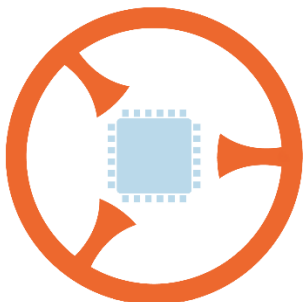
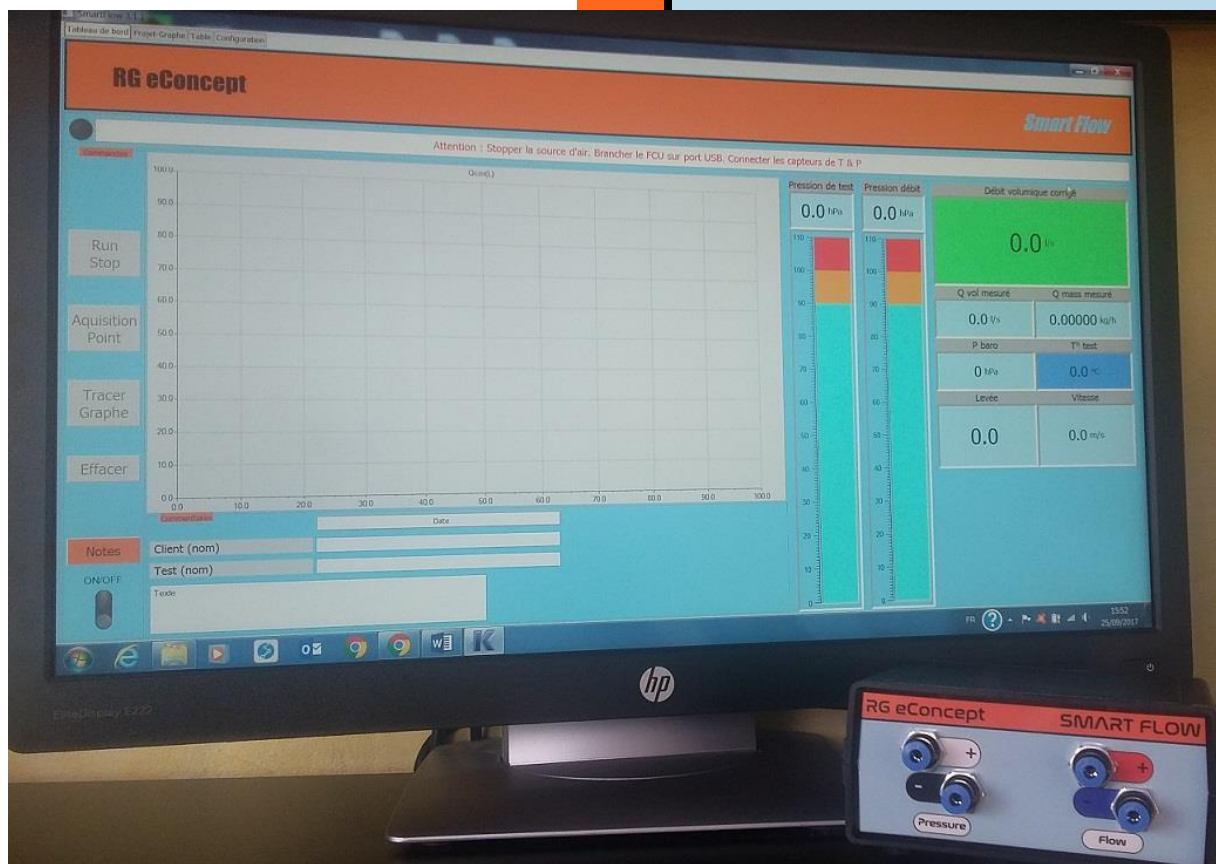


# User's Manual

# SmartFlowCams-SCC1



**RG eConcept**  
*Smart Motorsport*

[rgeconcept.fr](http://rgeconcept.fr)

StFwCm-UM

Révision	Commentaire	Date
1.0	Version initiale	09/11/2018
2.0	Modification des commandes (ajout de boutons)	20/11/2018
2.1	Modification du format fichier	09/09/2019
2.2	Fonction sauvegarde écran et fichier associé	06/04/2022

# 1. Introduction: Cylinder head permeability

## Purpose of the SmartFlowCams version

This version of the software allows you to visualize and quantify the flow rate of the "cylinder head-cam shaft" system.

By reading a file dedicated to the .csv format (template format indicated [here](#)) containing the cam lift data according to its rotation angle, the actual valve lift in the engine cycle is reproduced. The profile of this lift is displayed for the intake and exhaust camshaft.

Then by reading the flow rate of a valve and its pipe according to the valve lift obtained by a SmartFlow test, the flow rate of the valve in the cylinder head is recalculated with its camshaft in the engine cycle. It's the permeability of the cylinder head. It is therefore the spreading surface of the curve defining the variation of the flow rate at the valve as a function of the crankshaft rotation angle. The larger the surface, the better the permeability.

This permeability value shows us the possible gain in system flow between two configurations.

The example below shows the construction of permeability for the same flow rate and two different camshafts.

In this real case of valve and camshaft flow rate of the concerned cylinder head, the difference in value of the integral of the camshafts is 21% (2032 mm x ° versus 1676 mm x °) but the increase in flow obtained with the same valve and same pipe is 17% (22012 CFM x ° versus 18865 CFM x °).

Obviously, the analysis could focus on comparing the permeabilities obtained with the initial flow rate and the flow rate of the valve after porting work (type of valve, seat angles, guides...). This applies to any kind of camshaft.

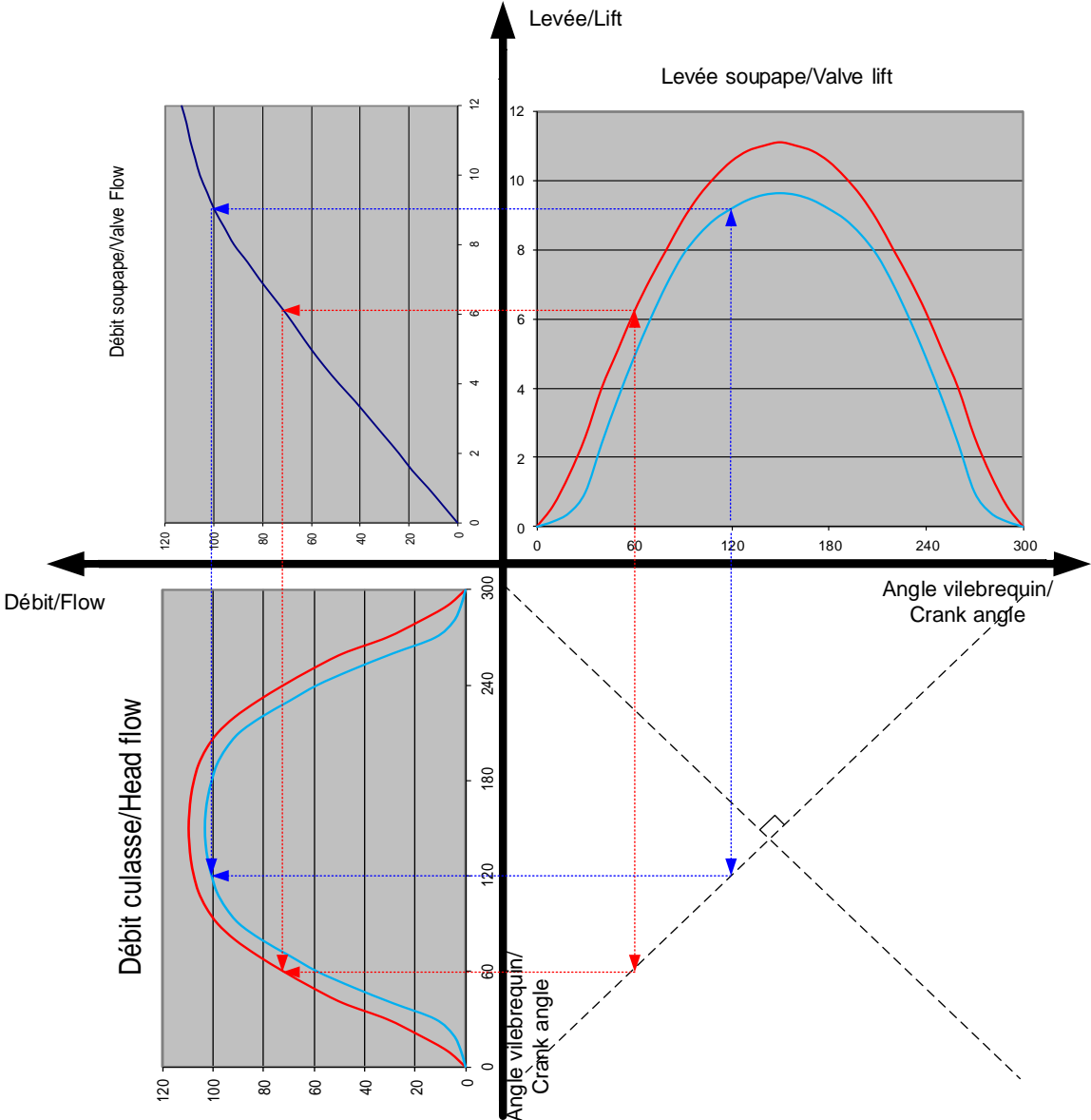


Figure 1 Construction of the permeability curve from valve flow and valve lift

## 2. Presentation of the software

The installation will automatically create a C:\DataSmartFlow\DataSmartCams directory where the camshaft files ".csv" must be located. The result files saved under the extension ".cmk" are also located in this directory.

### Cams

The "Cams" tab is the file manager and display of cams and permeabilities.

#### Frame « Commands »:

A block of 3 buttons on the left includes the commands for reading the camshaft file as well as the call to calculate the graph of the cylinder head flow rates. It is possible to open one camshaft file and then another in order to compare several permeabilities.

The file name is repeated in the frame at the top right of the screen.

The block of buttons on the right allows you to save, reread and print the graphs and results obtained.

#### Display:

The cam parameters are displayed in the grids on the left side of the screen. These parameters are read in the dedicated file.

It is possible to change the advance of the angle at the center line of the cam in a field under the grids and view the result in the graph.

The calculation of the TDC lift will be displayed in the corresponding box in the grid. This is an important parameter for engine builders.

The valve lift curves are displayed on the upper graph.

The one of permeability on the bottom graph.

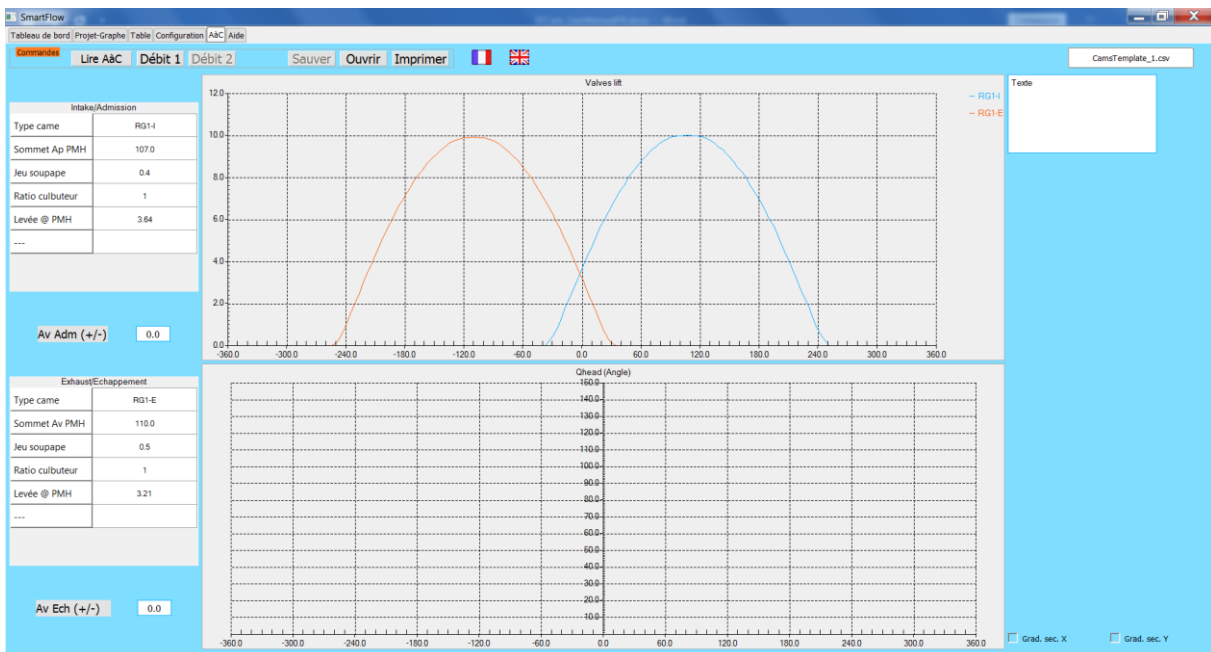


Figure 2 Tab Cams with a displayed profile

We also find the check boxes to obtain a fine grid of the graphs on the abscissa and ordinate.

A free text field allows you to add comments.

## 3. Software User Guide

### Modes

It is possible to load different cam profiles to compare the permeability result obtained with an identical valve flow, it is possible to load different valve flows to compare the result with an identical cam. And of course, to mix the 2 possibilities.

It is possible to proceed in any order, but here are the operations followed in the order of the tabs of the screens obtained:

#### Tab « Project-Graph »

- Open the performed graph project. A session that can contain up to 32 curves
- Select the curves to visualize them (informative)

#### Tab « Table »

- Open the table of your choice (from the 2nd curve in the example below). Mandatory for permeability calculation.

#### Tab « Cams »

- Read the cam data file. Click on the « Read cams » button
- To obtain the system graph, click on the « Flow 1 » button

The name of the curve is composed of the type of cam, the sum of the integral (the curve area) in flow unit x crankshaft degrees (e. g. CFM x °) and the average value of the flow rate of the « head-cam shaft » system.

Example of name: <Type> S : xxxxx M : xx.x

It is also plotted the ideal flow rate (never reached) that would come from a cam opening and closing instantly at the maximum value of the flow rate. The flow coefficient is indicated in the name of the obtained curve. This is the ratio between the maximum flow rate and the average flow rate.

Example of name: <Type> Cdm : xx.x%

To compare another flow rate, return to the « Table » tab and select a test and in the « Cams » tab click on « Flow 2 ». Or select another camshaft by pressing the « Read cams » button.

### Precaution

It is necessary that the actual lift of the valve is less than the maximum lift used during the flow reading. In other words, the flow rate must be measured with a lift exceeding the maximum lift of the valve.

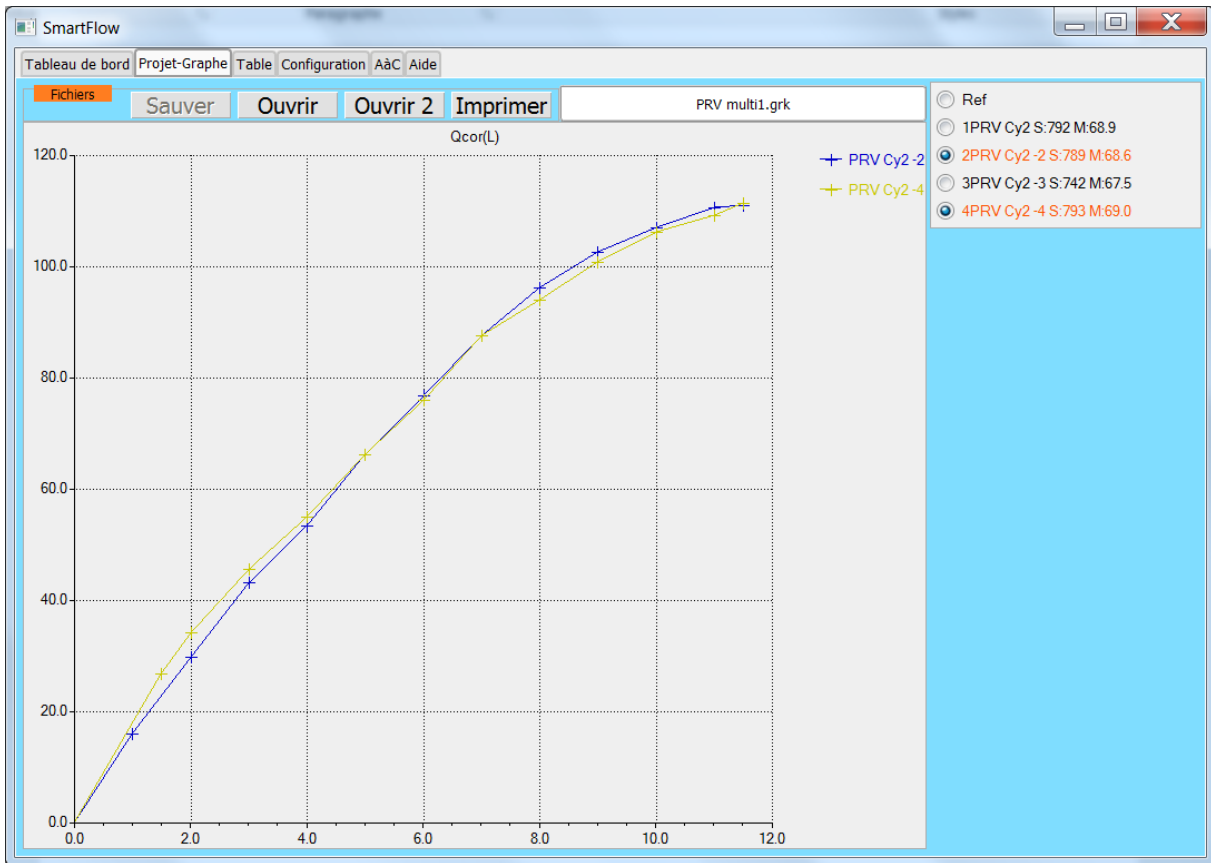


Figure 3 Selection of the flow graph

L (mm)	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00
Q cor (CFM)	16.10	29.76	43.30	53.46	66.14	76.80	87.59	96.15	102.64	106.92	110.69
V (m/s)	79.54	73.53	71.31	66.03	65.36	63.24	61.82	59.38	56.35	52.83	49.72
Ma	0.23	0.21	0.21	0.19	0.19	0.18	0.18	0.17	0.16	0.15	0.15
dP test (hPa)	25.00	25.24	25.24	25.64	24.90	22.44	18.09	15.32	13.48	12.28	11.46
dPflow (hPa)	1.97	6.92	14.80	23.08	34.63	42.44	44.79	45.89	46.09	45.64	45.69
T mes (°C)	18.83	18.30	18.09	17.94	17.87	17.90	18.01	18.11	18.17	18.17	18.34
Q mes (CFM)	16.29	30.20	43.89	54.60	66.55	73.37	75.16	75.96	76.06	75.65	75.68

P Baro	98264.8	Date	12:38:44 14.04.2018
T cor	16	Client	RG eConcept
P cor	10 "H2O	Test	PRV Cy2-2
Flux	Adm	Comment	Test avec controle de la pression de test avec variateur de vitesse. 25 hPa
D siége d0	40		
Angle soupape	45		
D soupape int d1	41		

Figure 4 Selection of the table corresponding to the graph of the studied flow rate

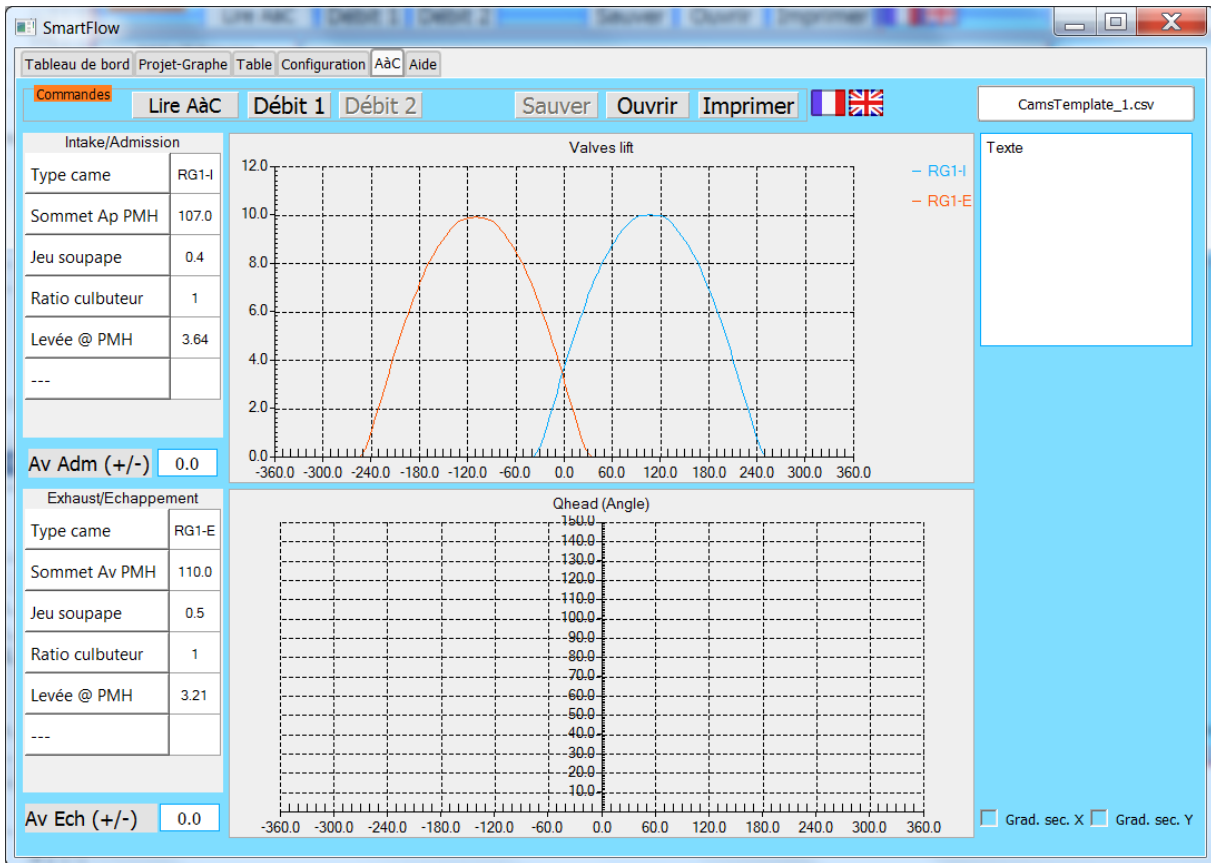


Figure 5 Selection of the desired cam profile

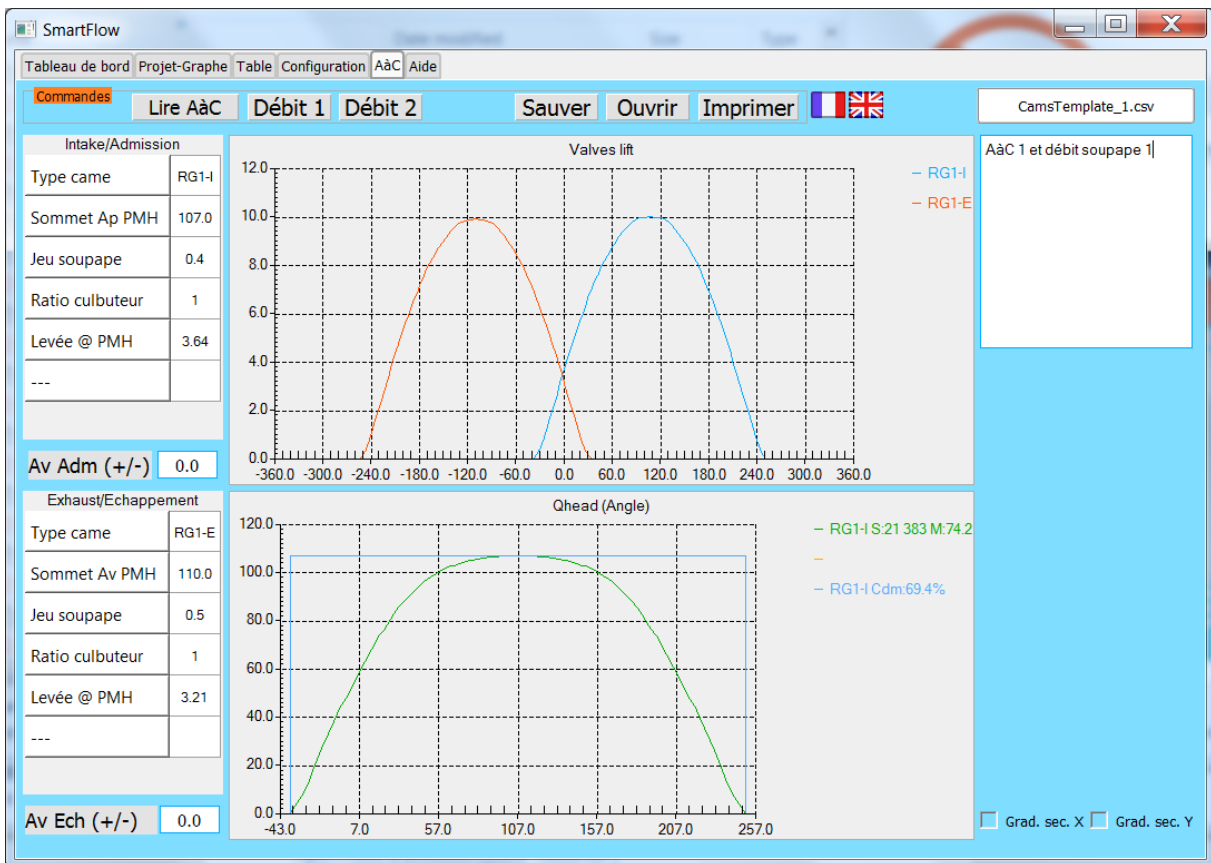


Figure 6 Permeability curve ("Head-Cylinder head" system)



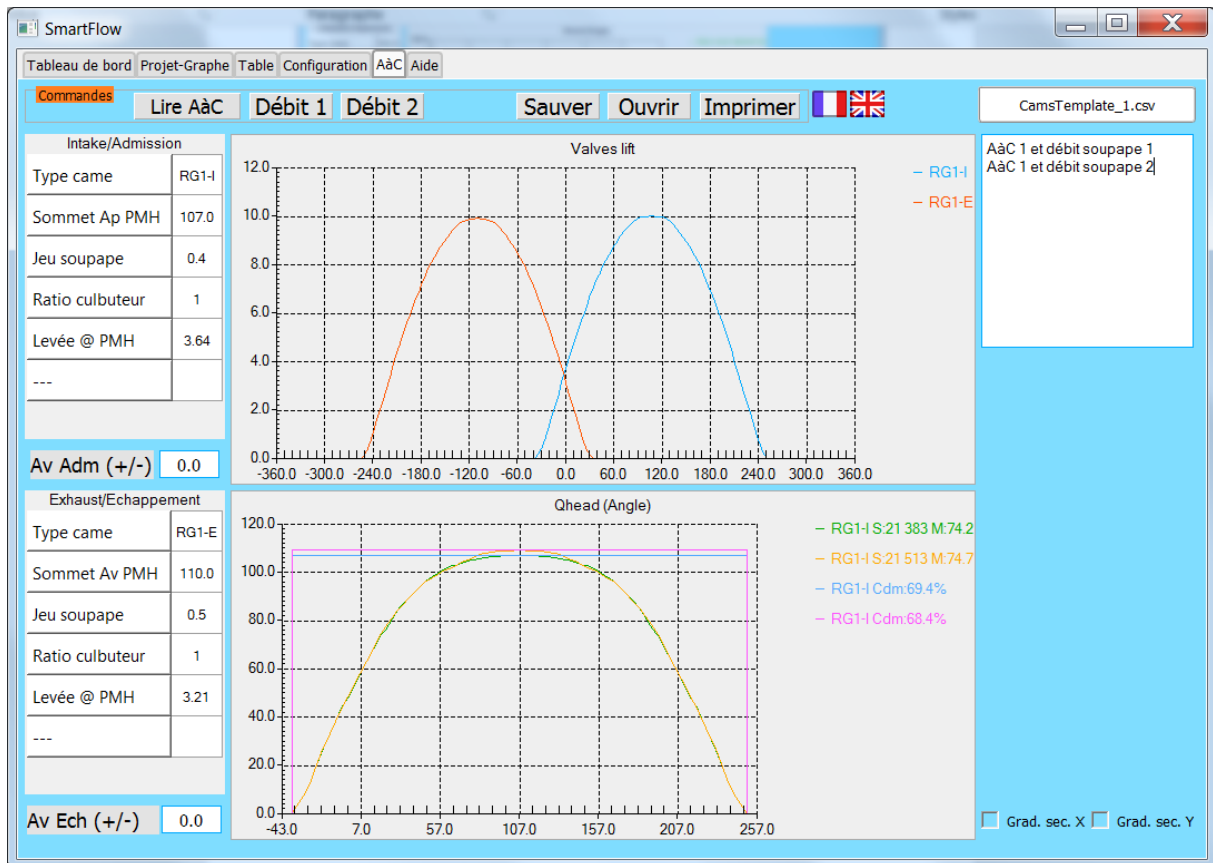
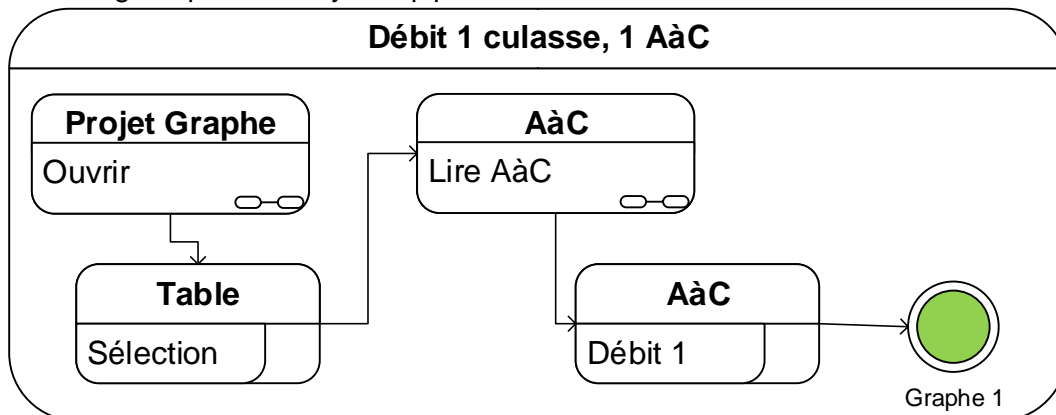


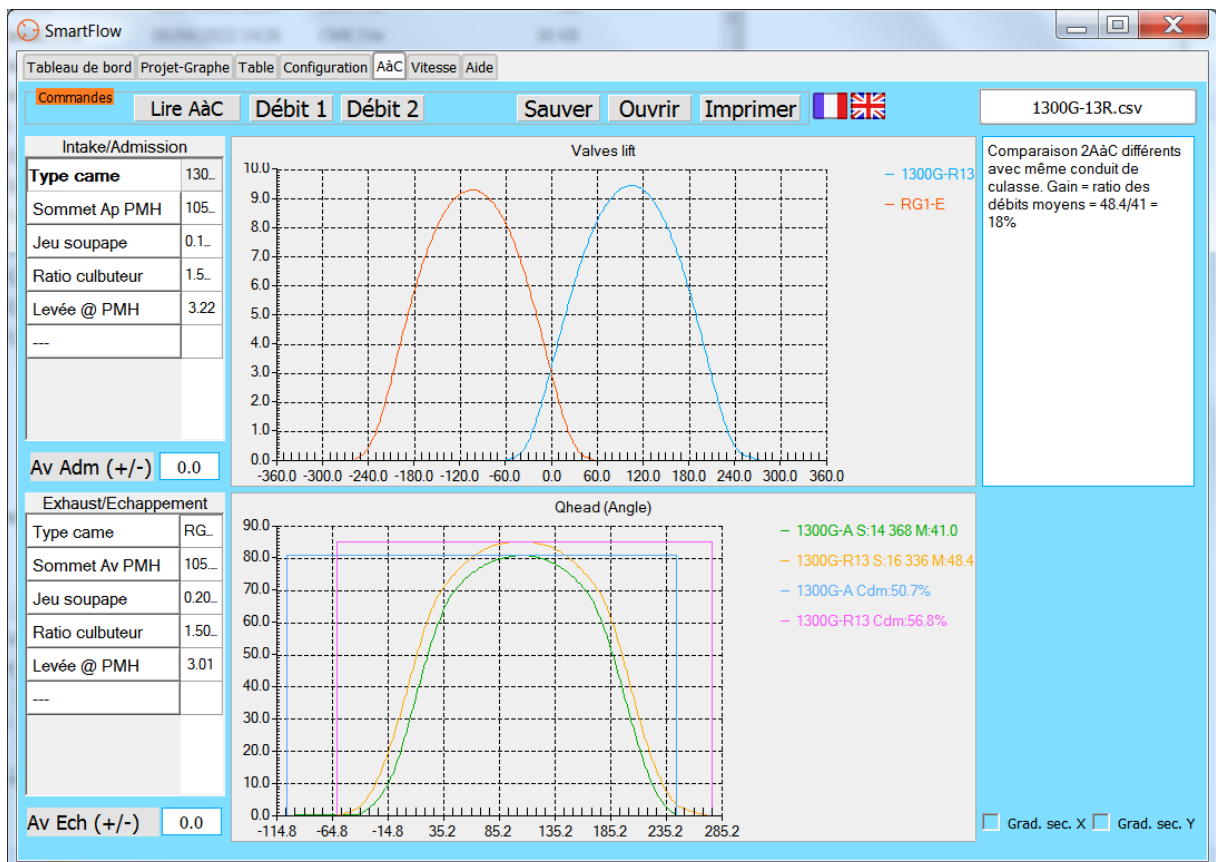
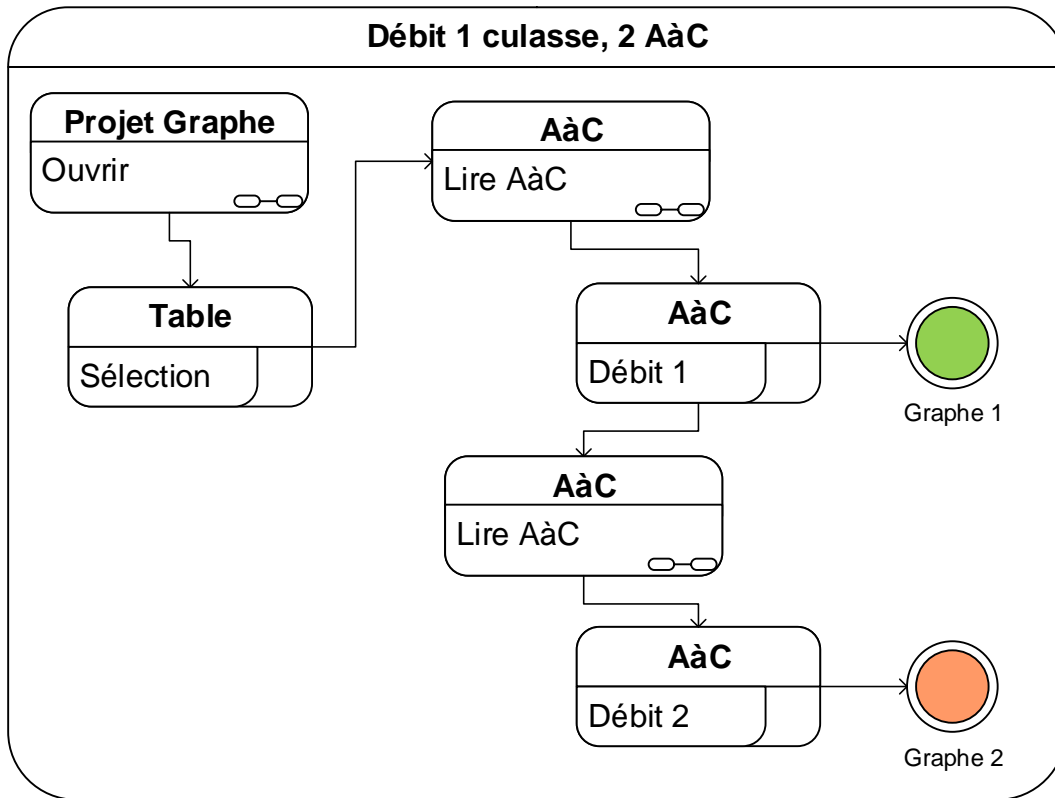
Figure 7 With 2 compared flows rates

## Sequencing of operations by graph

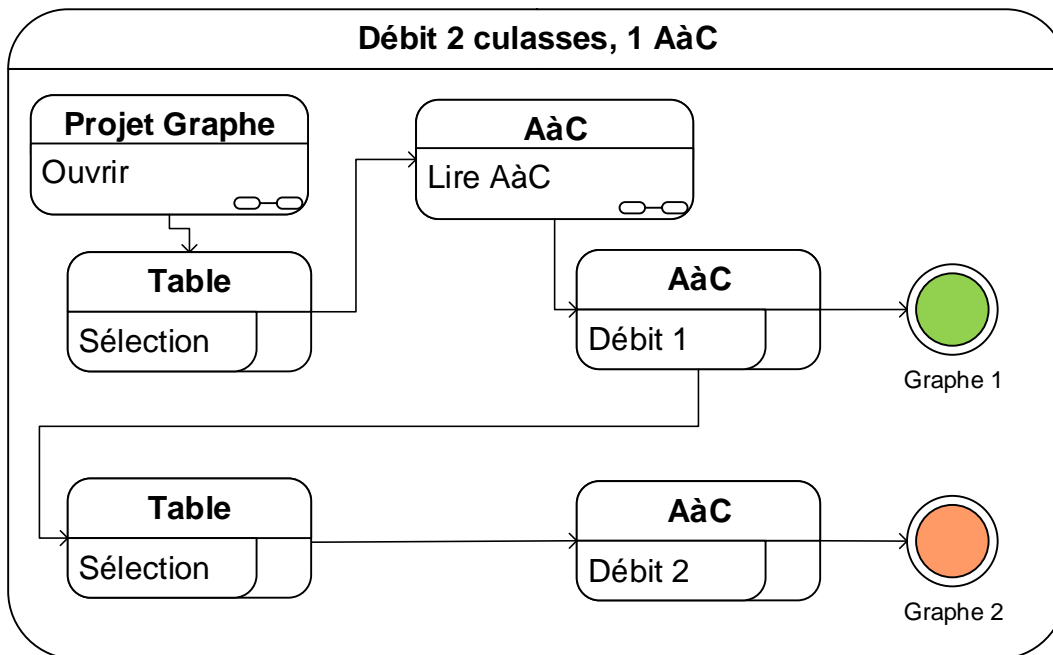
- Obtaining the permeability of a pipe with a camshaft



- Obtaining the permeabilities of the same pipe and two different camshafts



- Obtaining the permeabilities of two pipes with a same camshaft



Comparison of 2 different ducts with the same camshaft shows a gain of 3.5% (ratio of average flow rates = 35.9/34.7), while the ratio between the flow rates of the ducts alone was 3%.

Hence the interest of these comparisons which refine the perception of the work of the ducts and the use of different shafts.

## 4. Cam file format

The file is in CSV format from Excel (Separator: semicolon) (\*.csv).

The file must be in the directory: C:\DataSmartFlow\DataSmartCams

It is composed of a header for the intake cam profile followed by the "angle" and "cam lift" data (not crankshaft angle, the software recalculates the actual valve lift). In black the syntax to be respected and in red the data to be provided.

- Intake : give the name of the cam.
- Centerline : Cam top angle after TDC
- Valve lash : valve lash
- Rocker ratio : rocker ratio

Intake	Centerline	Valve Lash	Rocker ratio	
RG1-I	107	0.4	1	
Cams °	Cams Lift			
-76	0			
-74	0.19			
-72	0.36			
-70	0.63			
.....	.....			

Then it is necessary to insert the header for the profile of the exhaust cam as well as the data that will be finished by EOF;0:

Exhaust	Centerline	Valve Lash	Rocker ratio	
RG1-E	110	0.5	1	
Cams °	Cams Lift			
72	0.36			
74	0.19			
76	0			
.....	.....			
EOF	0			

A template file is provided at installation.