University of Tuzla,
Faculty for Mechanical Engineering, Postgraduate study
Modelling, Simulation, Optimisation

Design Integration for Screw Compressors

Part 3:
CAD Systems, DISCO Software overview

Ahmed Kovačević

Centre for Positive Displacement Compressor Technology
City University London, UK

a.kovacevic@city.ac.uk *www.city-compressors.co.uk*

Methods and Tools in Screw compressor design

- **2-D design tools -** Conventional approach
  - **SCORPATH** (**S**crew **CO**mpressor **R**otor **P**rofiling **a**nd **TH**ermodynamics)
  - **2-D CAD Software: AutoCad, …**
- **3-D design tools -** More modern approach
  - **SCORPATH** (**S**crew **CO**mpressor **R**otor **P**rofiling **and TH**ermodynamics)
  - **3-D CAD** **MDT, Inventor, Catia, Solid Works, Pro Engineer**
  - **SCORG** (**S**crew **CO**mpressor **R**otor **G**rid)
  - **CCM (CFD)** **Comet, Star, CFX, Fluent …**
- **3-D design management -** Concurrent approach
  - **DISCO** (**D**esign **I**ntegration for **S**crew **CO**mpressors)

Overview of modern CAD systems

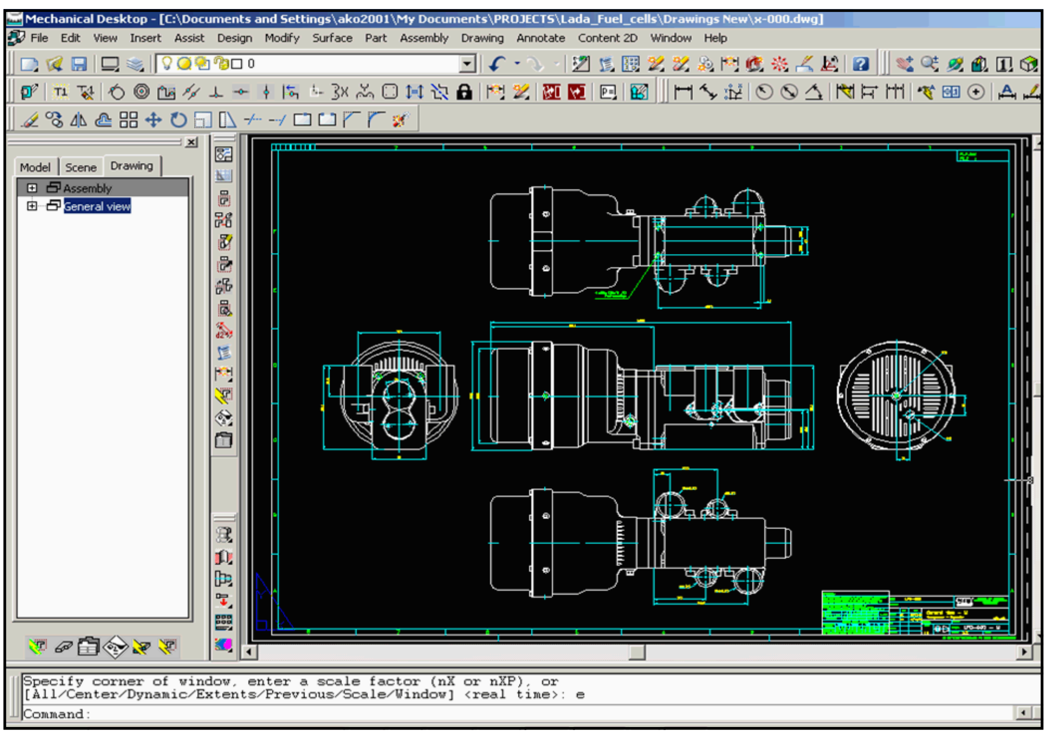
- Integrated Computer Aided Engineering tools
- Incorporate CAD, CAM, and other applications
- User friendly icon based graphical user interfaces
- Based on Variational/ Parametric technology
- Encourage design flexibility and design reuse
- Support Knowledge Based Design
- Allow user applications to be inserted through programmable interface

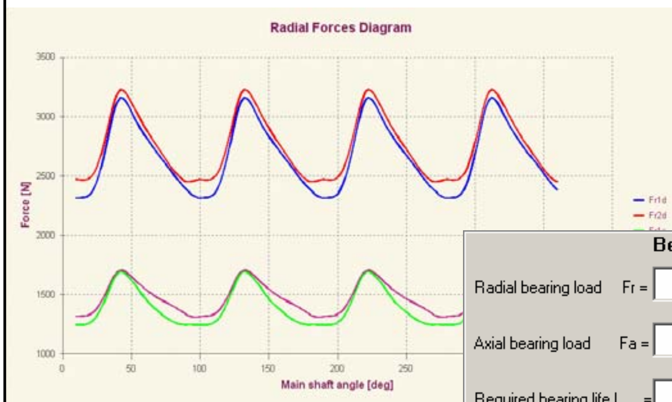
Philosophy of modern CAD Systems

- A Flexible Modelling environment
  - Ability to easily modify models, and implement design changes
  - Support for data sharing, and data reuse
- Knowledge enabled
  - Capture of design constraints, and design intent as well as final model geometry
  - Management of non-geometric as well as geometric design information
- The 3D Part is the Master Model
  - Drawings, Assemblies and Analyses are associative to the 3D parts. If the part design changes, the downstream models with change too.

Applications usually included in modern CAD

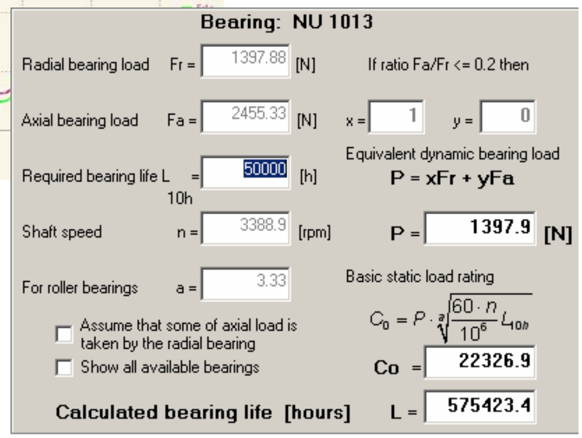
- Product Structure
- Part Design
- Assembly Design
- Sketcher
- Drafting (Interactive and Generative)
- Wireframe and Surface modelling
- Freestyle Shaper
- Digital Shape Editor
- Knowledgeware
- Photo Studio
- 4D Navigator (including kinematics)
- Manufacturing
- Finite Element Analysis
- (CFD – Finite volume)



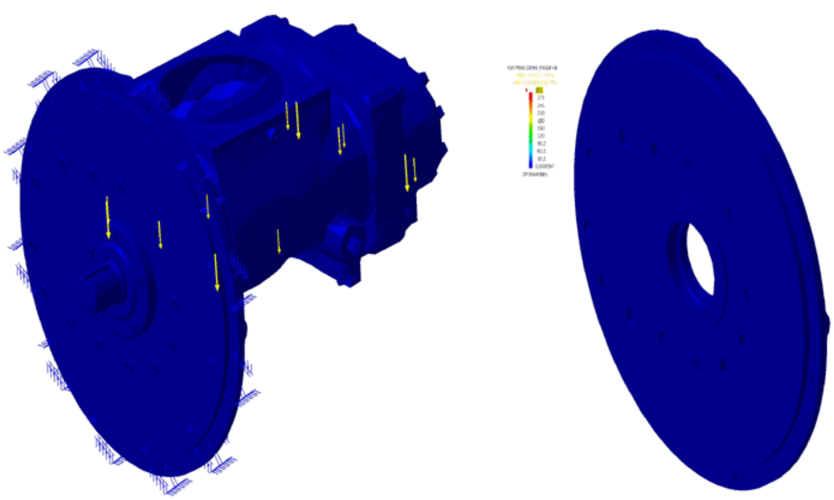


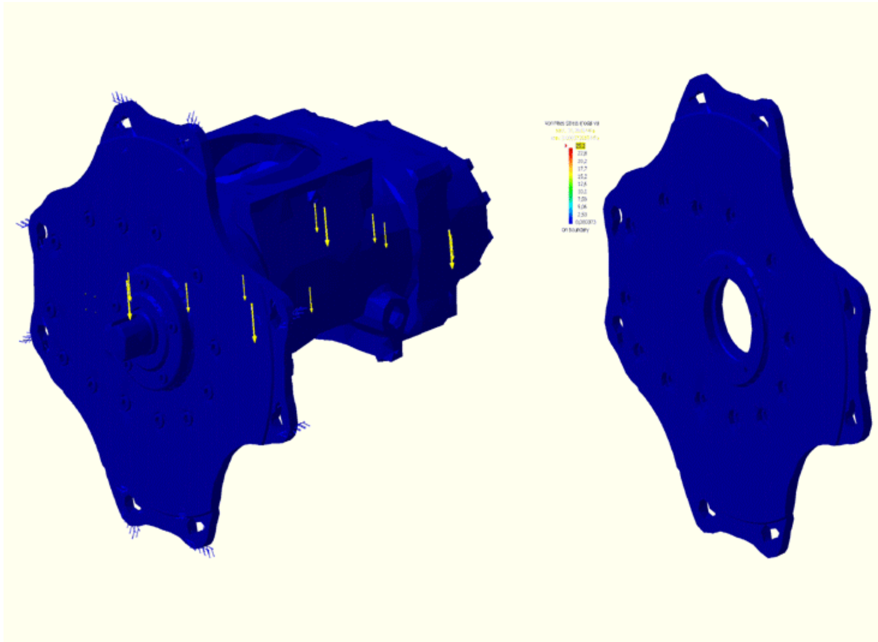
Mechanical calculation Bearing selection, bolts, housing thickness …

- Based on forces calculated in either 1D or 3D
- Using bearing life theory



Finite element calculation





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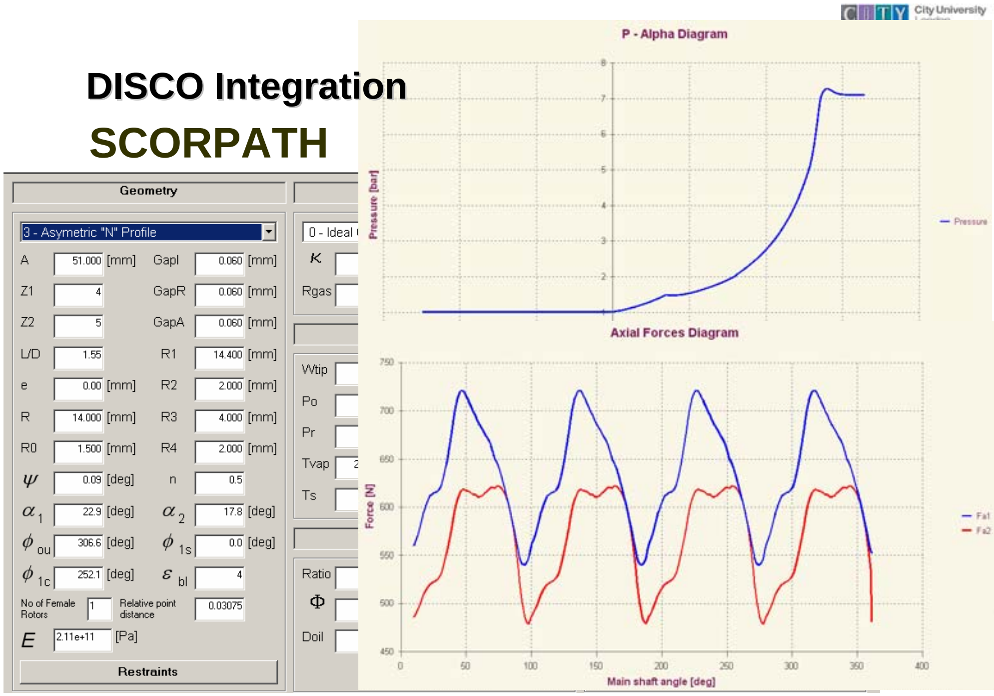
-DISCO **(D**esign **I**ntegration for **S**crew **CO**mpressors**)**

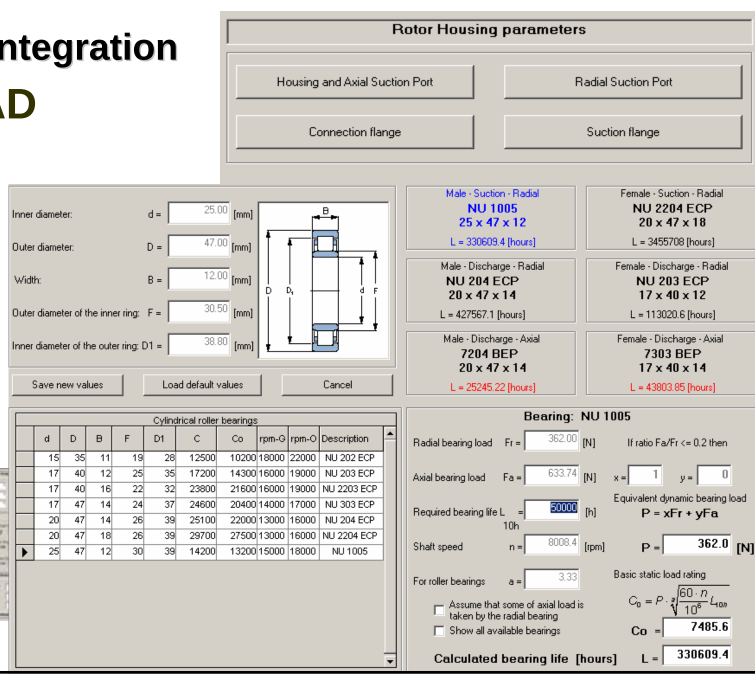
DISCO Integration

SCORPATH

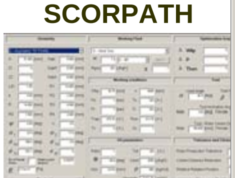


DISCO Integration

SCOCAD



SCORPATH

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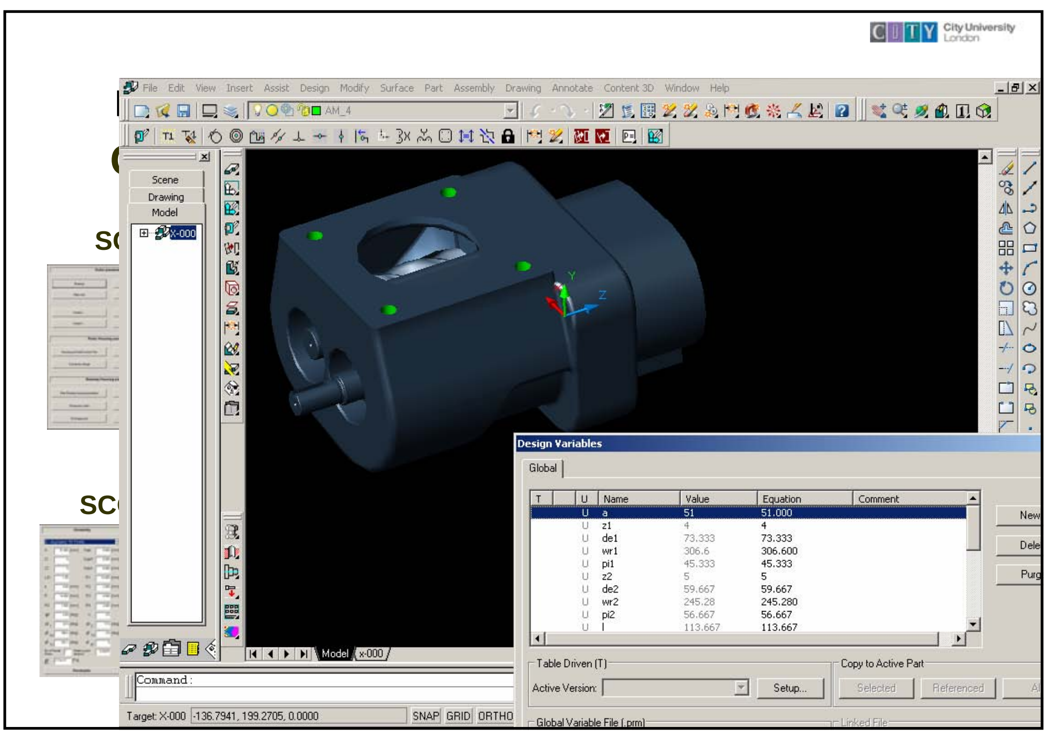
DISCO Integration
SCORG
SCOCAD
SCORPATH
Type of the machine
Number of divisions along the lobe
Number of divisions in the radial direction
Number of divisions in the Z direction
Inlet port
Outlet port
Save
Default value
Rotor
Boundary distribution
Mesh calculation
Rotor mesh calculation
Inlet port calculation
Outlet port calculation
Preprocessor input file generation
Number of time steps to skip before writing the results
K3/K4 factor in the Hermite bidirectional transfinite interpolation
Tension spline parameter
Order of interpolation
Mesh ortogonalization
Coefficient in the mesh ortogonalization procedure
Number of the grid line smoothing iterations
Coefficient for the grid line smoothing procedure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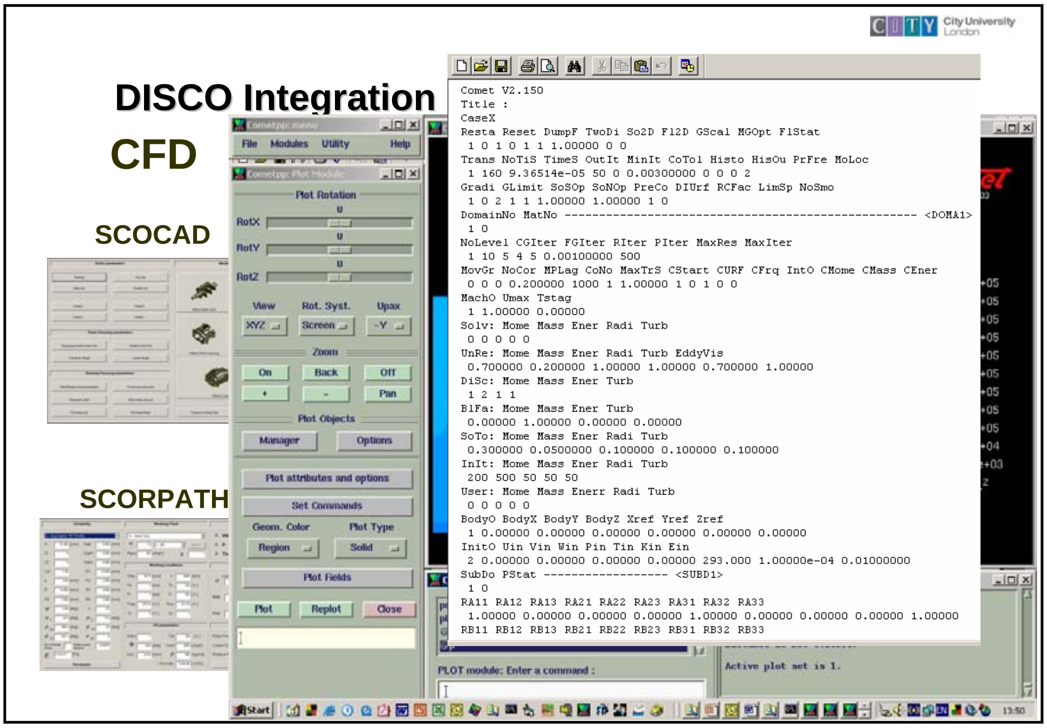
File Edit View Insert Assist Design Modify Surface Part Assembly Drawing Annotate Content 3D Window Help
Scene
Drawing
Model
Design Variables
Global
Name
Value
Equation
Comment
Table Driven (T)
Copy to Active Part
Active Version:
Setup...
Command:
Target: X-000 -136.7941, 199.2705, 0.0000
SNAP GRID ORTHO



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DISCO Integration
CFD
SCOCAD
SCORPATH
Comet V2.150
Title :
CaseX
Resta Reset DumpF TwoDi So2D Fl2D GScal MGOpt FlStat
1 0 1 0 1 1 1.00000 0 0
Trans NoTiS TimeS OutIt MinIt CoTol Histo HisOu PrFre MoLoc
1 160 9.36514e-05 50 0 0.00300000 0 0 0 2
Gradi GLimit SoSOp SoNOp PreCo DIUrf RCFac LimSp NoSmo
1 0 2 1 1 1.00000 1.00000 1 0
DomainNo MatNo -- <DOMA1>
1 0
NoLevel CGIter FGIter RIter PIter MaxRes MaxIter
1 10 5 4 5 0.00100000 500
MovGr NoCor MPLag CoNo MaxTrS CStart CURF CFrq IntO CMome CMass CEner
0 0 0 0.200000 1000 1 1.00000 1 0 1 0 0
MachO Umax Tstag
1 1.00000 0.00000
Solv: Mome Mass Ener Radi Turb
0 0 0 0 0
UnRe: Mome Mass Ener Radi Turb EddyVis
0.700000 0.200000 1.00000 1.00000 0.700000 1.00000
DiSc: Mome Mass Ener Turb
1 2 1 1
BlFa: Mome Mass Ener Turb
0.00000 1.00000 0.00000 0.00000
SoTo: Mome Mass Ener Radi Turb
0.300000 0.0500000 0.100000 0.100000 0.100000
InIt: Mome Mass Ener Radi Turb
200 500 50 50 50
User: Mome Mass Enerr Radi Turb
0 0 0 0 0
BodyO BodyX BodyY BodyZ Xref Yref Zref
1 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
InitO Uin Vin Win Pin Tin Kin Ein
2 0.00000 0.00000 0.00000 0.00000 293.000 1.00000e-04 0.01000000
SubDo PStat ------------------ <SUBD1>
1 0
RA11 RA12 RA13 RA21 RA22 RA23 RA31 RA32 RA33
1.00000 0.00000 0.00000 0.00000 1.00000 0.00000 0.00000 0.00000 1.00000
RB11 RB12 RB13 RB21 RB22 RB23 RB31 RB32 RB33
Plot Rotation
RotX
RotY
RotZ
View
Rot. Syst.
Upax
Zoom
On
Back
Off
Pan
Plot Objects
Manager
Options
Plot attributes and options
Set Commands
Geom. Color
Plot Type
Region
Solid
Plot Fields
Plot
Replot
Close
PLOT module: Enter a command :
Active plot set is 1.

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SCORP
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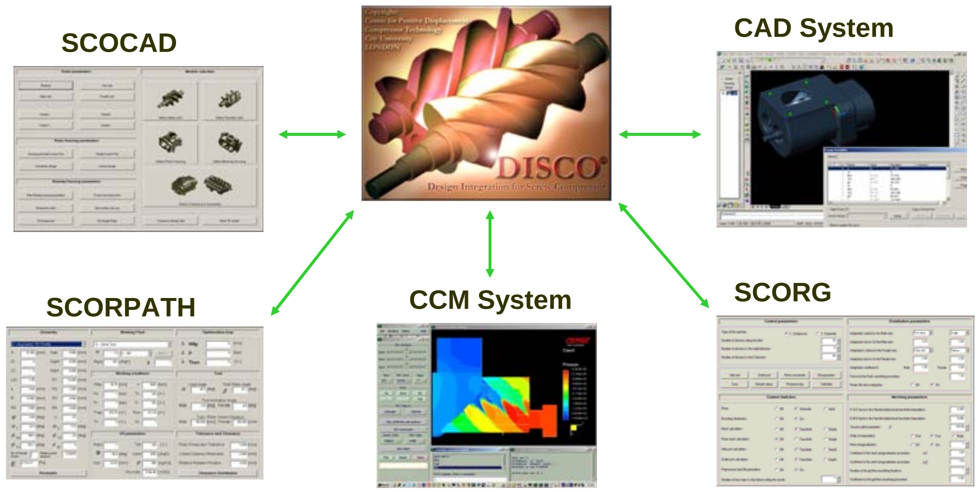
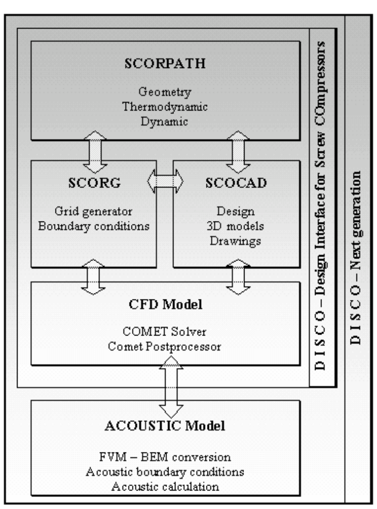
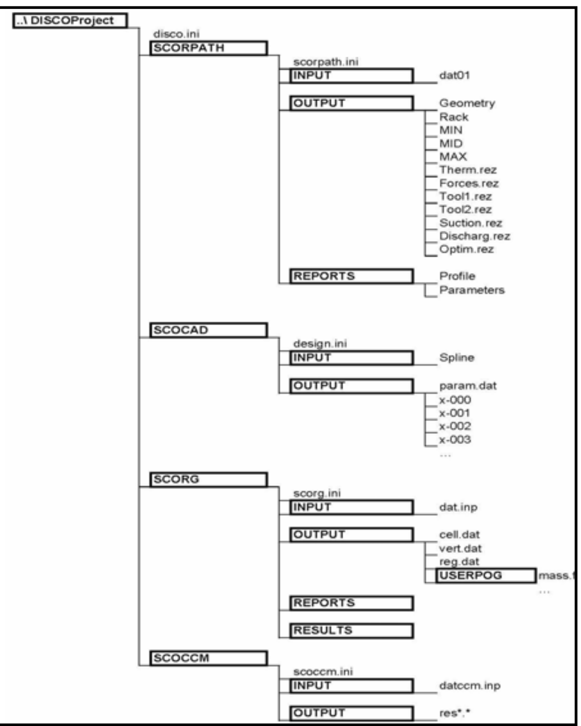
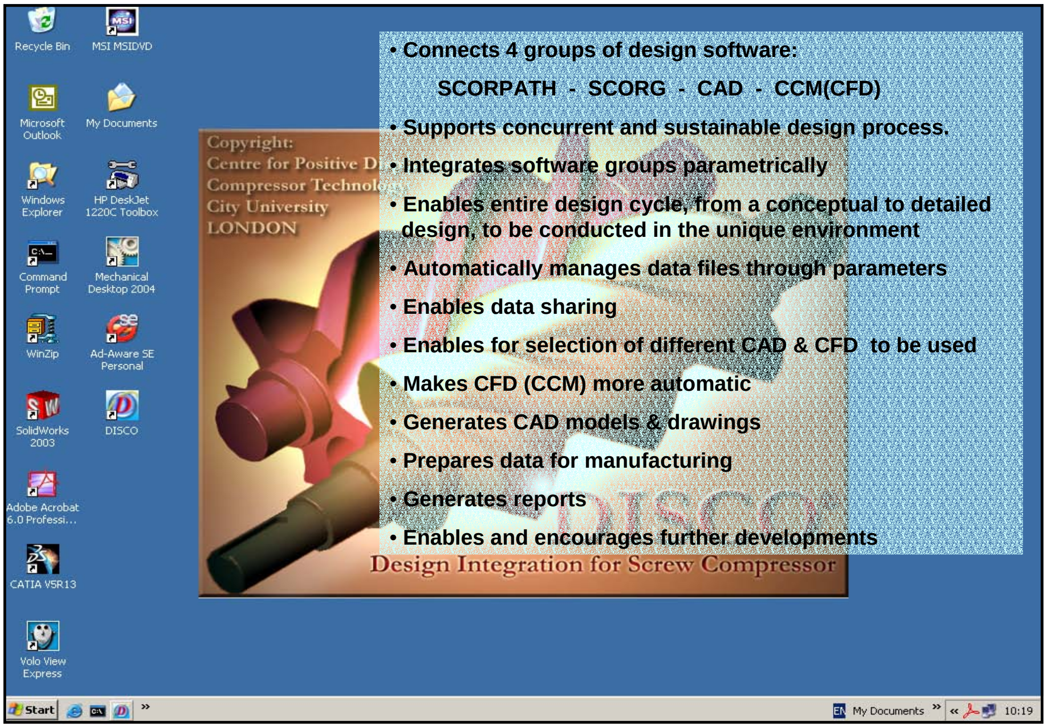
DISCO Integration



Structure of DISCO







• Connects 4 groups of design software:
SCORPATH - SCORG - CAD - CCM(CFD)
• Supports concurrent and sustainable design process.
• Integrates software groups parametrically
• Enables entire design cycle, from a conceptual to detailed design, to be conducted in the unique environment
• Automatically manages data files through parameters
• Enables data sharing
• Enables for selection of different CAD & CFD to be used
• Makes CFD (CCM) more automatic
• Generates CAD models & drawings
• Prepares data for manufacturing
• Generates reports
• Enables and encourages further developments
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Recycle Bin
MSI MSIDVD
Microsoft Outlook
My Documents
Windows Explorer
HP DeskJet 1220C Toolbox
Command Prompt
Mechanical Desktop 2004
WinZip
Ad-Aware SE Personal
SolidWorks 2003
DISCO
Adobe Acrobat 6.0 Professi...
CATIA V5R13
Volo View Express
Start
My Documents
10:19