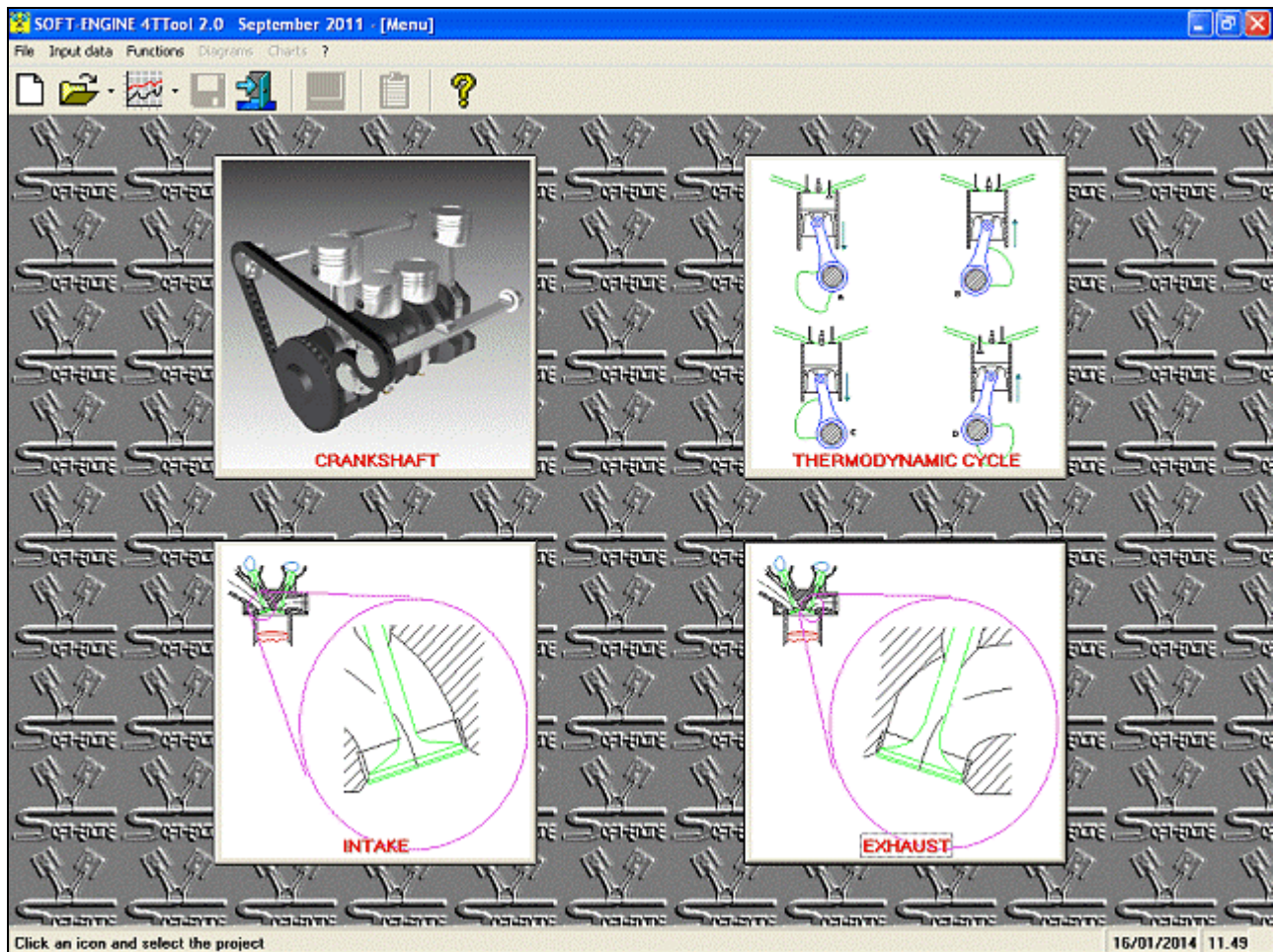


## Soft-Engine - Software 4TTool 2.0

### Main features

**4TTOOL** is a software by **Soft-Engine** for a wide range of applications including everything you may need to develop a 4-stroke engine with a special focus on practical issues. It runs on Windows. Data can be entered by means of drawings.



*The main window*

### Data input

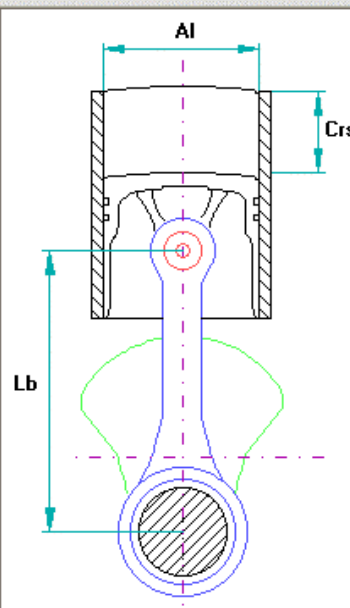
By the main window the right computing model can be selected.

**Crankshaft Data**

| Engine data input   |         |
|---------------------|---------|
| Bore [mm]           | 54.0    |
| Stroke [mm]         | 54.0    |
| Con rod length [mm] | 110.0   |
| Max. RPM [RPM]      | 14000.0 |

| Inertial force data input                   |       |
|---------------------------------------------|-------|
| Alternate masses [g]                        | 100.0 |
| Area of stressed section [mm <sup>2</sup> ] | 100.0 |

**KINEMATICS**

**INERTIAL F.**

**OK**

**Close**

Input data, OK to confirm... 13/12/2013 17.10

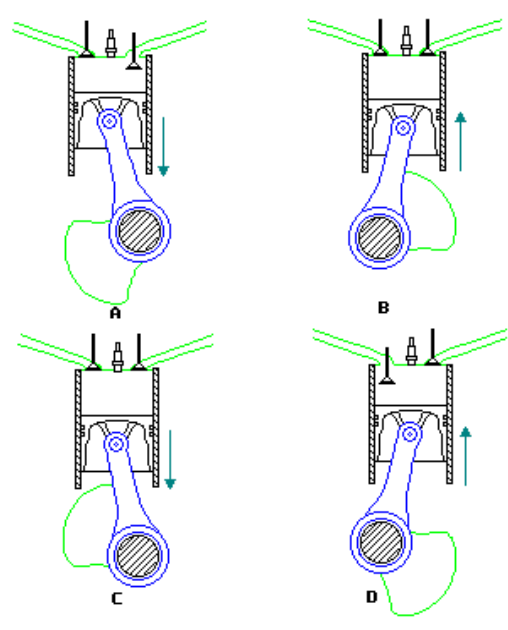
*Crankshaft data input*

**Crankshaft Data**

| Engine data input   |         |
|---------------------|---------|
| Bore [mm]           | 54.0    |
| Stroke [mm]         | 54.0    |
| Con rod length [mm] | 110.0   |
| Max. RPM [RPM]      | 14000.0 |

| Thermodynamic cycle data input   |        |
|----------------------------------|--------|
| Effective compression ratio      | 9.0    |
| Volumetric efficiency            | 0.78   |
| Air / fuel ratio                 | 14.0   |
| Inlet pressure [mBar]            | 1000.0 |
| Inlet temperature [°C]           | 15.0   |
| Ignition advance BTDC [°]        | 20.0   |
| Inlet opening advance BTDC [°]   | 30.0   |
| Inlet total period [°]           | 300.0  |
| Exhaust opening advance BBDC [°] | 40.0   |
| Exhaust total period [°]         | 300.0  |

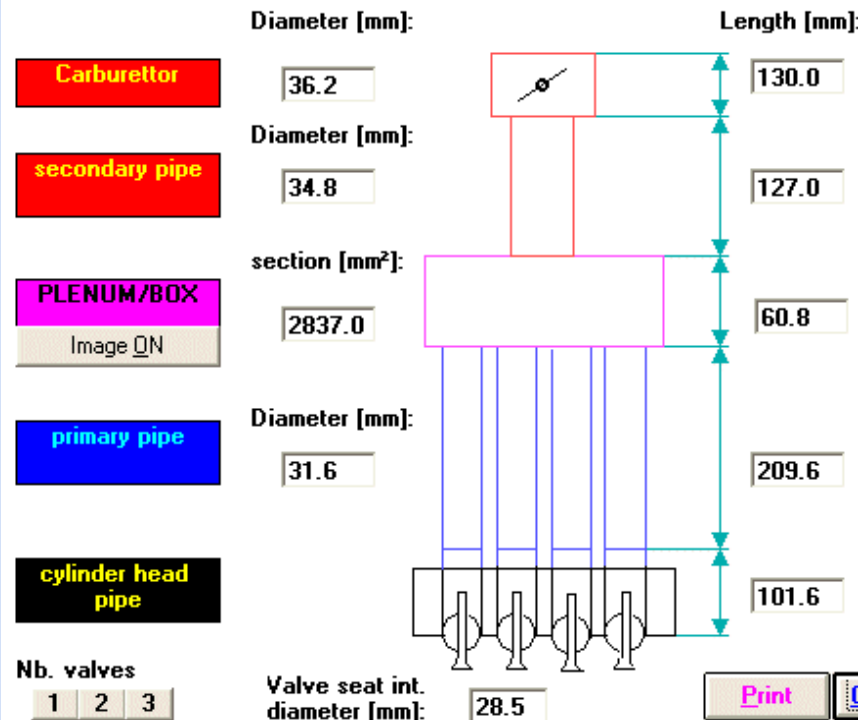
**Close**

**OK**

Input data, OK to confirm... 13/12/2013 17.10

*Thermo-dynamics data input*

**INTAKE: HELMHOLTZ MODEL, 4 CYLINDER ENGINE**



**Carburettor** Diameter [mm]: 36.2 Length [mm]: 130.0

**secondary pipe** Diameter [mm]: 34.8 Length [mm]: 127.0

**PLENUM/BOX** section [mm²]: 2837.0 Length [mm]: 60.8

**primary pipe** Diameter [mm]: 31.6 Length [mm]: 209.6

**cylinder head pipe** Length [mm]: 101.6

Nb. valves: 1 2 3 Valve seat int. diameter [mm]: 28.5

**RESULTS**

Text ON

Resonance engine RPMs

Nb. valves: 1

N1 [rpm]: 3810

N2 [rpm]: 8955

Print Observe OK Close

LIMITES [10.0; 54.0] mm 13/12/2013 17.10

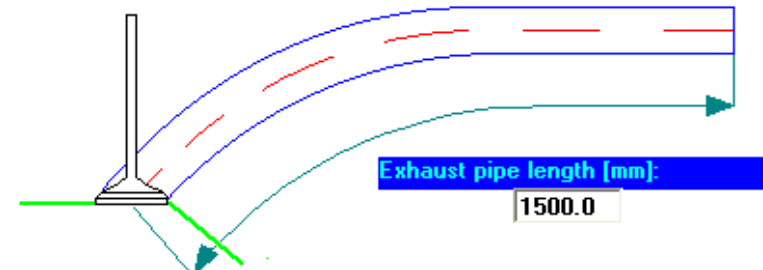
Intake computing model (Helmholtz) to calculate resonance regimes for single or four cylinders engine. Data input

**EXHAUST: SINGLE CYLINDER ENGINE**

Exhaust gases temperature [°C]: 620.0

Exhaust phase total period [°]: 345.0

Exhaust opening advance BBDC [°]: 85.0



Exhaust pipe length [mm]: 1500.0

**RESULTS**

Text ON

RESONANCE ENGINE RPMs [rpm]

K = 1 8834

K = 2 4417

K = 3 2944

K = 4 2208

K = 5 1766

Sound velocity [m/s]: 600.1

Print Observe OK Close

Input data, click on OBSERVATION to get results 16/12/2013 17.25

Exhaust computing model for single cylinder optimal length and resonance regimes. Data input

## Results

This software calculates the following values:

🔧 **crank shaft system** with:

- animation
- **inertial forces**
- **sigma (stress)**

🔧 **thermodynamic cycle**

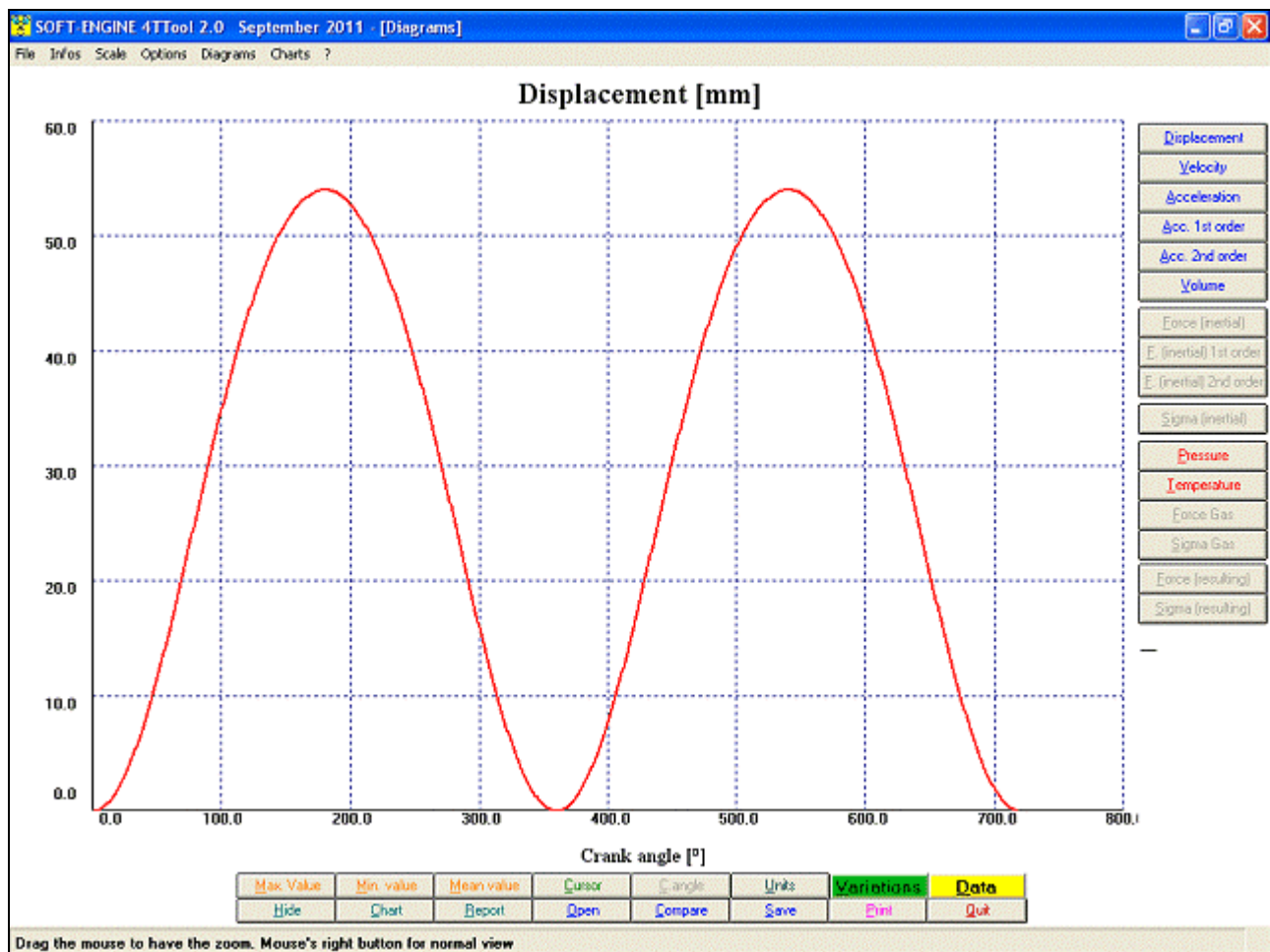
🔧 **exhaust** with:

- R.P.M. when engine resonance for single cylinder or individual ducts occurs

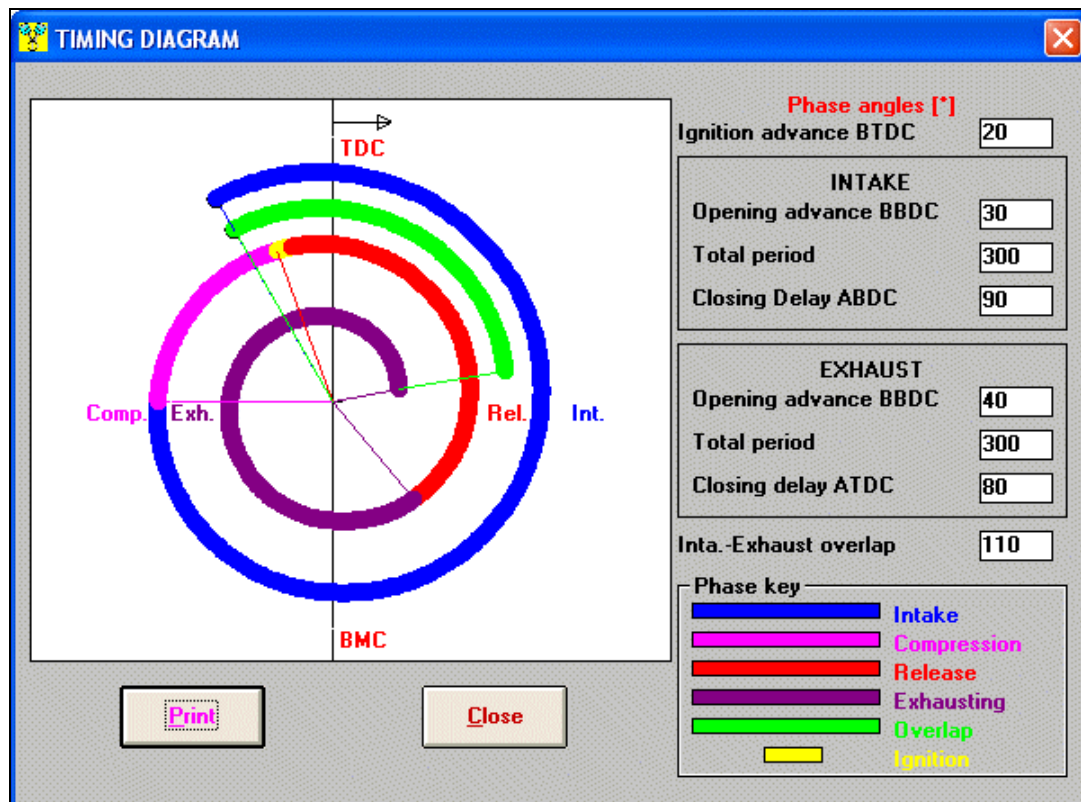
🔧 **inlet** according to the Helmholtz model for :

- **single cylinder** or individual ducts
- **4 cylinders engines**

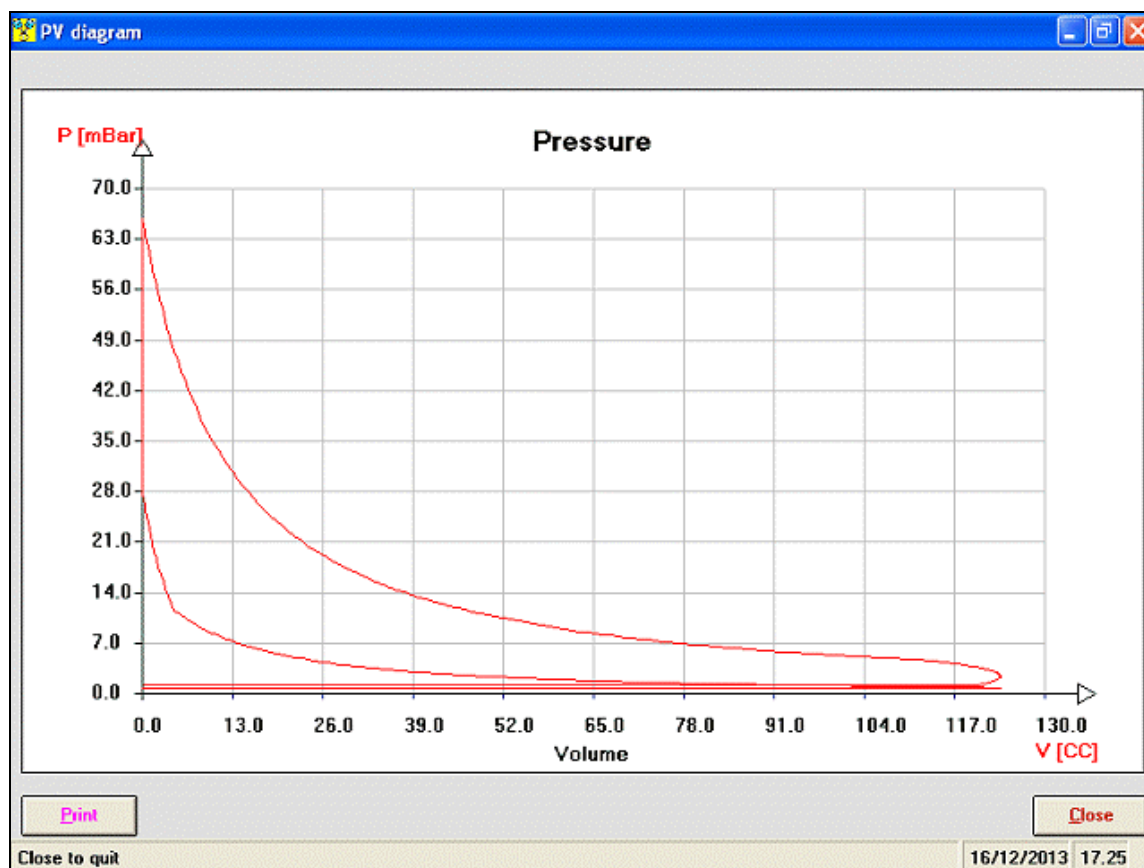
Graphics, charts, file printing, and on-line help utilities.



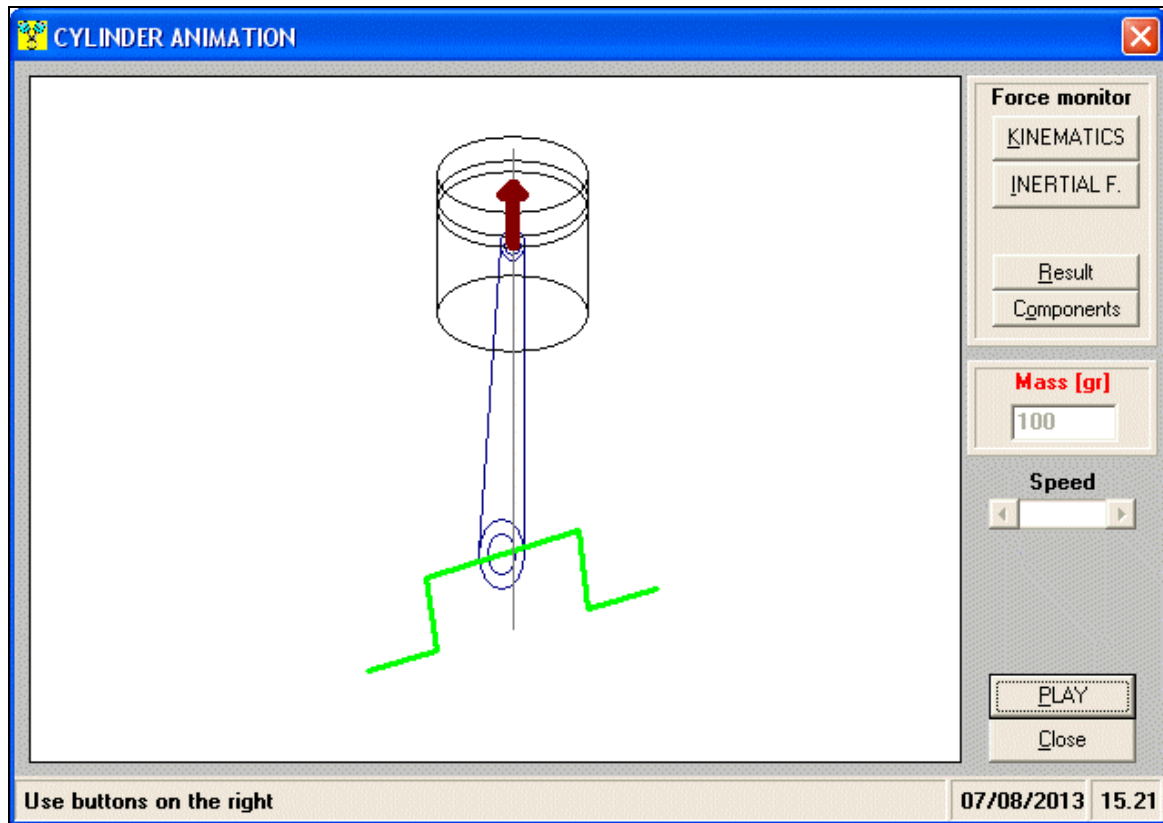
*Crankshaft (dynamics) - piston Displacement diagram*



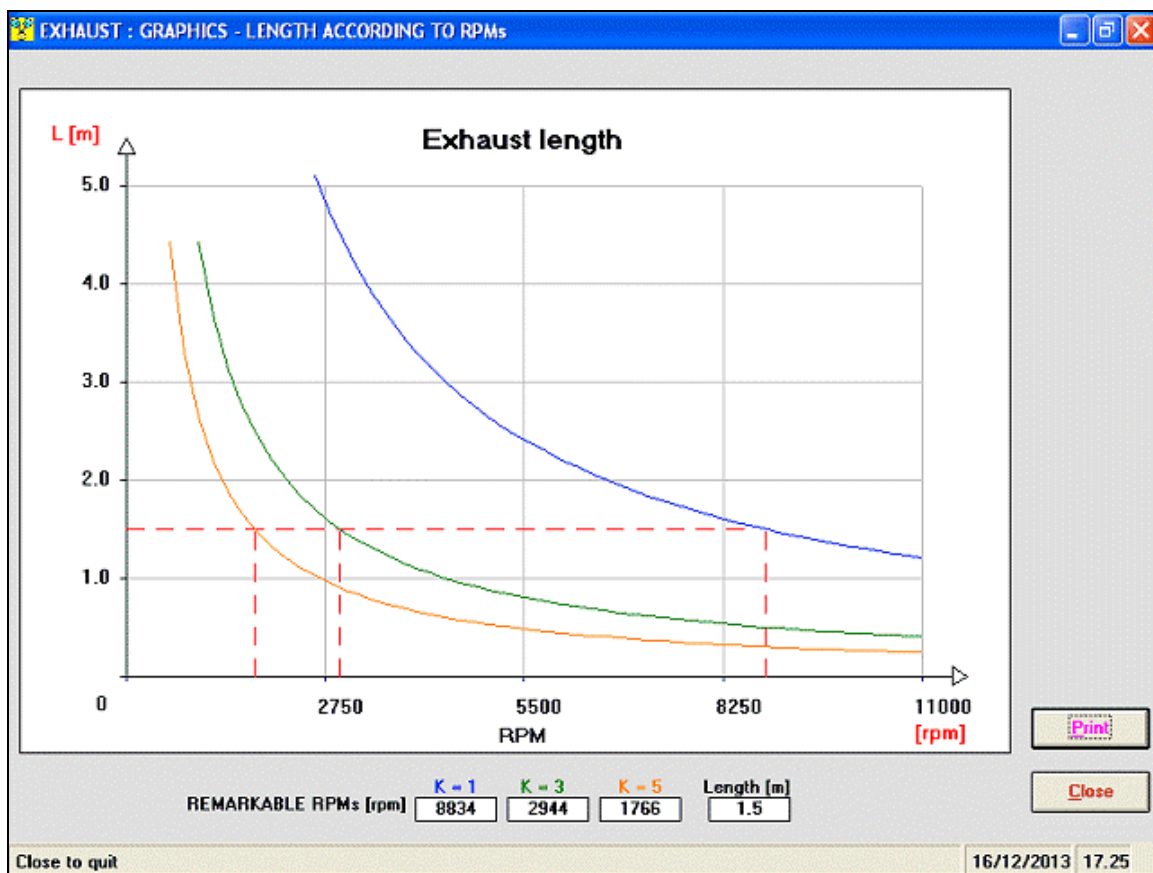
Timing



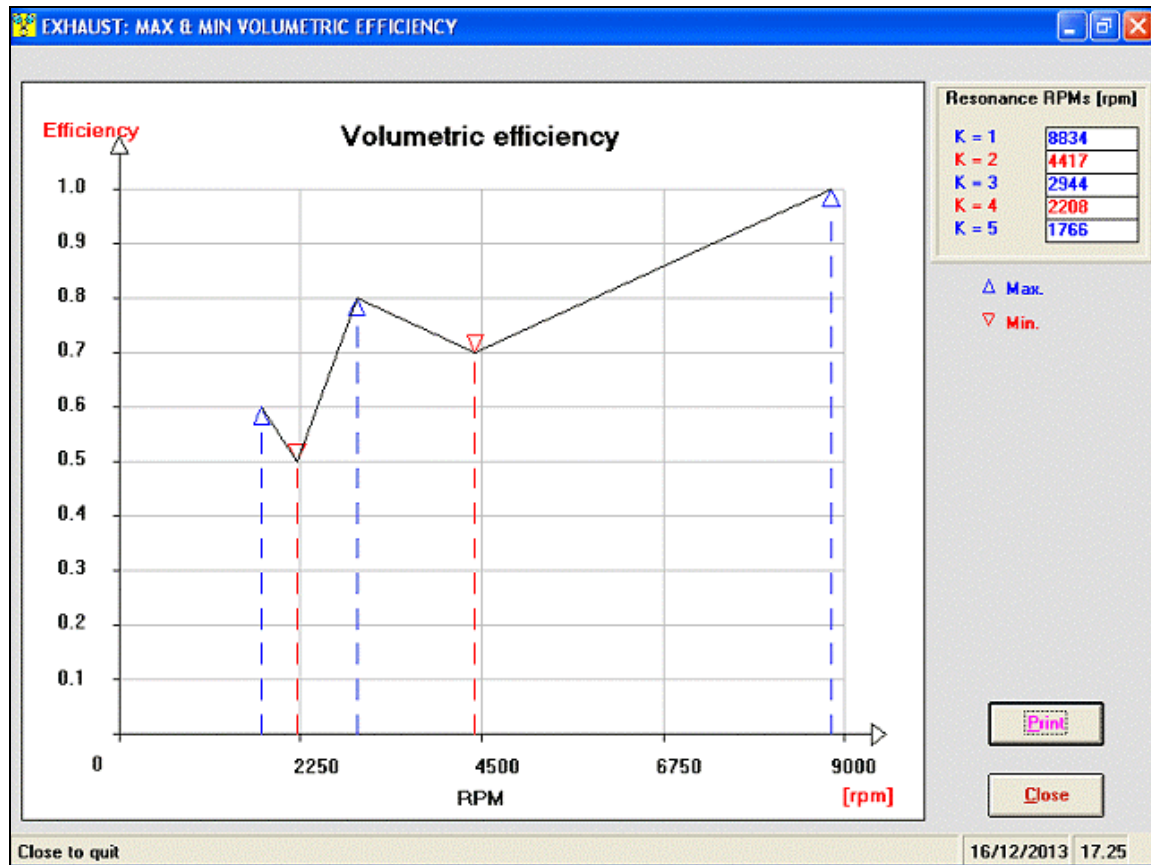
P/V diagram



Animation showing the inertial forces in the piston



Exhaust: optimal lenght exhaust systems diagram, varying the maximum resonance RPMs



*Exhaust: volumetric efficiency diagram*

## Versions

| Version    |
|------------|
| 4TTool 2.0 |

## PC mininum 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. |                                                                                     |