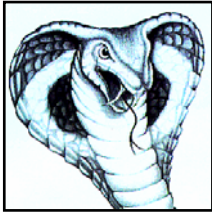


COBRA-EHL

COMPUTER OPTIMIZED BALL & ROLLER BEARING ANALYSIS
with ELASTOHYDRODYNAMIC LUBRICATION & ROLLER CROWN



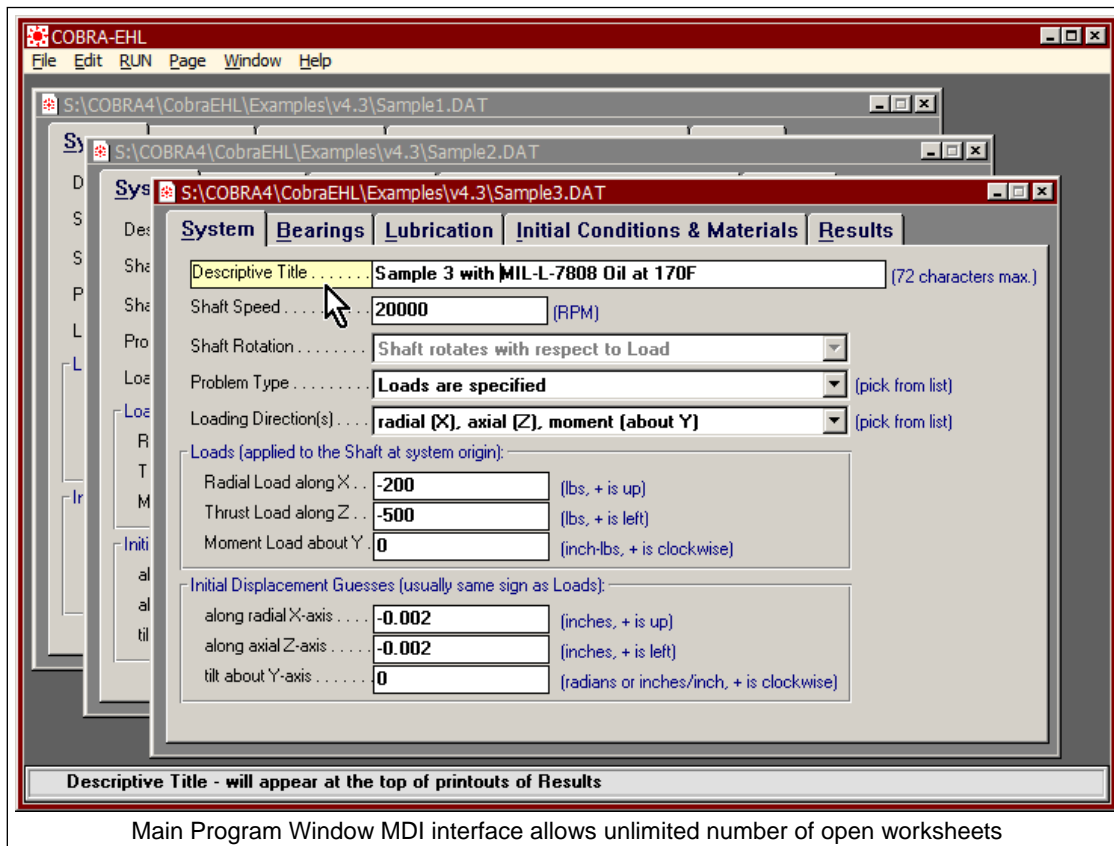
COBRA-EHL is a bearing analysis program that computes the behavior of up to six (6) bearings on a shaft under combined Radial, Thrust and Moment loading. The program has a modern menu-driven Windows interface with a multi-tabbed worksheet format, allowing users to interactively change input data and quickly generate results. Lubricant Film Thickness and associated Life Adjustment Factors are internally computed. Roller Crown analysis uses the approximate laminated roller model.

PROGRAM CAPABILITIES INCLUDE:

Up to 6 Bearings on a rigid shaft	Location Offsets	Inputs and Results in English units
Radial, Thrust & Moment Loads	Axial Float	Integrated w/ ARMD Rotordynamics
Specified Loads or Displacements	Actual or Estimated Geometry	Copy Bearing Function
Crowned Rollers w/ Lamina	Hybrid Bearings	Quick Running
Solid and Spring Preload	Lubricant Film Thickness	Results Immediately Available
Internal Clearance & End-Play	Lubricant Effects on B10 Life	Copy Results to Clipboard
Misalignment	Library of Lubricants	Hard Copy for Printing

SIX (6) BEARING TYPES:

Radial (Conrad) Ball	Cylindrical Roller	Tapered Roller
Angular Contact Ball	Angular Contact Roller	Spherical Roller



	Bearing #1	Bearing #2	Bearing #3	Bearing #4	Bearing #5	Bearing #6
Bearing Type (pick from list) ...	Angular Cont.	Angular Cont.	Cylindrical			
Location (inches from origin) ...	7.024	4.976	Angular Contact Ball Bearing			
Bearing I.D. (mm) ...	80	80	Conrad/Radial Ball Bearing			
Bearing O.D. (mm) ...	140	140	Cylindrical Roller Bearing			
Estimated Geometry? (yes/no) ...	No	No	Tapered Roller Bearing			
Width of a Single Row (mm) ...	n/a	n/a	Spherical Roller Bearing			
Number of Rolling Elements ...	34	15	34			
Pitch Diameter (inches) ...	4.331	4.331	4.921			
Element Diameter (inches) ...	0.75	0.75	0.5472			
Roller Total Length (inches) ...	n/a	n/a	0.5669			
Roller Flat Length (inches) ...	n/a	n/a	0.3			
Roller Crown Radius or Drop ...	n/a	n/a	500			
Cone Rib Diameter (in) ...	n/a	n/a	0			
Contact Angle (degrees) ...	25	-25	0			
Outer Race Curvature/Osc ...	0.53	0.53	n/a			
Inner Race Curvature/Osc ...	0.52	0.52	n/a			
Capacity Reduction Factor ...	n/a	n/a	0.66			
Dynamic Capacity (lbs) post1990	32,990.	19,119.	40,161.			

	Bearing #1	Bearing #2	Bearing #3	Bearing #4	Bearing #5	Bearing #6
Lubricant Type (pick from list) ...	user-specified	user-specified	user-specified			
Lube Density [g/cm ³] ...	0.88	0.88	Mineral Oil (Shell Turbo 33)			
Lube Thermal Exp. Coeff [1/F] ...	0.000352	0.000352	MIL-L 78086			
Lube Viscosity @100 F [cSt] ...	64	64	Polyphenyl Ether MCS 293			
Lube Viscosity @210 F [cSt] ...	8	8	MIL-L-23699			
Pressure Coefficient [1/psi] ...	0	0	user-specified lubricant			
Lube Temperature [F] ...	200	200	200			
Element Roughness [u-inches] ...	6	6	6			
Race Roughness [u-inches] ...	8	8	8			

Notes re 'Lubricant Type': If you select 'no lubrication,' then you must specify the 'Life Adjustment Factor for Lubrication' (on 'Initial Conditions' page).

If you select one of COBRA's four pre-defined Lubricant Types, then COBRA will enter default values for the lubricant's properties. You may modify these values in your worksheet, if you wish. Also, the COBRA engine will calculate the 'Life Adjustment Factor for Lubrication' (on 'Initial Conditions' page).

If you select 'user-specified lubricant,' then you must specify values for the lubricant's properties. The COBRA engine will calculate the 'Life Adjustment Factor for Lubrication' (on 'Initial Conditions' page).

	Bearing #1	Bearing #2	Bearing #3	Bearing #4	Bearing #5	Bearing #6
Diametral Clearance (inches) ...	0	0	0.001			
Axial Float? (yes/no) ...	No	No	n/a			
Axial Preload (lbs) ...	0	0	n/a			
Axial Offset along Z (inches) ...	0	0	n/a			
Radial Offset along X (inches) ...	0	0	0			
Initial Tilt about Y [radians] ...	0	0	0			
Axial Spring Preload? (yes/no) ...	No	No	n/a			
Axial Spring Coeff. A (for x ³) ...	n/a	n/a	n/a			
Axial Spring Coeff. B (for x ²) ...	n/a	n/a	n/a			
Axial Spring Coeff. C (for x ¹) ...	n/a	n/a	n/a			
Axial Spring Coeff. D (for x ⁰) ...	n/a	n/a	n/a			
Young's Modulus of Elem. (psi)	29000000	29000000	29000000			
Poisson's Ratio of Elements ...	0.28	0.28	0.28			
Young's Modulus of Race (psi)	29000000	29000000	29000000			
Poisson's Ratio of Race ...	0.28	0.28	0.28			
Life Adj. Factor for Reliability ...	1	1	1			
Life Adj. Factor for Material ...	2.2	2.2	1.37			
Life Adj. Factor for Lubrication ...	n/a	n/a	n/a			

S:\COBRA4\CobraEHL\Examples\v4.3\Sample1 with Crown.LPT 2004/09/01 **Status: CURRENT**

Bearing Location Diagram:

Spring Rates at Origin:

DFX/DX = -1.077E+07	DFX/DALY = 2.529E+07	DFZ/DALY = 1.6172E+06
DFX/DZ = 4.293E+05	DFZ/DZ = -1.195E+06	DMY/DALY = -1.7129E+08

Results: Sample 1 for CobraEHL 4.3

Unadjusted System L10 Life (hrs) = 2.671E+04	6 Iterations
Adjusted System L10 Life (hrs) = 1.341E+04	
Shaft Speed (rpm) = 1.500E+03	

--FORCES--			--DISPLACEMENTS--		
Radial (Along X)	Thrust (Along Z)	Moment (About Y)	Radial (Along X)	Axial (Along Z)	Angular (About Y)

PROGRAM RESULTS INCLUDE:

- | | | |
|----------------------------------|-------------------------------|------------------------------------|
| Bearing Reactions & Load Sharing | Load Zones | Required Shoulder Heights |
| Radial & Axial Spring Rates | Hertz Contact Stress | Adjusted Hybrid Bearing Life |
| Angular Spring Rate | Sub-Surface Shear Stress | Lubricant Film Thickness |
| Dynamic Capacity | Depth to Maximum Shear Stress | Life Adjustment Factor-Lubrication |
| System L10 Life | Operating Contact Angle | Individual Element Output |
| Bearing L10 Life | Element Loads | Stress Distribution across Crowned |
| Timken BRR & Life | Contact Ellipse Size | Rollers |

LIMITATIONS:

- DN Values must be under 1 million DN (RPM x Bore Size in mm)
- 3 Degrees of Freedom
- COBRA-AHS is recommended to analyze higher DN values and/or 5 Degrees of Freedom

SYSTEM REQUIREMENTS:

- IBM-compatible PC; 32-bit Windows Operating System (2000, XP, ME); CD drive
- 4 MB free space on hard disk; 800x600 pixel screen resolution; 16-bit color display

PACKAGE INCLUDES:

- Installation CD; End-User License; Example Problems; Printed Manual; Hardware Security Lock.
- Free Technical Support for 1 year after purchase. Fee-based support available thereafter.