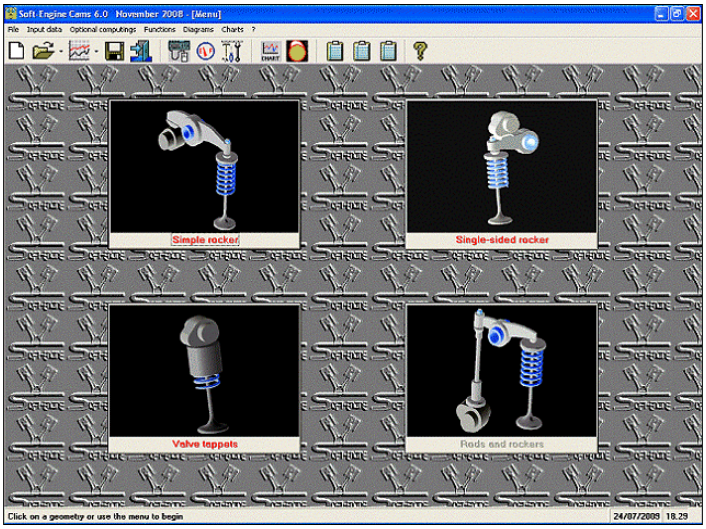
Soft-Engine - Software Cams

Main features

CAMS is a **Soft-Engine** software to analyse, calculate and make **cams** for **4-stroke engine valves**; it is possible to **input the valve (or cams) lift point by point** first of all. Then, it is also possible to plan a cam contour by **polynomial** or dynamic-polynomial (**polydyne**) methods. **CAMS** is used to make, analize and verify a new cam and to know its dynamic performances, or to analize an exsisting cam importing its valve lift into the software.



The main window

The software is completely restiled in the graphical interface, and it is very very advanced comparing to the older version.
A lot of function (especially in the diagrams section) are improved or added. The data input is easier because the user inputs data directly in the rocker schema.
It is possible to choose quickly the rocker geometry and the computing methods, and there is the total interface with the most important Windows data sheet software, like **Excel**.

The software allows the possibility to **input the valve (or cams)** lift by points and to find the cam contour with a reverse-engineering computation.
The software computes and analyses the cam and **valve** main quantities (see later) and the cam contour and profilings above all. It is possible to have the **construction data** for cam contour and for the main cutting machines (the centers of the slider, grinder and miller arm positions) in X-Y and polar coords.

Finally, an **intake or an exhaust cam** can be planned (with Polynomial or Polydine method) or i**t is possible to import an exsisting cam to study its performances**. The import procedure can be made from excel or txt files.

By an adding module, it is possible also to **measure directly a cam contour or a valve lift** by a special Soft-Engine machine, that can be added to the software package by request. The measured data will be transmitted directly to the software computing routines.

Data input

Firstly, the software asks if user wants make an intake cam or an exhaust cam. All the geometries can be computed with different computing methods:

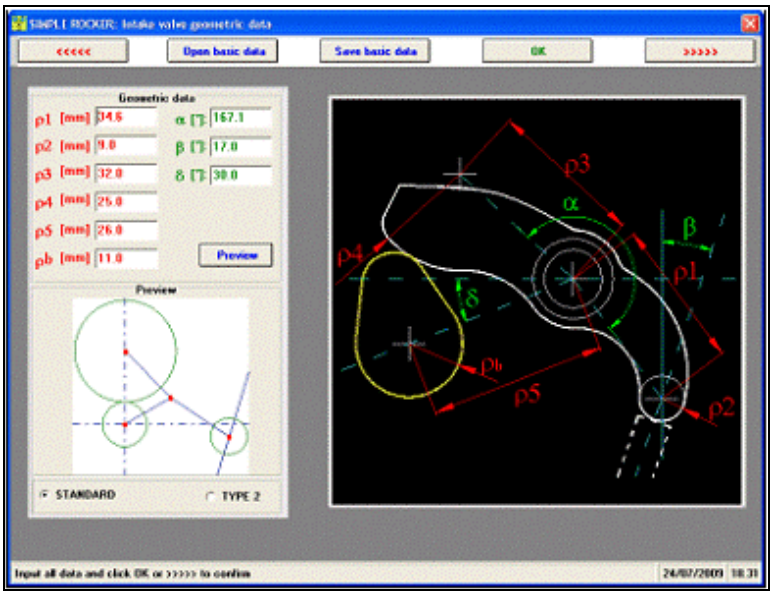
- **Lift point by point:** input of a valve lift (or cam lift) step by step, the data can be inserted, imported or measured (by the acquisition system): the software computes all the kinematics and dynamics quantities and creates the cam contour.
- **Polynomial:** in this case only kinematics is computed: so software calculates valve and cam lift, velocity, acceleration, and it and creates the cam contour.
- **Polydine:** in this case kinematics and dynamics are computed: so software calculates also the forces, the torques, the stresses and creates the cam contour.

The different possible geometries are:

Simple rocker

The software computes the cam contour for a rocker as shown in the picture, according to a computing method (see later).

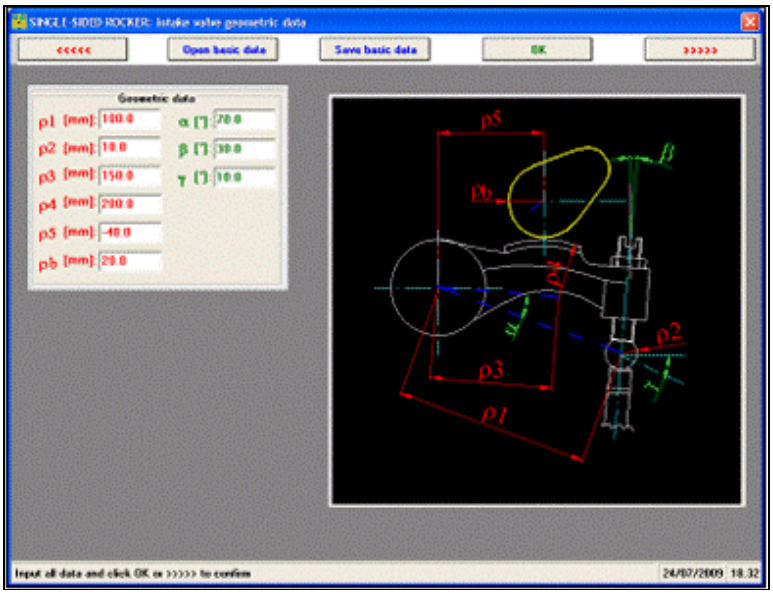
If comuting method is polynomial or polydine, software data input are:
basic data (durations and other data), ramp acceleration, geometric data, cutting mechanism data (for miller, grinder and slider) and material data (for cam and slider).
If computing method is "Lift point by point" the lift must be imposed or imported in the computing model



Single sided rocker

The software computes the cam contour for a rocker as shown in the picture, according to a computing method (see later).

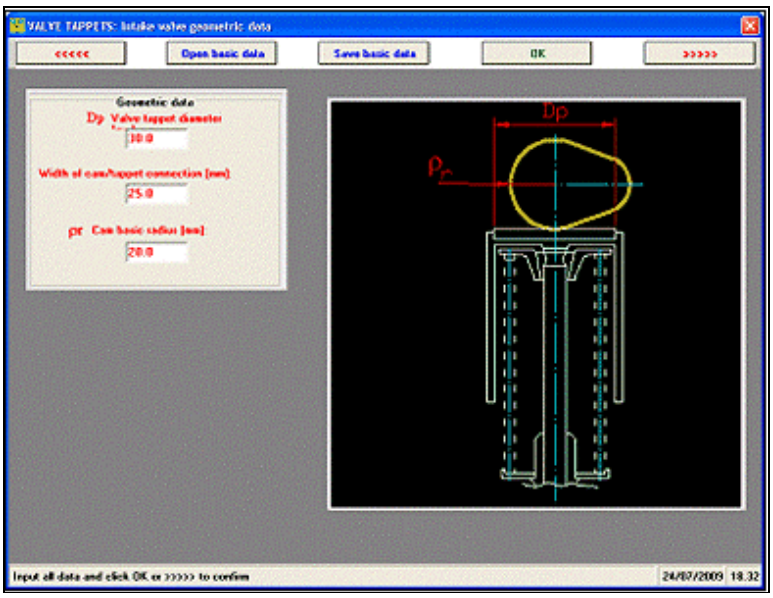
The main data are the same of the "Simple rocker" geometry, with some differences about the geometry and mechanisms.



Valve tappets

The software computes the cam contour for a rocker as shown in the picture, according to a computing method (see later).

The main data are the same of the "Simple rocker" geometry, with some differences about the geometry and mechanisms.



Softwareresults

The results are diagrams and charts about:

- **valve** and **cam lift**;
- valve and cam **velocity;**
- valve and cam **acceleration;**
- **SIMPLE ROCKER**
  - **Contact force;**
  - **Rotation angle;**
  - **Eccentricity;**
  - **Hertzian pressure;**
  - **Strip velocity;**
  - **Strip velocity x P.Hz;**
- **SIMPLE SIDED ROCKER**
  - **Inertial force;**
  - **Spring force;**
- **VALVE TAPPETS**
  - **Inertial force;**
  - **Spring force;**
  - **Normal force;**
  - **Hertzian pressure;**
  - **Resistant torque.**

All the computed quantities can be displaied vs:

- Total **crank angle** (0° to 720°), it is the most important referring datum; the most important referring points (TDC, BDC, AI, CI, AE, CE) are shown.
- **Duration valve crank angle** (0° to valve final period, crank dergrees);
- **Cam angle**.

Other computings are:

Spring computings

For valve springs it's possible to choice **single spring** or **double spring** computing.

Tipically, software data input are:

- **Free spring lenght**
- **Max. compression force**
- **Pre-loaded spring froce**
- **Stress** (closed valve, for engine valves)
- Stress (of work material, for shock-absorbers).

Software give some diagrams and charts about these results::

- Spring lenght (vs spring excursion)
- **Spring force** (vs spring excursion)
- **Valve lift**

Suitable query reports show some interest data, like **block forces and stresses**, **Whal factor**, **number of coils** or **harmonics of excitation**. You can vary input data in these query reports to study how projected spring change its features (option: variations). See also "**SPRING**" software.

Areas computings

This option computes the section swapped by piston areas. Here the results:

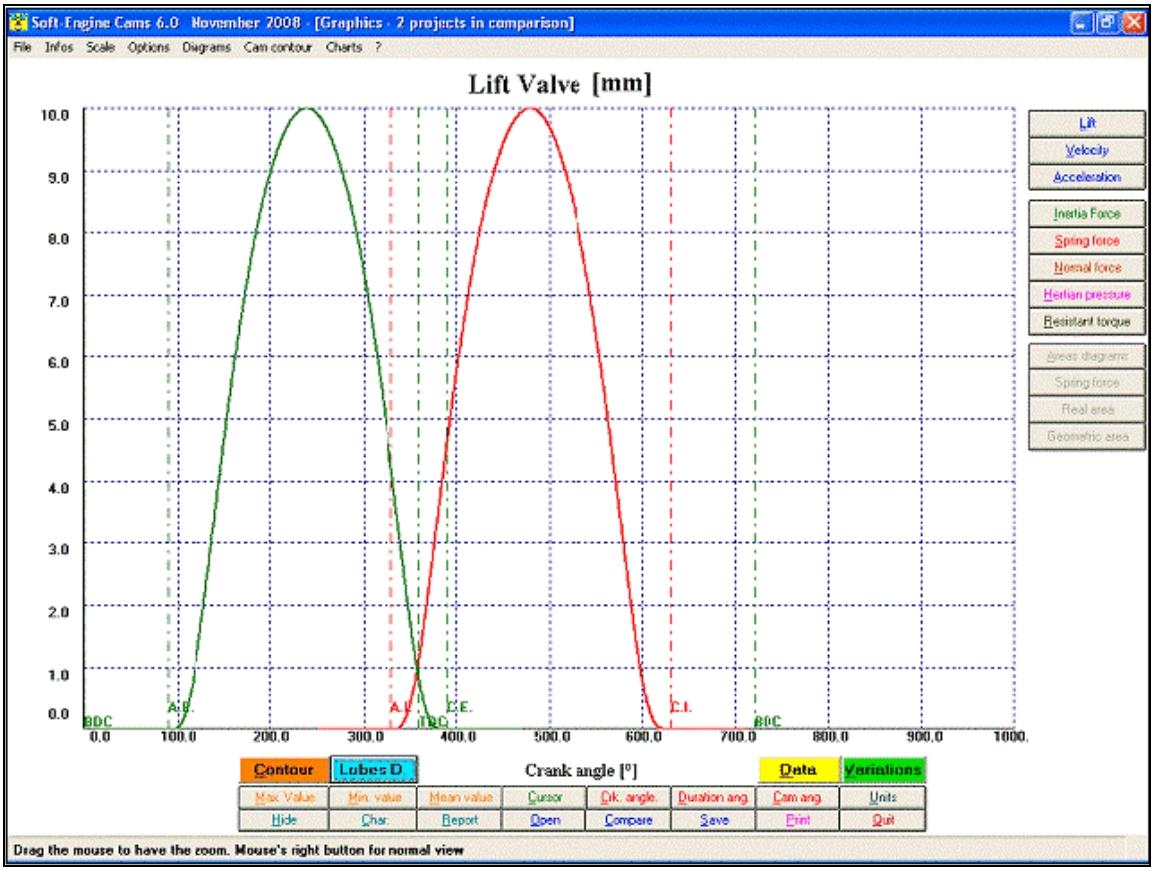
- **Real, geometric and resulting areas** diagrams and chart (vs crank angle);
- **max. area** - **mean area**;
- **angle-area** (angle x mean area);
- **specific-angle-area** (angle x area / capacity;)
- **time-area** (total period x mean area);
- **specific-time-area** (time-area / capacity).

Diagrams, charts and other features

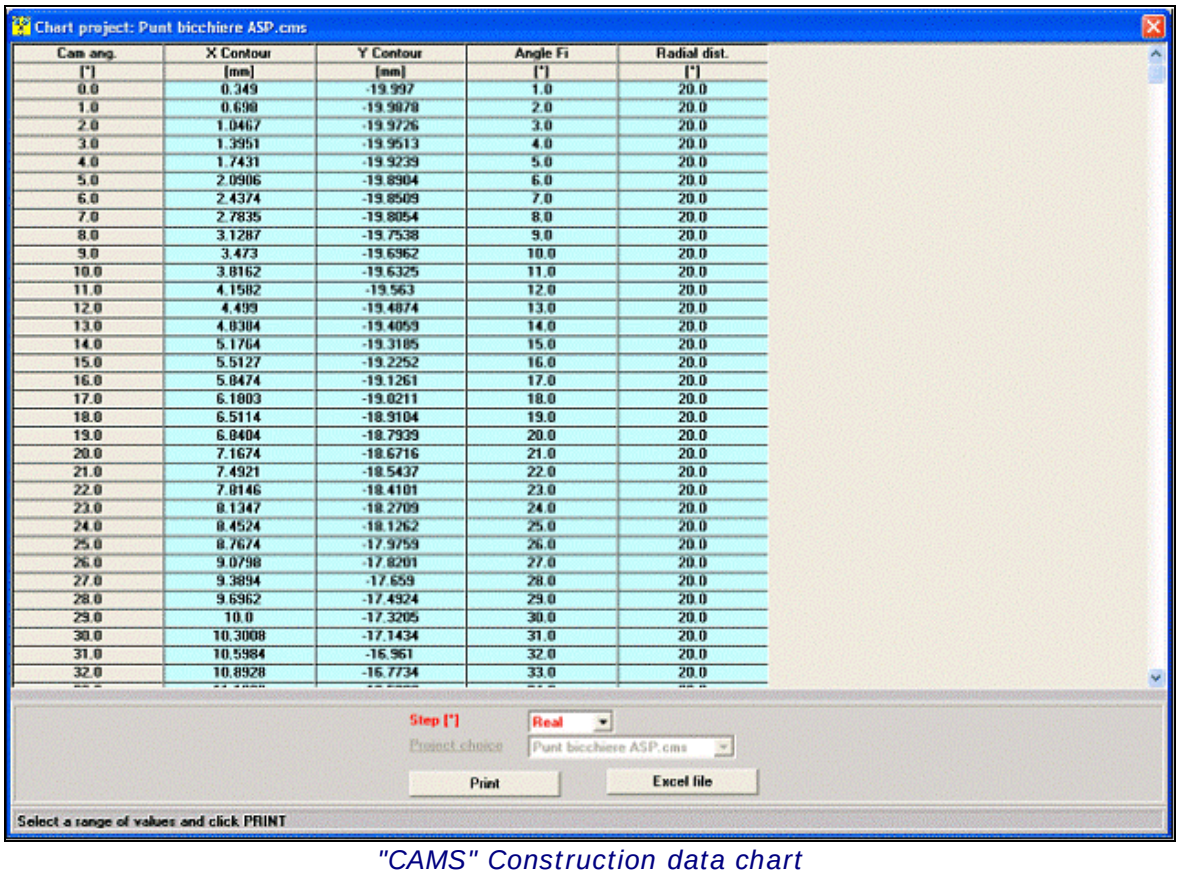
For each computed quantity the following options are available:

- **Max**., **min**. and **mean** value; **cursor** to read all curve points
- **Zoom**, graph scale management
- Sizeable graphics window with **complete colors management**
- **Comparison** of different "CAMS" projects (max 6 projects)
- File section: it is possible to create directories to classify projects in a single session.
- Long filename management
- Different projects **compared charts**
- **Printing page setup,** with remarks, logo and graphics management
- Chart of all quantities
- **Construction data charts**

About charts, it is possible to export them in **Excel** format and to variate the visualization step. Moreover, it's possible visualize the value changing the visualization step. Finally, it is possible to print all chart or to select a range of values before printing.



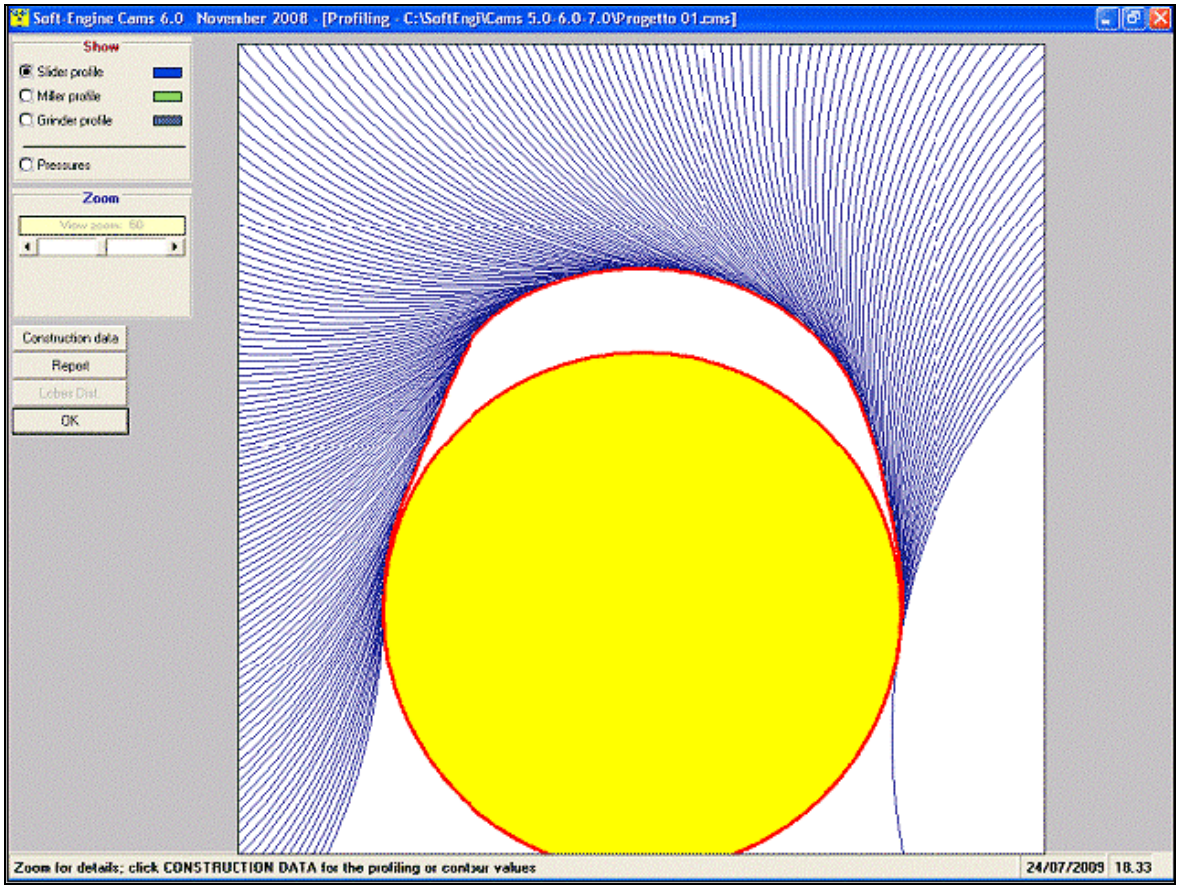
"CAMS" diagrams (Valve lift vs Crank angle)



"CAMS" Construction data chart

Cam contour

The cam contour is shown in the following picture:

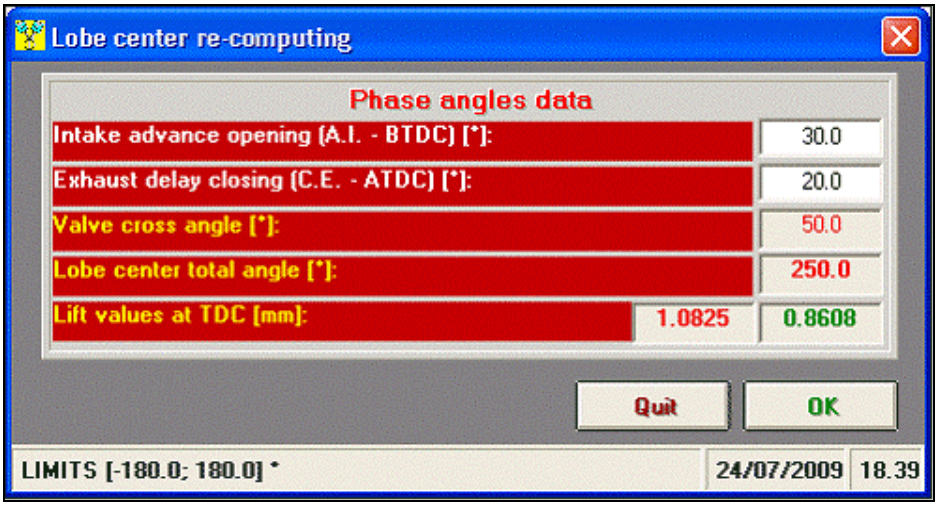


"CAMS" contour, with the slider profiling shown

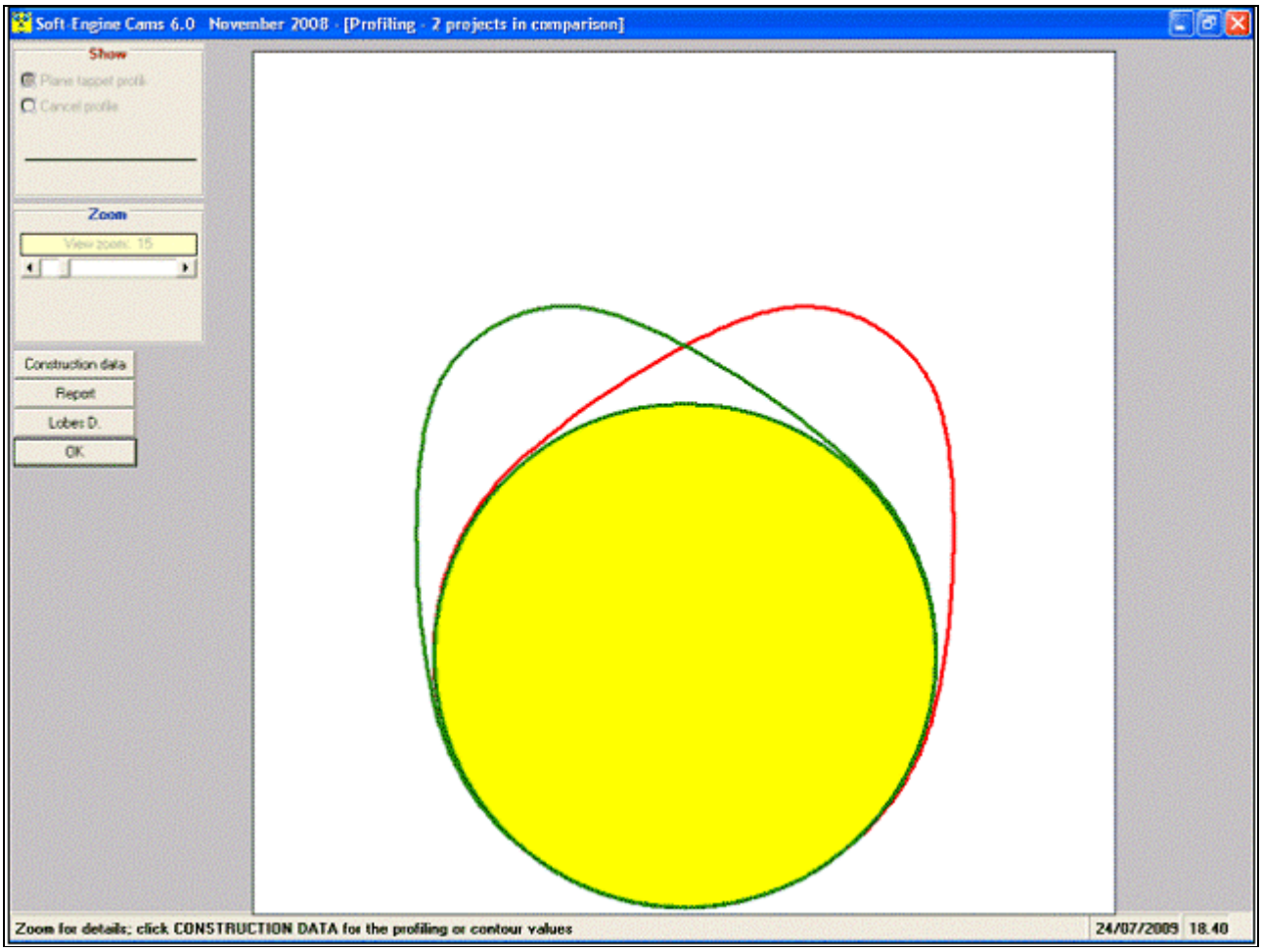
It is possible to zoom the contour, study the pressures on the contour, see the construction data and change the profilings of the cutting machines.

Lobe centers management

As explained before, i**t is possible to measure directly a cam or a valve lift by a device**; it can be added to the software package by request. The measured data will be transmitted directly to the software computing routines.



"CAMS" - The "Lobe center" management...



... and effects on cams

Compatibility

All the old cams version file are compatible with the new software.
Moreover, the software can export data in "**4TBASE**" format, **so a cam planned with CAMS can be tested in 4TBASE**.
The software makes also **reports** in **TEXT**, **DOC** and **HTML** file format. Also, all the charts can be export in **EXCEL** format, and all input charts (like ramps acceleration and valve lift value input chart) allows the import/export procedure from/to txt files.
The maximum software version (Cams 7.0) exports the construction data in **ISO** format and **DXF** format for a direct communication to a machine tools.

Versions and costs

Version	Cost
Cams 5.0 LT This version is for **tappet** cams. according to **Polynomial**, **Polydine** and **Lift points by points** computing methods. This program is used to analyse and verify the right cam and to know the dynamics. Output values are: **valve** lift valve velocity valve acceleration valve **inertial force** **spring** force **cam** design envelopt **valve area** valve **time-area** Graphs comparison of inlet and exhaust valves available, including: valve timing overlap valve area Printable charts, **contruction data** etc... are also available.	€ 350.00
Cams 5.0 This version includes all computations about **Single rocker**, **Single sided rocke**r and **Valve Tappets**, according to **Polynomial**, **Polydine** and **Lift points by points** computing methods. The output values are the ones explained in the presentation. This program version does not supply the construction data. This version conresponds to an educational purpouse, so it is particularly suitable for tech schools and universities.	€ 580.00
Cams 6.0 Like version 5.0 **including the construction data**.	€ 800.00
Cams 7.0 Like version 6.0 version including the exporting of the construction data in **ISO** format and **DXF** format to drive machine tools. This version is highly professional and easy to use as it supplies the nearest profile (to be found among a maximum of 200,000 ones), to the lift law required, with a precision of less than a thousandth of a millimeter.	€ 1,200.00

PC minumum configuration

Feature	Description
Processor:	Any personal computer IBM compatible.
System:	Windows ME, NT, Xp, Vista, Seven, Eight, Ten - 32 or 64 bit systems.
Memory RAM and Hard Disk:	At least 512 MB RAM and 2 GB free in the hard disk (for best Windows performances).
CDrom or Dvdrom device:	Speed at least 52X.
Graphic card:	VGA, SVGA and compatible cards, set at least 32 bit, Min. resolution: 1024x768.
Miscellaneous:	Keyboard, mouse, at least 1 USB port free (to connect the printer).
Printer:	Any ink-jet printer. Total compatibility with laser printers.
Total compatibility with notebooks and cases minitower PC.	