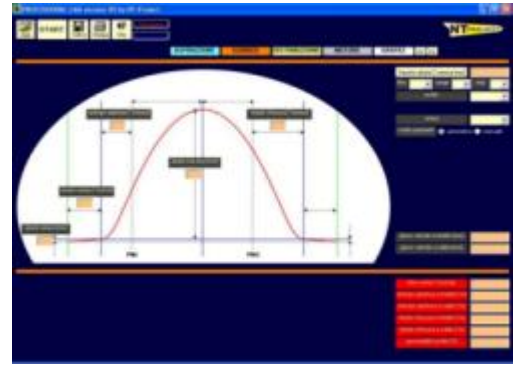
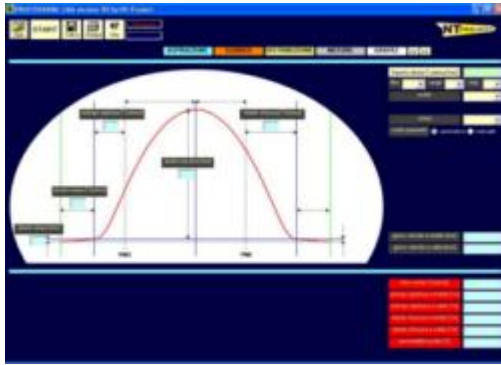
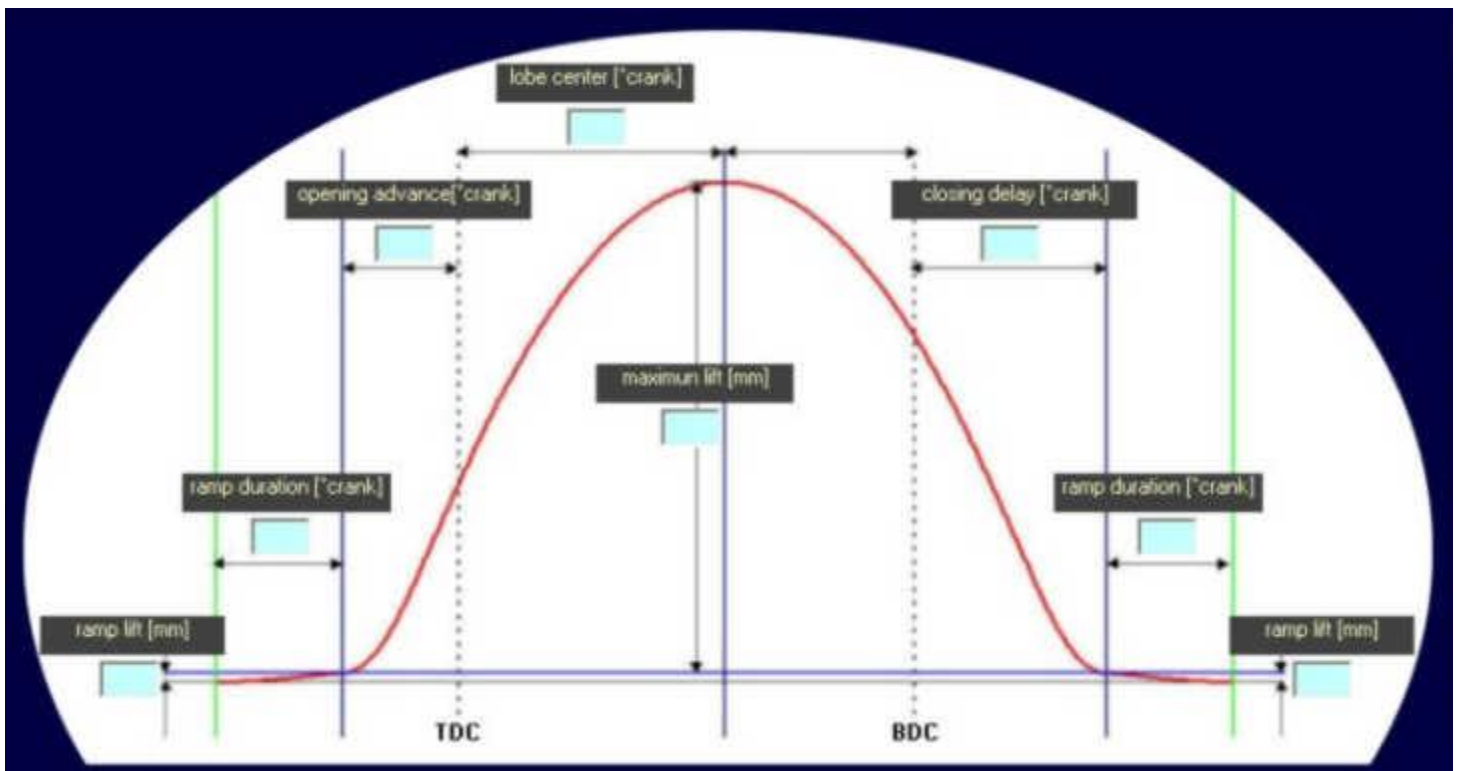


# PROFESSIONAL CAM - presentation



PROFESSIONAL CAM is divided into four main screenshots: two are related to the data for the definition of intake and exhaust valve lift laws, one is related to the data for defining the characteristics of valve train system and the last for the data of the combustion chamber and the engine. In addition to these four screenshots, there was also a fifth where they are shown the graphs of the data processed in the calculation.

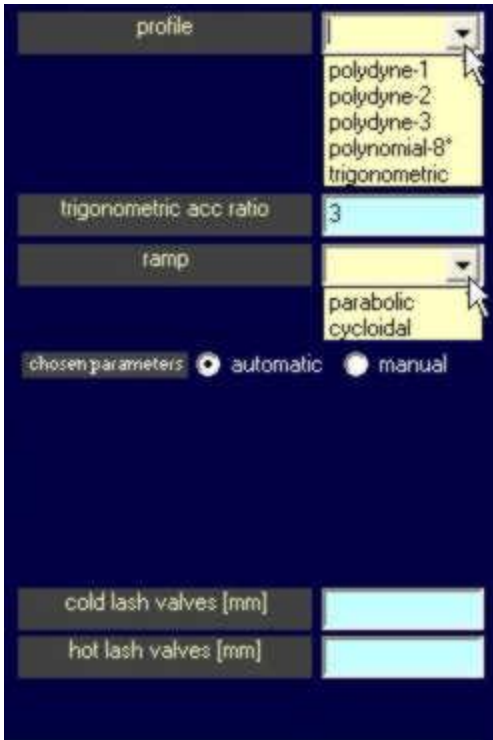
## PROFESSIONAL CAM - lift law definition



The areas of the software on the definition of intake and exhaust valve lift laws have an area for entering the basic data of the lift that you want to achieve. Shown in the figure above you can see how in PROFESSIONAL CAM is extremely easy and clear to enter the timing and the maximum lift of the main profile, like so the features of ramps for getting the lash both during descent and ascent of the valve and the position of the lobe center if you want obtain asymmetric laws.

# PROFESSIONAL CAM - lift law definition

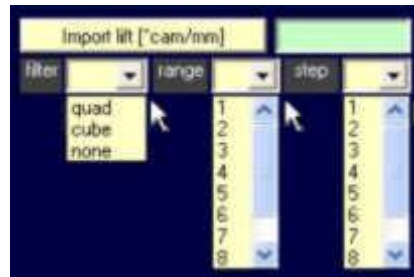
For a definition of the intake and exhaust valve lift laws together with the data shown previously, it is necessary to make technical choices on the type of the lift law for the main profile and for the ramps which you want to use. PROFESSIONAL CAM offers several options to meet diverse needs.



Choosing between a number of effective and proven laws you can get symmetric lift in automatic mode with rapidity and accuracy.

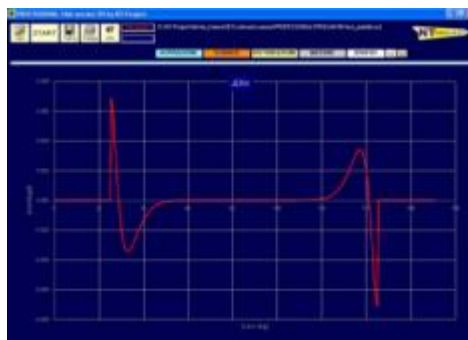
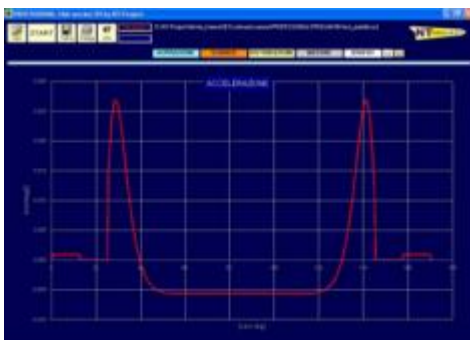
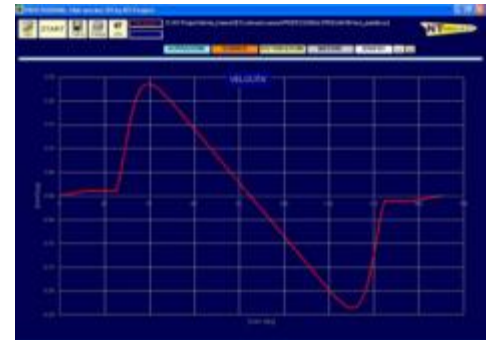
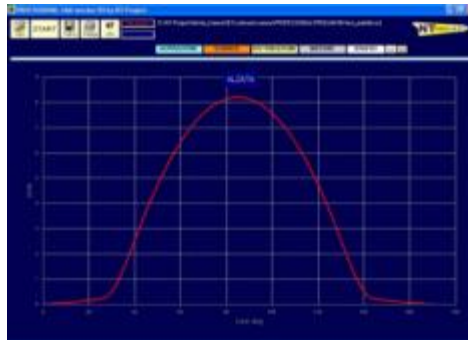
If you want obtain lifts with specific characteristics you can manage aggressivity, acceleration, jerk and asymmetry of the laws, with great versatility and ease thanks to spline algorithms of join on purpose designed.

Finally you can import lift law measured experimentally and thanks to a special algorithm for filtering the data to calculate the cam profile and to verify the valve train system.



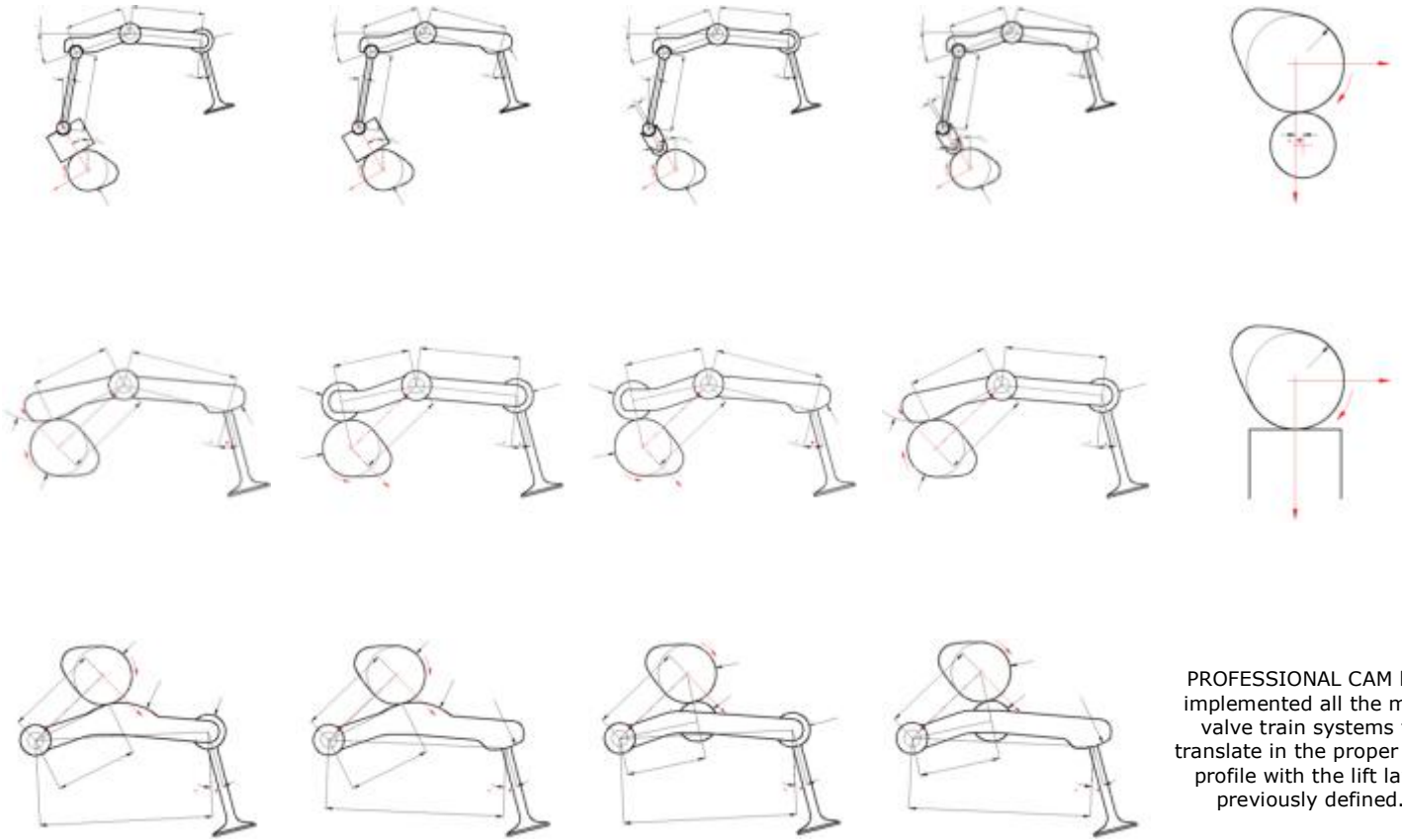
# PROFESSIONAL CAM - lift law output

lobe center [°crank]	90.00
cold opening advance [°crank]	29.98
hot opening advance [°crank]	48.74
cold closing delay [°crank]	30.02
hot closing delay [°crank]	48.76
profile efficiency [%]	62.37

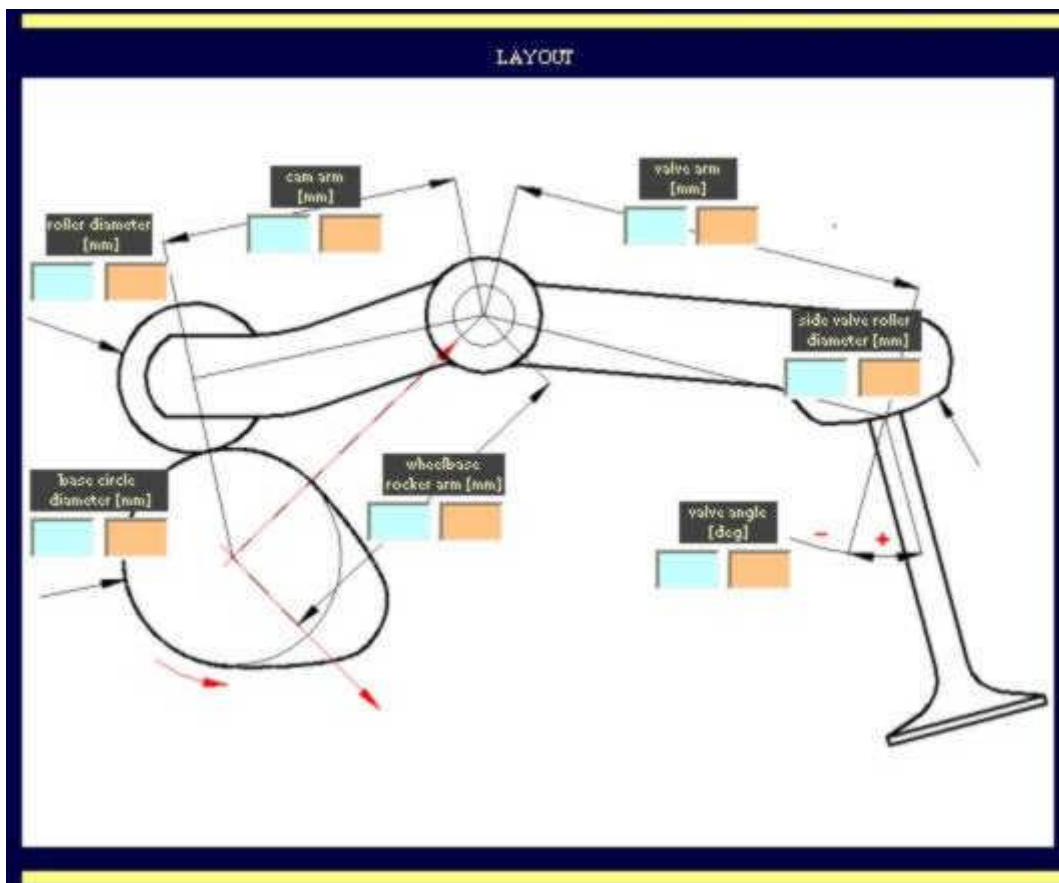


Define the characteristics of the lift law, PROFESSIONAL CAM performs calculation and displays immediately the information about lift, such as hot and cold timing, the lobe center and an index of permeability of the profile, moreover shows the graphs of lift, velocity, acceleration and jerk.

# PROFESSIONAL CAM - *cam profile calculus*



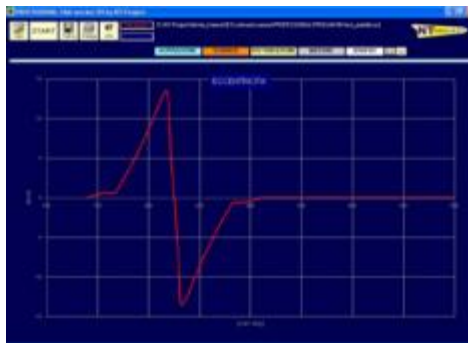
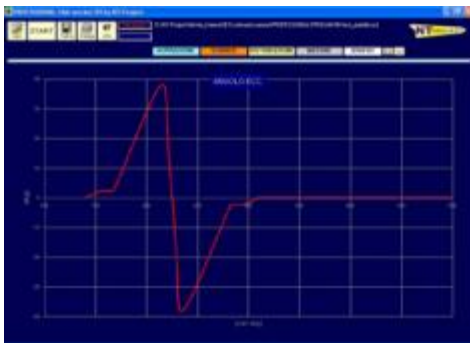
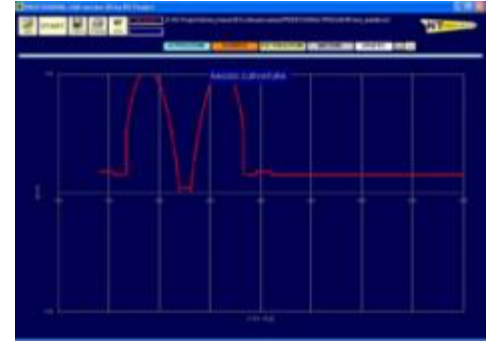
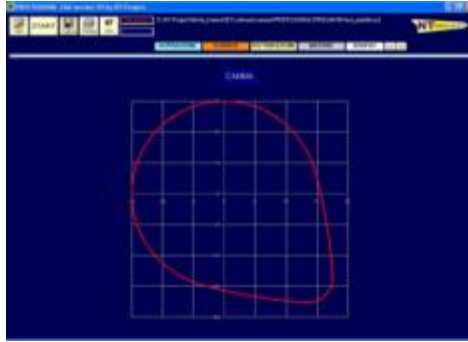
# PROFESSIONAL CAM - *cam profile calculus*



For each type of valve train system PROFESSIONAL CAM shows a sketch where it's easy to enter the data to define it. This allows you to calculate a cam profile that responds precisely to the lift law previously defined.

# PROFESSIONAL CAM - *cam profile output*

radius of curvature [mm]	2.02	4.82
minimum diameter tappet [mm]	27.0	23.8
max pressure angle [°]	0.00	0.00



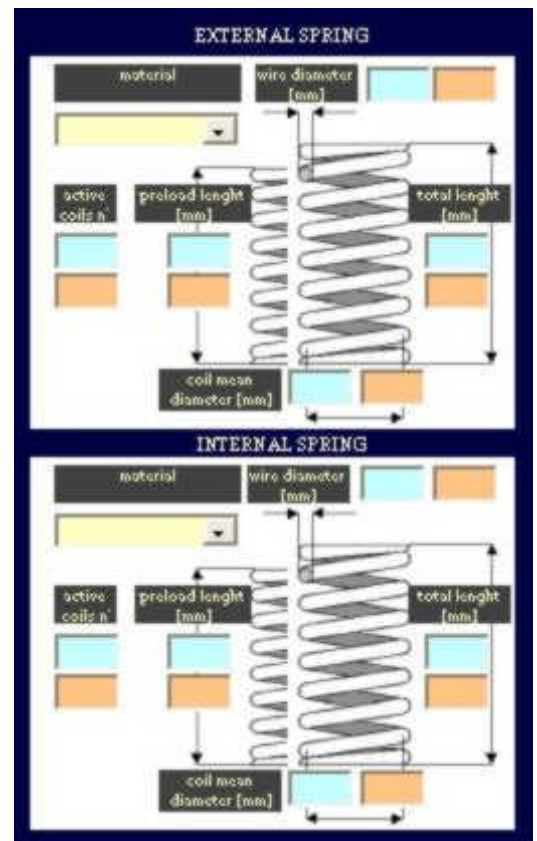
Define the characteristics of the valve train system, PROFESSIONAL CAM performs the calculation and displays immediately the information about the cam profile, such as the minimum radius of curvature, the minimum diameter of tappet and the maximum pressure angle, moreover shows the graphs of the cam, radius of curvature, offset angle, offset, etc.

# PROFESSIONAL CAM - *valve train check*

cam	INT	EXH
direct - flat tappet		
rotation	clockwise	
speed [rpm]		
lubricant		
cam material		
cam roughness [micron]		
cam width [mm]		
tappet material		
tappet roughness [micron]		
cam-tappet friction coeff.		
spring data	calculation double spring	
valve and parts mass [gr]		
tappet mass [gr]		
springs mass [gr]		
push-rod mass [gr]		
rocker arm mass [gr]		

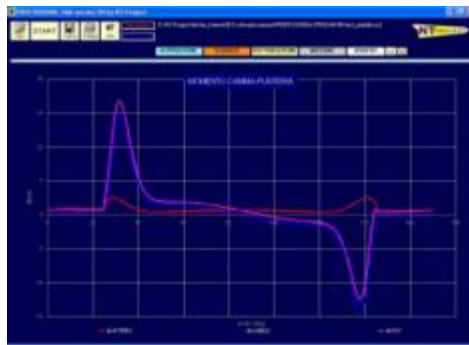
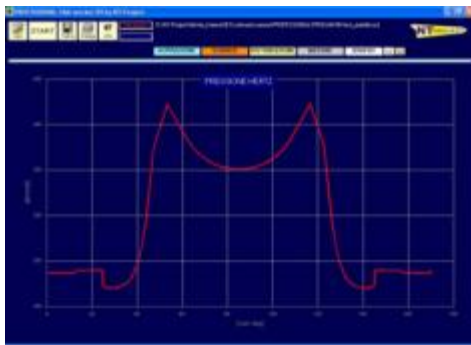
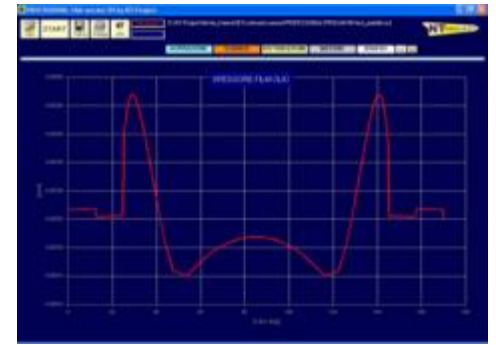
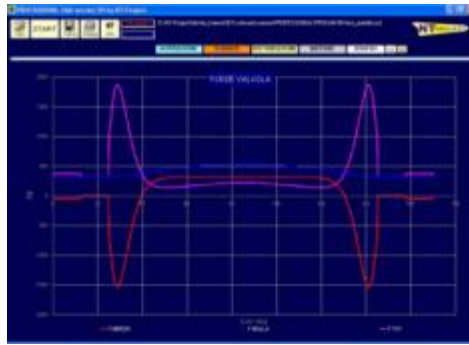
Define or import the intake and exhaust valve lift laws, providing the geometrical information and technical specifications of the valve train system, PROFESSIONAL CAM calculate whether there are conditions of valve float and the conditions of lubrication, wear and friction. In contrast to the forces of inertia of the elements of the distribution system there is the force generated by springs, which can be imported in function of lift or calculated thanks to PROFESSIONAL CAM simply inserting the geometrical information easily detectable from the springs that you have.

SPRINGLOAD FILE DATA	
Input spring load [mm/kg]	
Input spring load [mm/kg]	



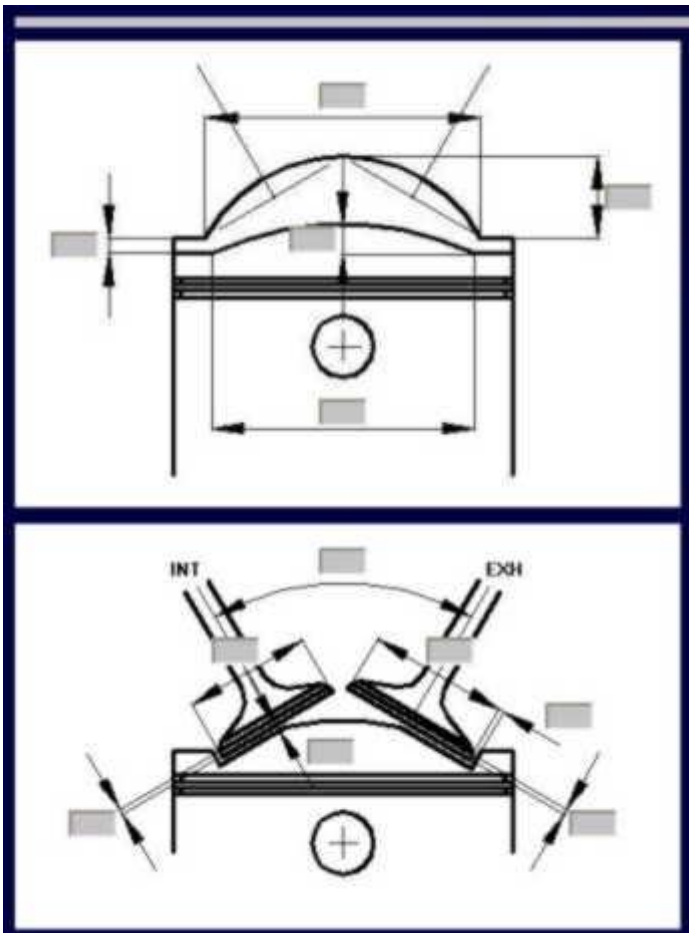
# PROFESSIONAL CAM - *valve train output*

cam loss torque [Nm]	0.34	0.40
cam loss power [kW]	0.10	0.12



At the end of the calculation of the valve train system PROFESSIONAL CAM shows immediately useful information for the design of cams, in fact, provides the torque and power necessary to move the cam previously defined and the graphs of forces to inquire about valve float, conditions lubrication through the parameter lambda and the oil film thickness, pressure hertzian to assess the wear and the friction coefficient and related torques agents on the cam.

# PROFESSIONAL CAM - *combustion chamber and engine*



n° cylinders	
n° valves int x cylinder	
n° valves exh x cylinder	
bore [mm]	
stroke [mm]	
connecting rod [mm]	

Together to design the camshaft, PROFESSIONAL CAM gives useful information for the design of a hemispherical combustion chamber. Defined the chamber and the data of engine is also possible to see if the lift laws previously defined cause interference and the losses to drive the camshaft in terms of torque and power.

# PROFESSIONAL CAM - *combustion and engine output*



diam max x 2 valv [mm]	41.39	compression ratio	13.39
interf max v int [mm]	2.98	surface / volume [1/cm]	3.42
interf max v exh [mm]	1.21	valvetrain loss tot torque [Nm]	2.98
interf max valves [mm <sup>2</sup> ]	13.17	valvetrain loss tot power [kW]	0.94

At the end of the calculation with the data of the combustion chamber and of the engine PROFESSIONAL CAM shows whether there are conditions of interference between valves and piston and between the valves themselves, it also provides the compression ratio and the ratio surface / volume of the hemispherical chamber defined, for a planning analysis. Finally shows the torque and power lost to move the cams of the engine.

## PROFESSIONAL CAM - *output files*

Together with data and graphs displayed within the software, PROFESSIONAL CAM creates a set of files with stored the output of the calculation. These files are extremely useful to be able to reprocess the results with spreadsheets and especially to transfer the necessary data to the machines to make the camshaft.

### LIFT LAW

Two files are created, one with the only lift every 0.5 cam degrees and the other with the kinematic variables of velocity, acceleration and jerk.

### CAM

A file is stored with the profile in polar coordinates every 0.5 degrees and another with the profile in polar and cartesian coordinates which are associated the information on, the radius of curvature, the lift and the relating kinematic variables, the offset and the lag between the rotation and the contact point.

In addition to these files, is created a file in dxf format with drawing the cam profile for an easy importation into cad-cam systems.

### VALVE TRAIN

For valve train system is created a file with all the data relating to analysis carried out, then the forces of inertia, of the springs, the acceleration in respect of the speed, the parameters of lubrication, of friction with the torques agents on the cam.

# PROFESSIONAL CAM

**As seen in summarizing this brief presentation, the software PROFESSIONAL CAM allows to guide you with ease in the design of a camshaft and to verify its right operation.**

The clarity data entry and to receive the basic information at the end of the calculations make PROFESSIONAL CAM a **software usable from those who have no great computer and techniques skills both from the professional**, as it offers all the tools of calculation to perform high-level design

In sequence is possible:

- **DEFINE WITH GREAT VERSATILITY THE INAKE AND EXHAUST LIFT LAWS;**
- **CALCULATING THE CAM PROFILE FOR ALL THE MAIN VALVE TRAIN SYSTEMS;**
- **CHECK THE OPERATION OF THE VALVE TRAIN SYSTEM IN TERMS OF VALVE FLOAT, WEAR, FRICTION AND LUBRICATION;**
- **DEFINING AN HEMISPHERICAL COMBUSTION CHAMBER AND TO VERIFY ANY INTERFERENCE OF VALVES.**

PROFESSIONAL CAM generates output user-friendly for both the design phase of the camshaft, and for the realization phase, so **you can follow all the steps with a single software and have an overview of the problems to finish the development by taking care of all important aspects.**