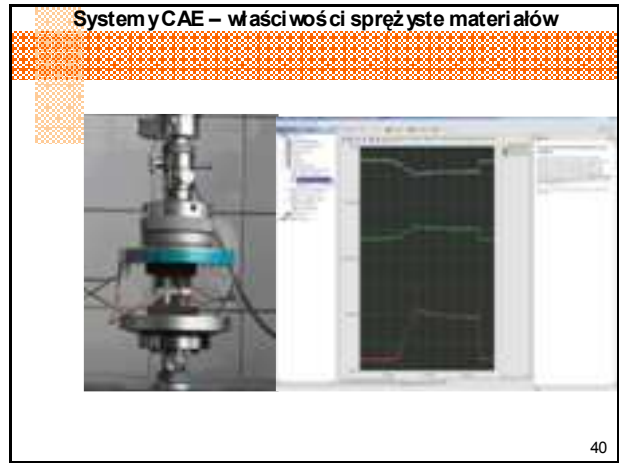
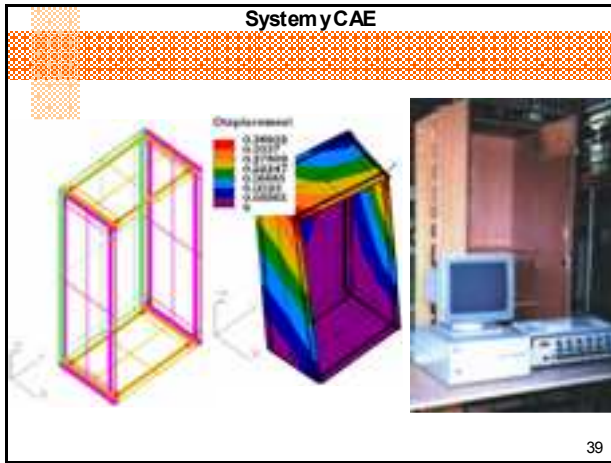
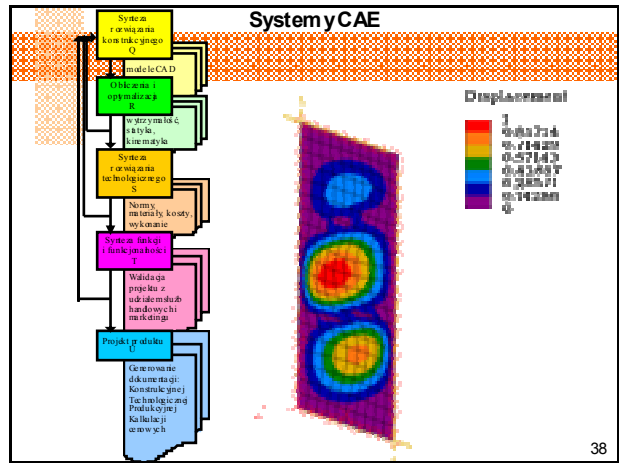
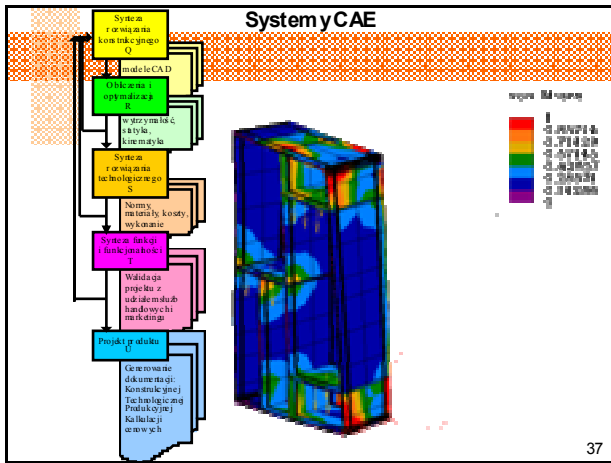
Systemy CAD – ergonomia



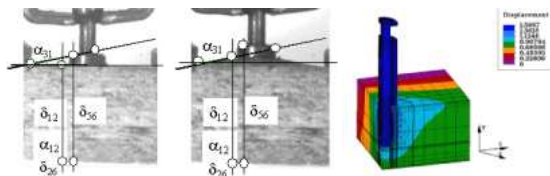
24





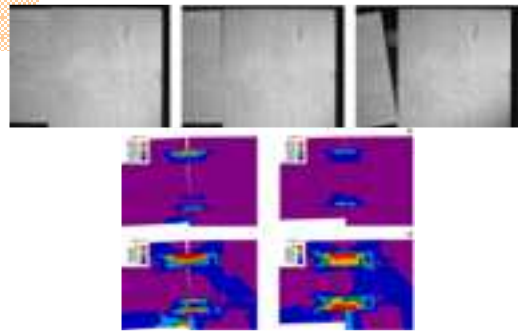


Systemy CAE – właściwości połączeń



43

Systemy CAE – właściwości połączeń



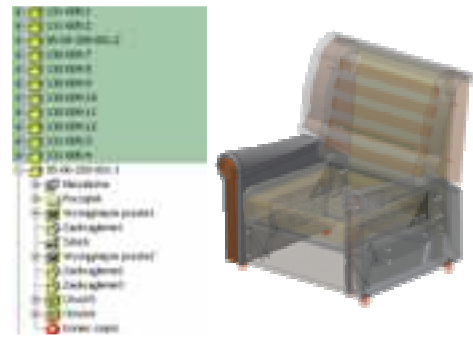
44

Badania atestacyjne



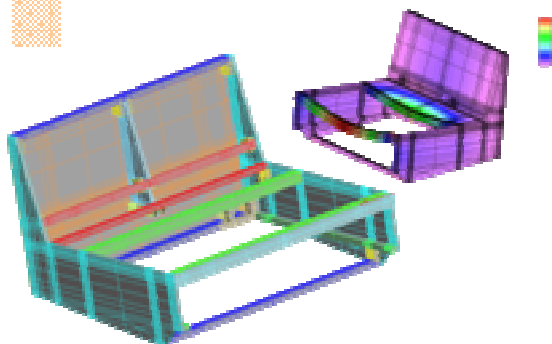
45

Systemy CAE



46

Systemy CAE



47

Systemy CAE



48

Badania atestacyjne



49

Systemy CAE



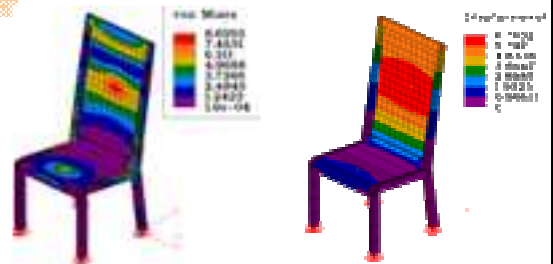
50

Systemy CAE



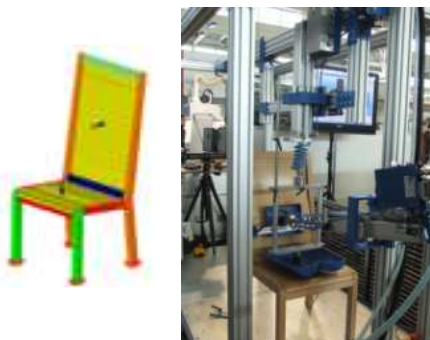
51

Systemy CAE



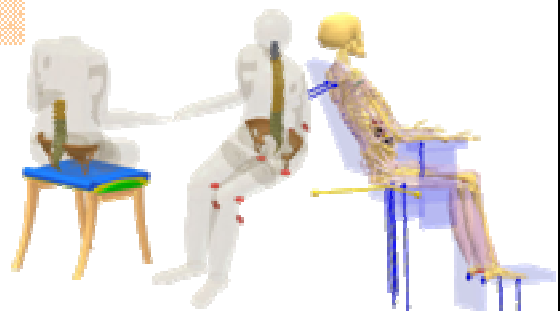
52

Systemy CAE

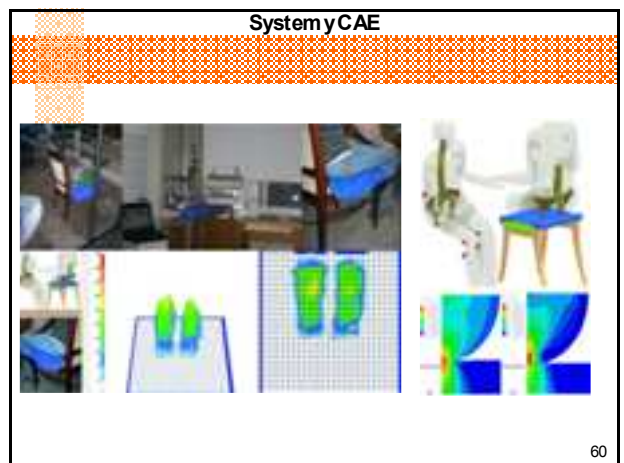
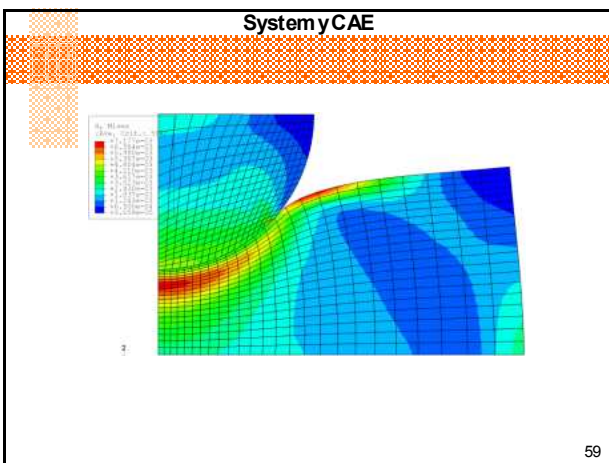
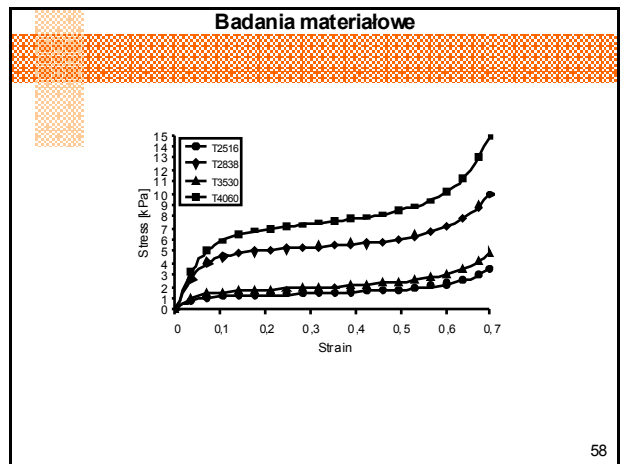
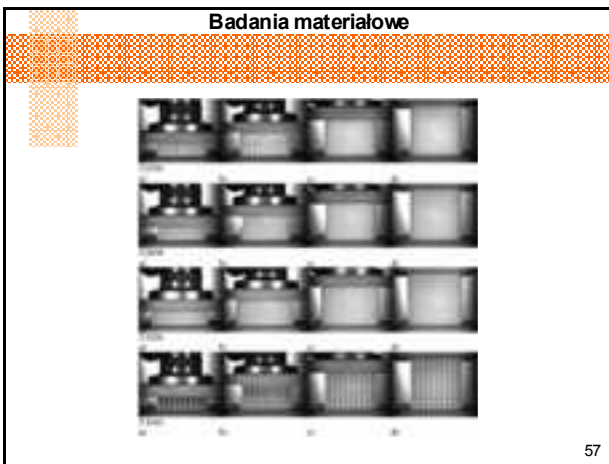
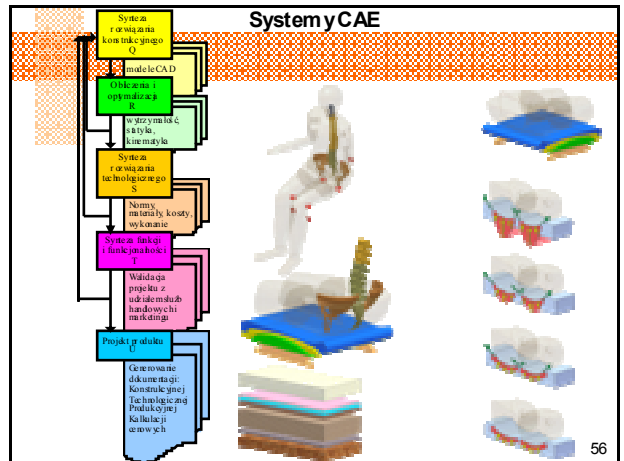
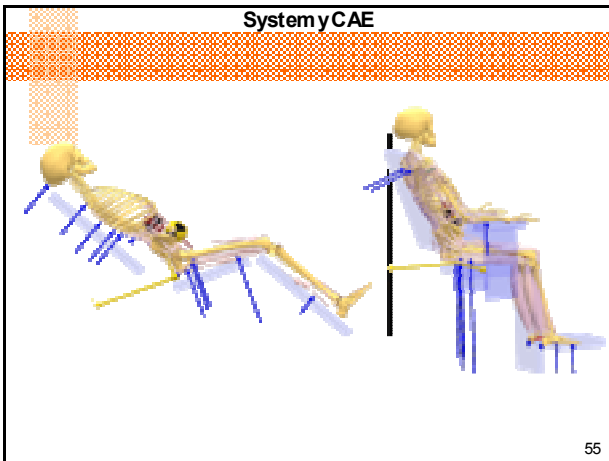


53


Systemy CAE



54



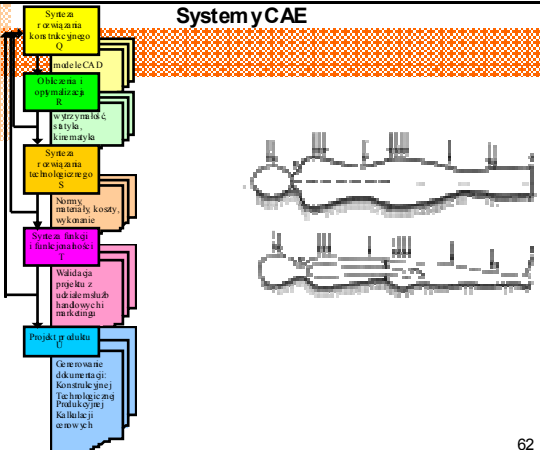
Systemy CAE



fot. www.reblomrak.com.pl

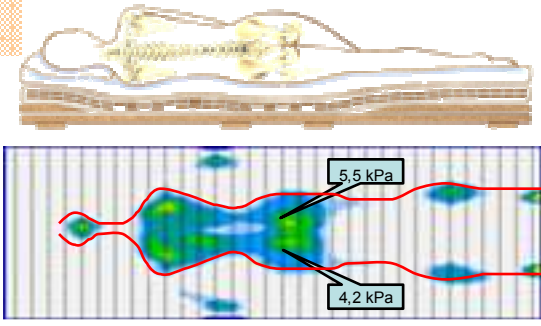
61

Systemy CAE



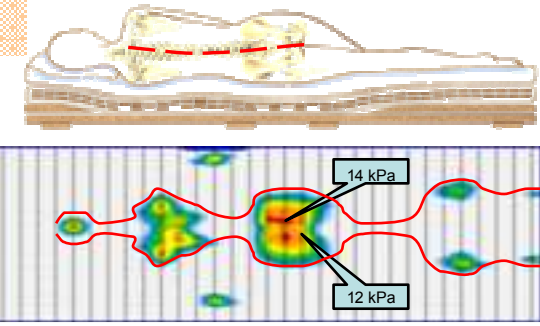
62

Systemy CAE



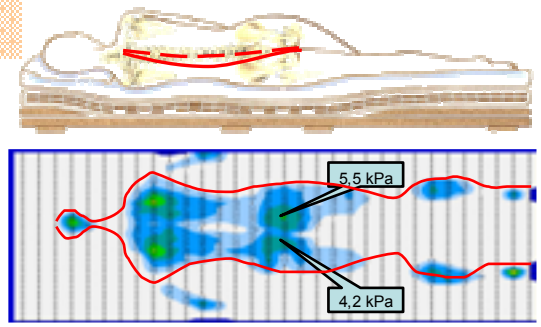
63

Systemy CAE




64

Systemy CAE



65

Systemy CAE



66

System y CAE

67

System y CAE

$$V = U_z - U_w$$

$$U_z = \frac{1}{2} P w(x, y)$$

$$U_w = \frac{1}{2} \int_0^a \int_0^b \left(q_x w(x, y) + M_x \frac{\partial^2 w}{\partial x^2} + M_y \frac{\partial^2 w}{\partial y^2} \right) dx dy$$

$$w_{\max} = \frac{2\sqrt{4} P D^2}{(D^2 k_1 + 32 k_g)} e^{-\beta z}$$

68

System y CAE

$$k = \frac{1}{\frac{4mn}{GJ^2 (R_2^m - R_1^m)} \int_0^{R_2} R^{m+2} dR}$$

69

System y CAE

70

System y CAE

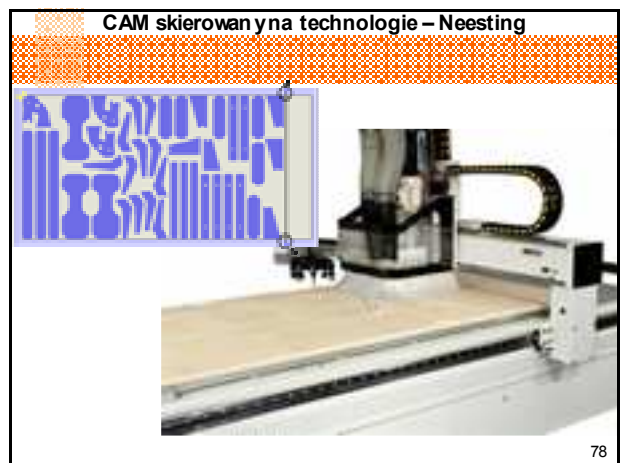
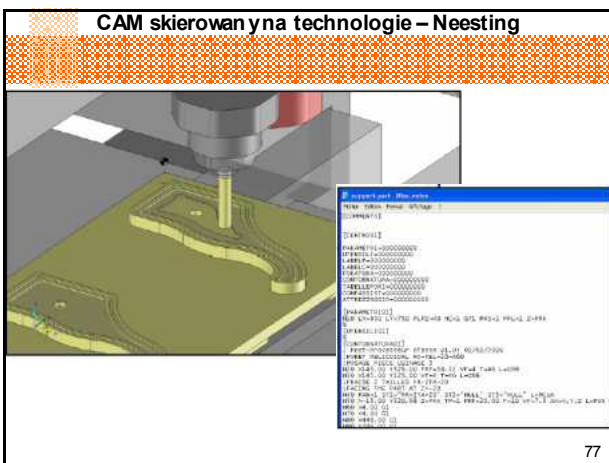
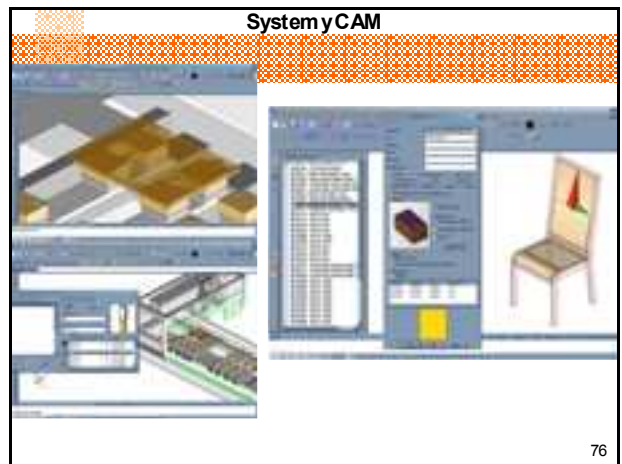
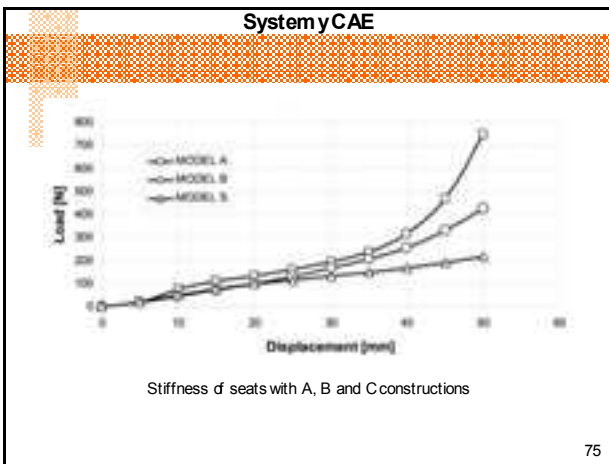
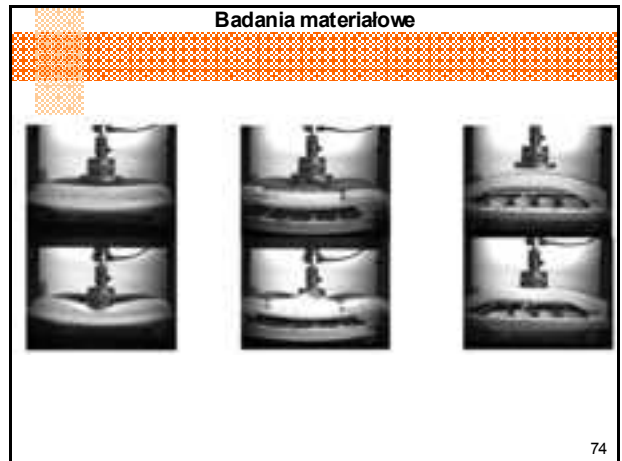
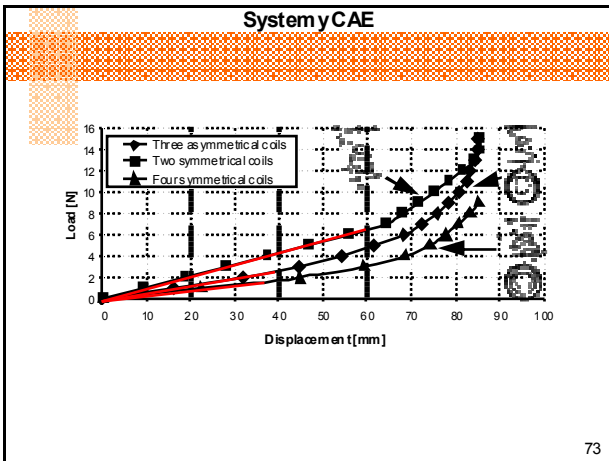
Example of a beam model of finite elements for a dual conical spring

71

System y CAE

Example of deformation and subsidence of active coils in the dual conical spring model

72

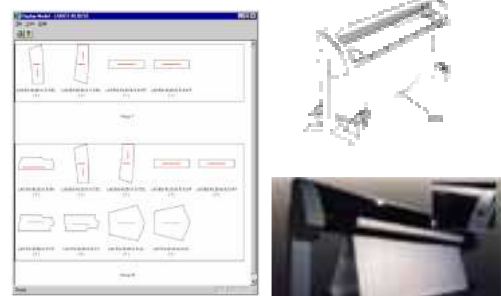


Interfejsy do programów optymalizujących rozkroje



79

Szablony dla rozkroju tkanin i skór



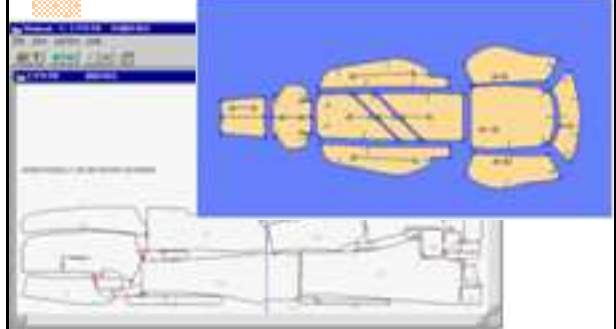
80

Szablony dla rozkroju tkanin i skór



81

Układy kroju tkanin



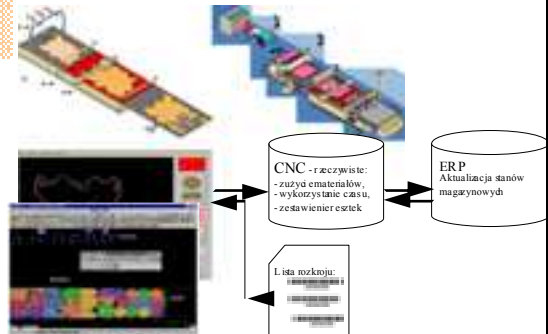
82

Układy kroju tkanin



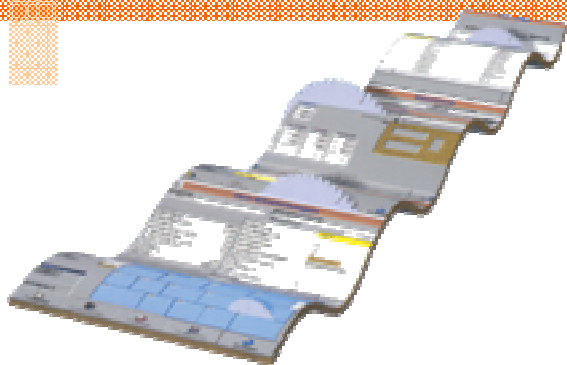
83

Systemy CAM



84

Lista części i zlecenia produkcyjne



85

CAQ - Straty z powodu niedostatecznej jakości

Straty widoczne:

1. wady nienaprawialne,
2. poprawki,
3. zwroty od klientów.

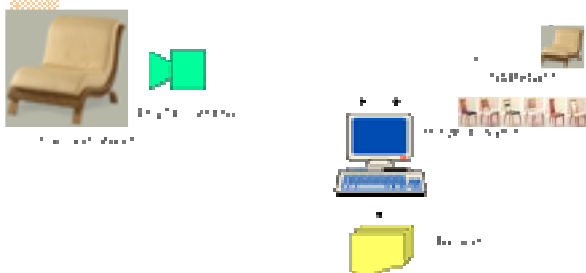
Straty ukryte:

1. reklamacje klientów
2. roszczenia klientów
3. nadgodziny
4. zaległości płatnicze
5. zmarnowany wysiłek i nakłady
6. opóźnienia
7. zwiększone zapasy
8. nadmierny potencjał
9. utrata lojalności klientów
10. utrata potencjalnych klientów



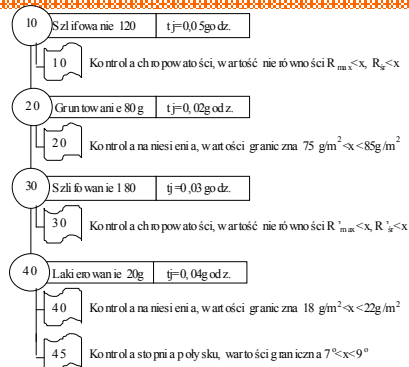
86

DIC w ocenie jakości mebli



87

Plan kontroli jakości



88

Systemy CAQ



89

Systemy CAQ



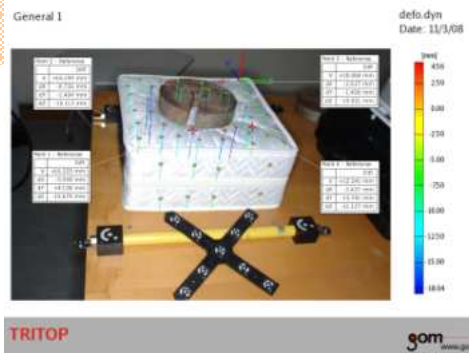
90

System yCAQ



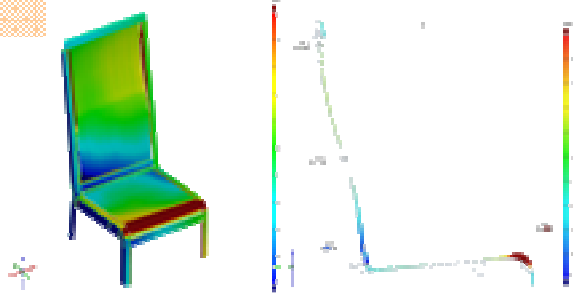
91

System yCAQ



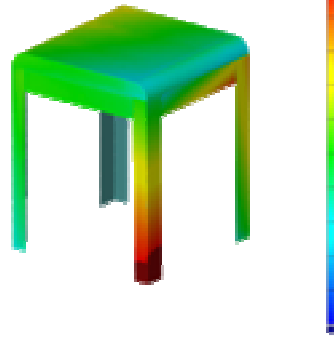
92

System yCAQ



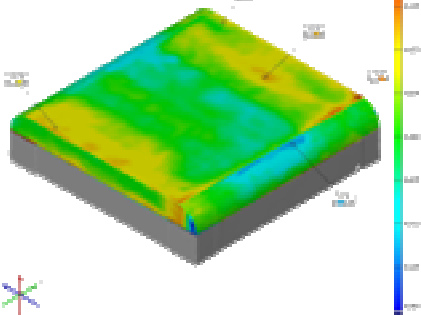
93

System yCAQ



94

System yCAQ

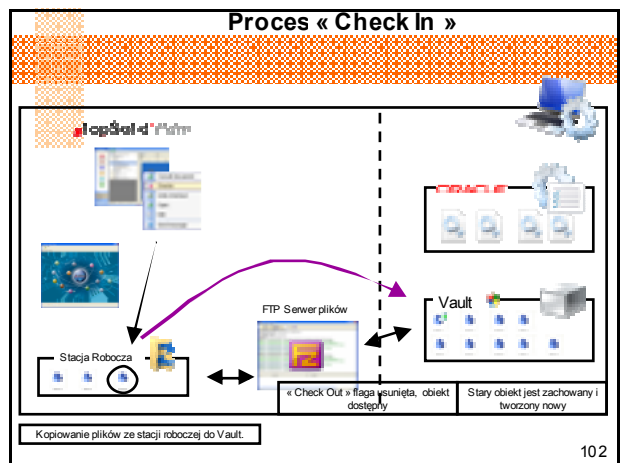
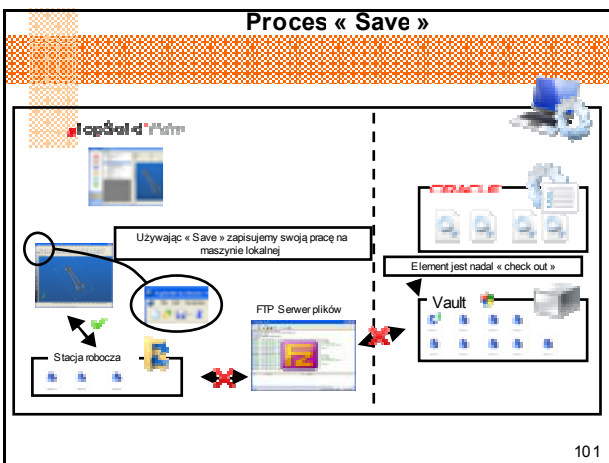
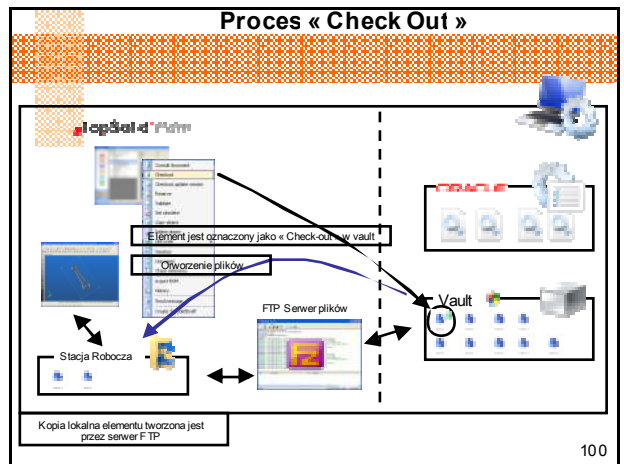
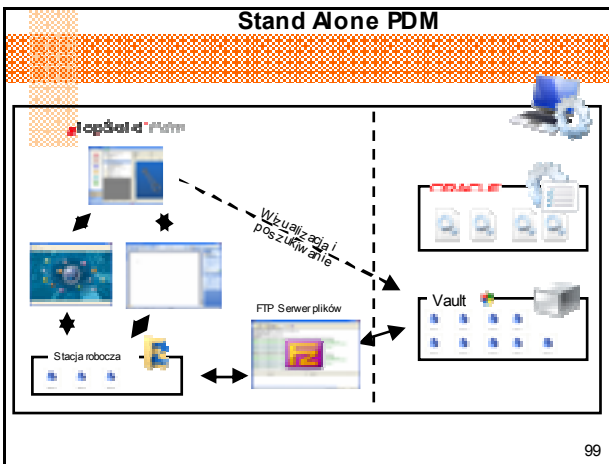
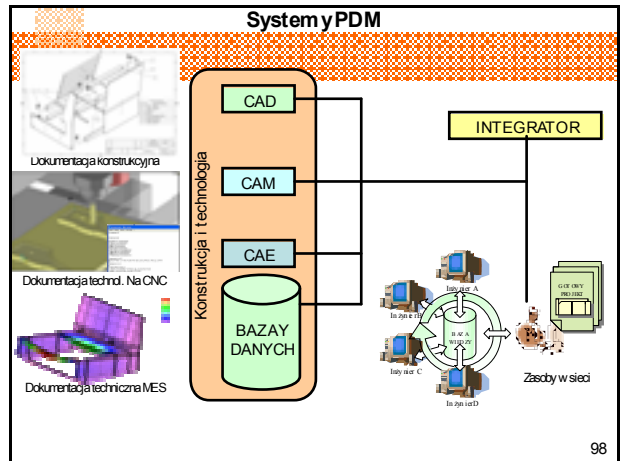
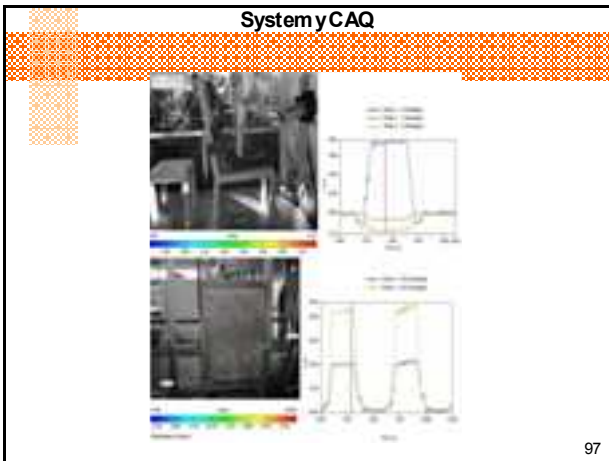


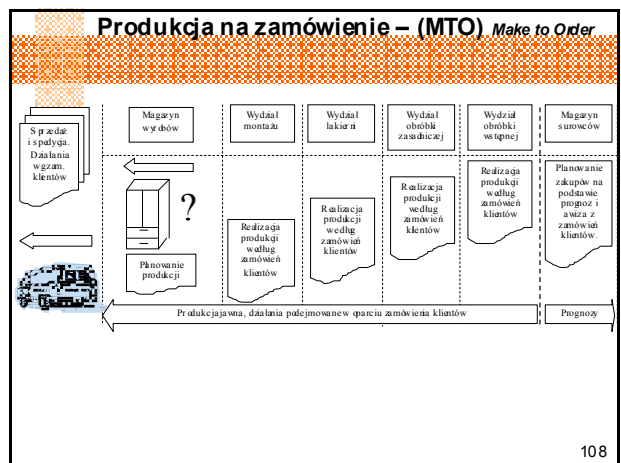
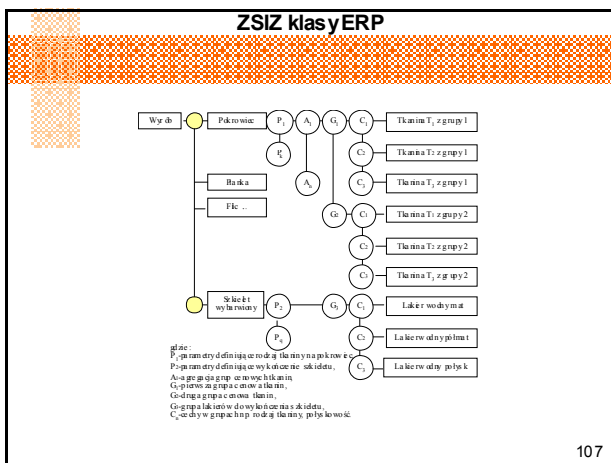
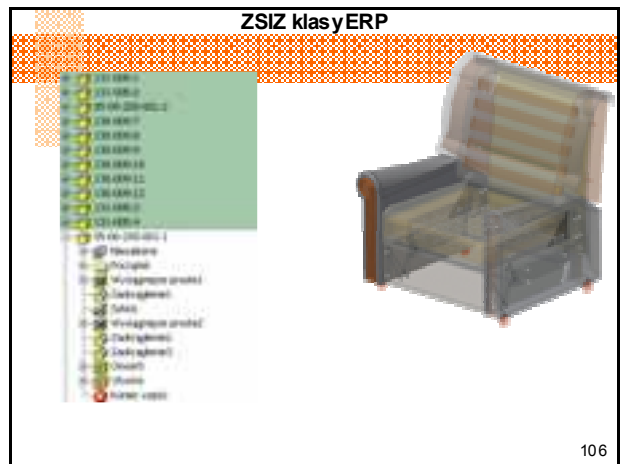
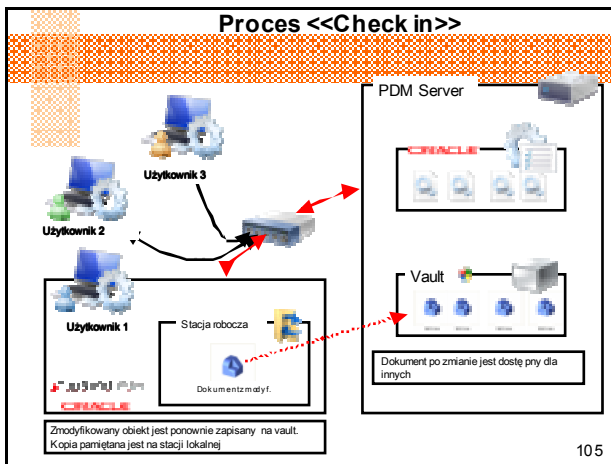
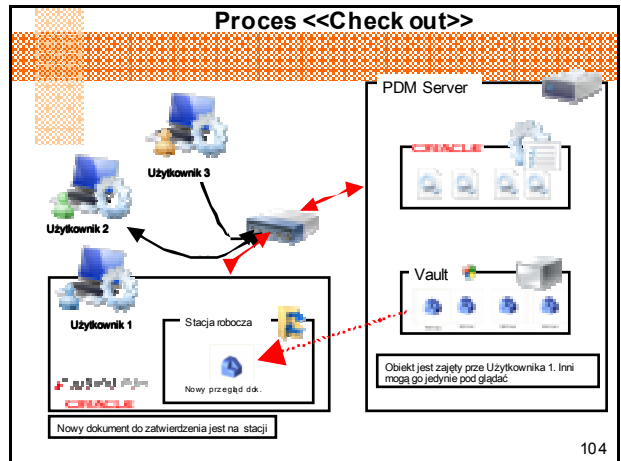
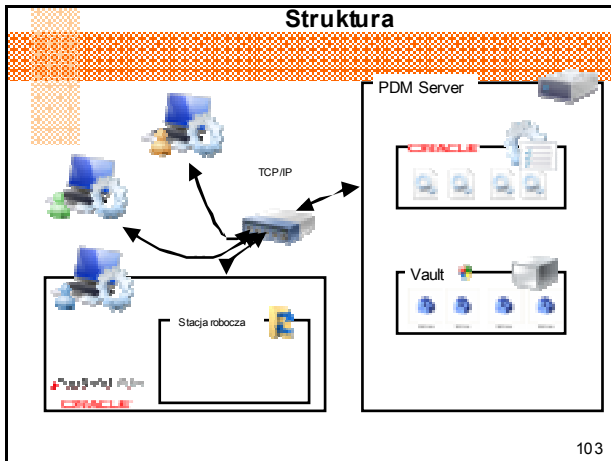
95

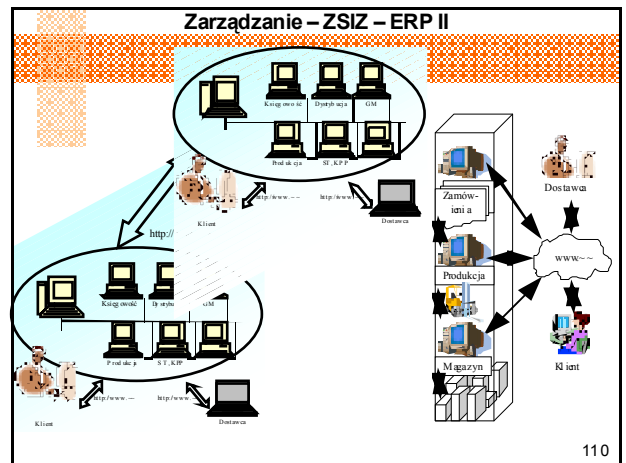
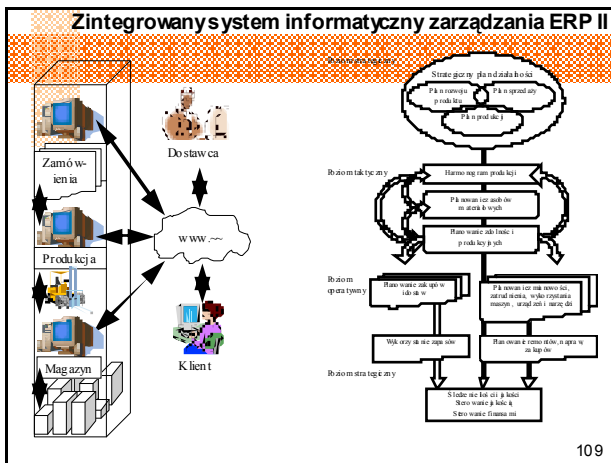
System yCAQ



96









Dziękuję za życzliwą uwagę