Fluid Optics™' Letter

La lettre des Syzygies

2000, June

EDITORIAL

We are pleased to present to you in this letter an article on a projector with a variable aperture beam whose optimization of the cost in series is the first concern while preserving good optical performances. In a second article, you also find comparative measurements of light sources for cars. Lastly a new command that we built up for XMOLD software is presented to you.

Fluid Optics' inventors

CONCEPT

A cheap projector with variable aperture beam

Today, one of the great concerns of the industrialists of lighting is to find increasingly powerful, original and cheap products. The show business does not escape from this rule.

This is why we present to you, in this letter, a projector with variable aperture beam with a simple modification of the projector geometry.

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SUMMARY

SOFTWARE

To extend surfaces

To build up skew optical parts is not easily done. As a prototype, these parts cannot be moulded because their cost would be excessive. Numerical milling is then used to build up these parts.

Thanks to research in optics, we now have a CAD of the necessary optical surfaces and they must be built up as perfectly as possible. Today the subcontractors have machines able to get good tolerances, but a preparative phase of the CAD project is necessary to make sure that the realization by the CAM will not create errors which

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MEASURE

Automotive lamps

The choice of a light source in an automotive project is not a point to be disregarded. Indeed, there are several sources on the market with various photometric performances.

It is often noted that the photometric performances of these sources do not always reach the values announced by the manufacturers. One of the reasons of these differences is that light sources manufacturers present in their catalogues the values obtained with prototype sources and not with industrially made sources.

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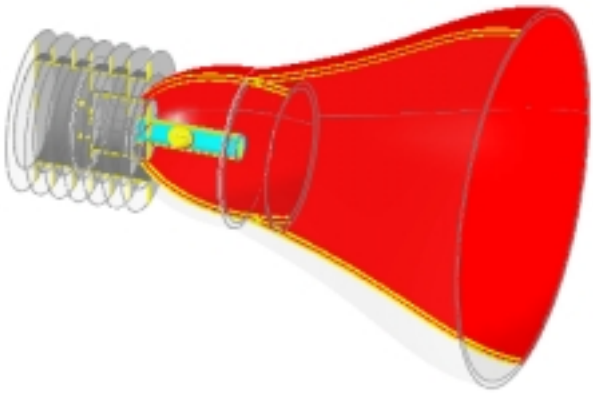
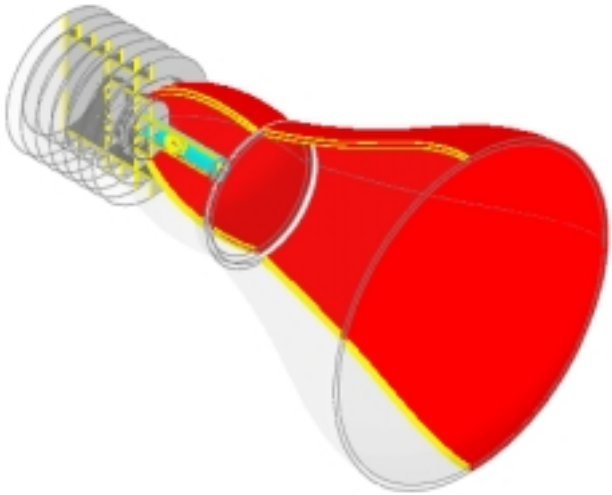
These reflectors can be build up at lower cost with manufacturing techniques, well known by the subcontractors.



FIRST GEOMETRY

Thanks to the absence of output lens, the light source is not confined any more. Then it makes it possible to increase air cooling and to increase its lifetime.

This projector does not use an expensive lens of Fresnel made of glass at output of the reflector, and it presents interesting photometric performances.



SECOND GEOMETRY

Indeed, it is possible to vary the output beam of the projector from 10° to 40° (total aperture) by a simple change of the reflector geometry.

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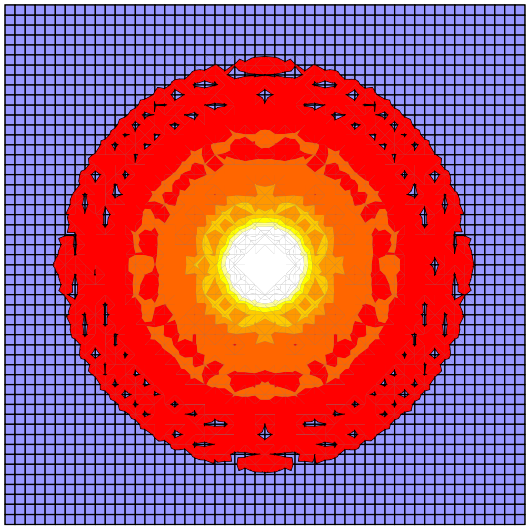
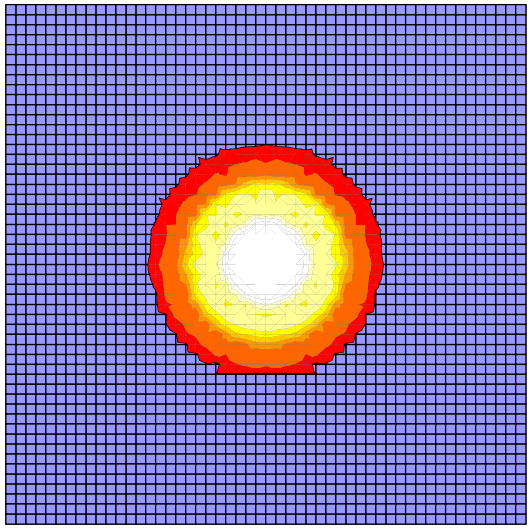


FIRST GEOMETRY
Radiant profile of the light beam
at 3m of the projector.

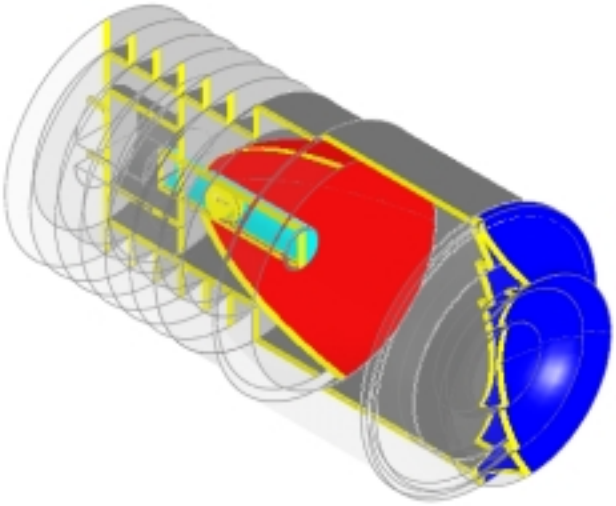


SECOND GEOMETRY
Radiant profile of the light beam
at 3m of the projector.

The respective efficiency of the first and second geometry are 74% and 80%.

In this projector, the modification of the geometry remains simple. However other solutions can be imagined to answer this type of problems. This concept can help a lot in other branches of industry, where the enlightened ranges can be modified at will, as in maritime lighting, aeronautics, automobile lighting, etc....

In the case of a more expensive projector, fluid reflectors associated with a dioptric fluid optics in echelon can be used.



Projector using a dioptic fluid optic in echelon

According to tests of simulation, we succeeded in varying the angle of the beam from 10° to 80° (total aperture) and this in a very small space.

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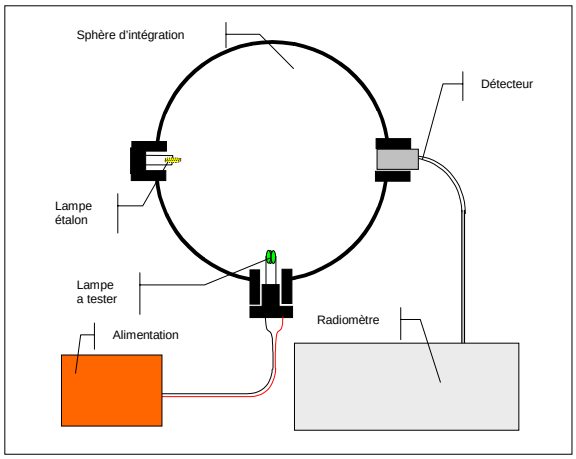
This is why, for each project, it is necessary to measure these sources carefully, before using these values which can not always be reached with industrially made bulbs.

We thus got various light sources from a car industry retailer and we present to you the measurements obtained with these sources.

To measure the total flux emitted by these lamps, we use an integrating sphere coupled to a detector. The assembly is as follows:

Procedure of test:



- We calibrate the sphere between each measurement of lamp. Indeed the insertion of a new lamp in the sphere, introduced luminous disturbances due to their different geometry. We must thus carry out a calibration with each change of lamp in order to ensure good measurements.

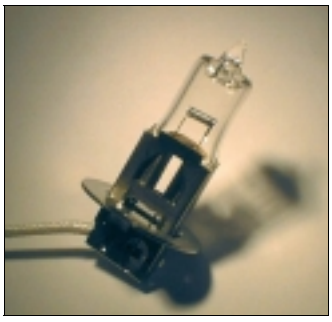
- Then, for each value of the imposed tension (10, 11, 12, 13, 14Volts), we take the luminous flux with the radiometer and the intensity on the power supply.

- taking into account our hardware and our conditions of measurement, in the old metrology convention, uncertainties of absolute measurements are around 0,1 lm for the measurement of luminous flux, of 0,01 V for the measurement of tension and 0,1 W for the measurement of power.

Models of measured bulbs

H1

H2



H3

H4

H7

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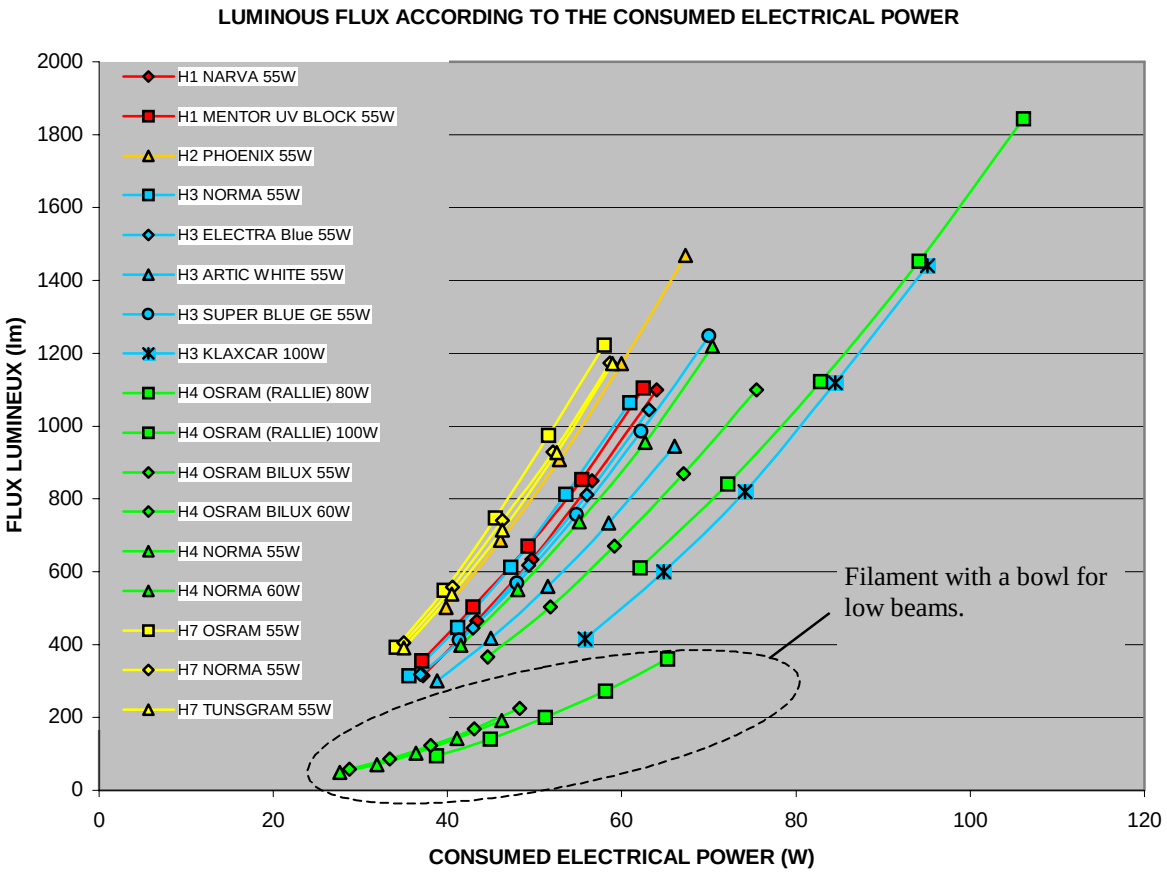
Comparison of flux according to the power

The sources at our disposal are various powers, we compare the curves giving the flux according to the electric power.



This graph shows the disparities of efficiency between the various lamps. For a value of flux given the H7 lamp consumes less.

The performances of the H2 lamp are close those of the H7 lamp.

The filaments associated with a bowl (for low beams) are those which present the worst outputs.

Emitted total flux with 12Volts input

In the car, these bulbs are always supplied by a battery whose tension is fixed at 12 V. It is thus interesting to compare the flux emitted by each source between them with this tension.

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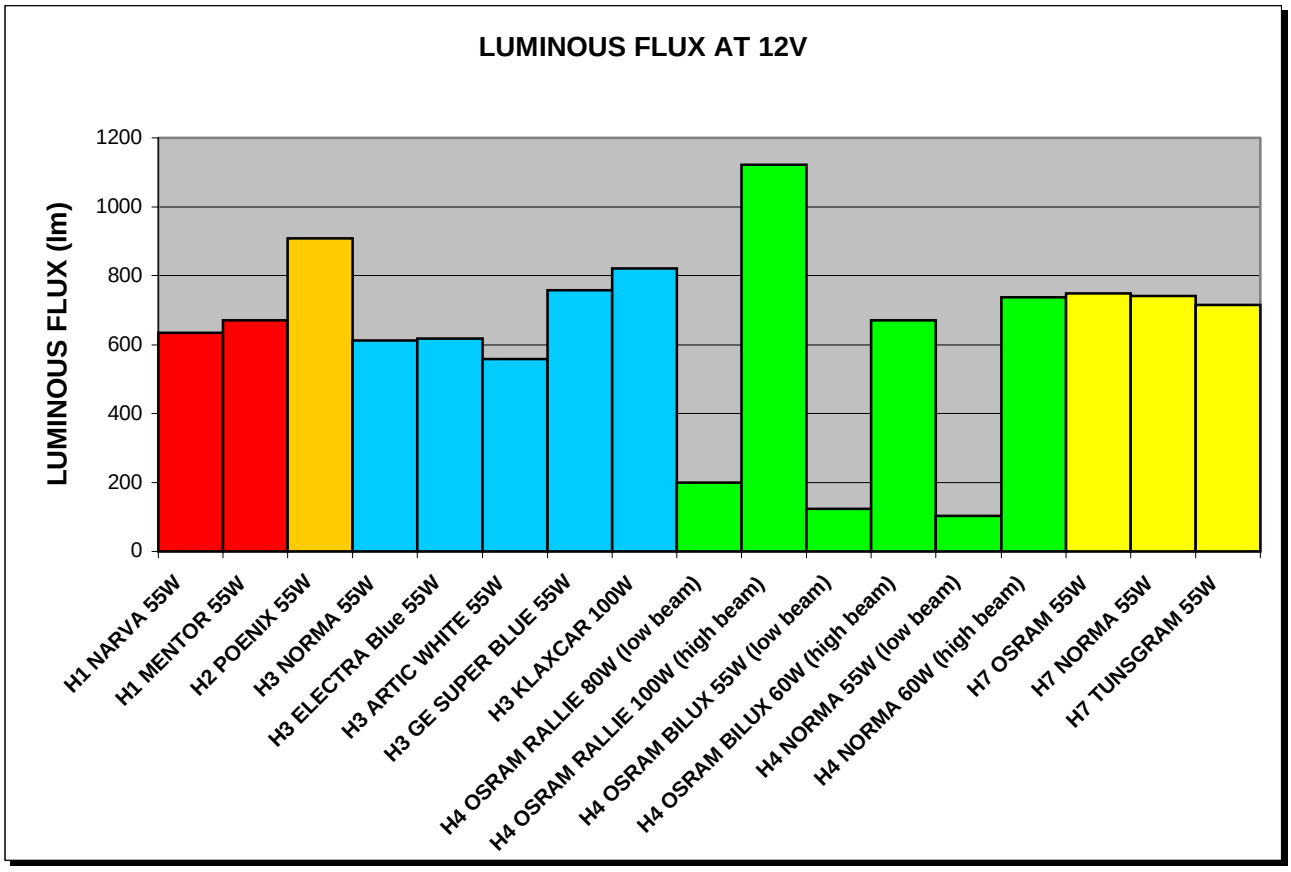
Model	Electrical power measured (W)	Flux (lm)	Luminous efficiency (lm/W)
H1 NARVA 55W	49,68	634	12,8
H1 MENTOR 55W	49,2	670	13,6
H2 POENIX 55W	52,8	907	17,2
H3 NORMA 55W	47,28	612	12,9
H3 ELECTRA Blue 55W	49,32	617	12,5
H3 ARTIC WHITE 55W	51,48	559	10,9
H3 GE SUPER BLUE 55W	54,84	757	13,8
H3 KLAXCAR 100W	74,16	820	11,1
H4 OSRAM RALLIE 80W (low beam)	51,24	200	3,9
H4 OSRAM RALLIE 100W (high beam)	82,8	1122	13,6
H4 OSRAM BILUX 55W (low beam)	38,04	122,7	3,2
H4 OSRAM BILUX 60W (high beam)	59,16	670	11,3
H4 NORMA 55W (low beam)	36,36	102,9	2,8
H4 NORMA 60W (high beam)	55,08	737	13,4
H7 OSRAM 55W	45,48	747	16,4
H7 NORMA 55W	46,32	741	16,0
H7 TUNSGRAM 55W	46,32	715	15,4



We saw that the results could be very different according to the source model and their brand. Even if a particular source provides more luminous flux than the others at 12Volts, it will not be systematically used. Indeed, the flux is not the only selection criterion, the geometry of the source, its price, its space distribution, etc... are also criteria quite as significant.

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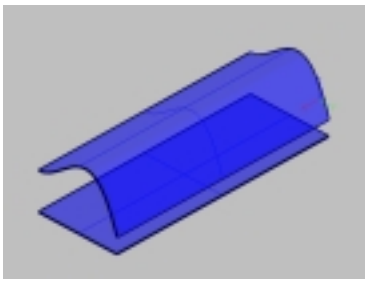
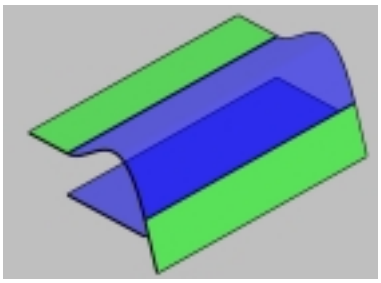
could make deviate the expected optical results.

On the basis of these problems, a new CAD command of surface extension in tangency is created in XMOLD software by the inventors of Fluid Optics. This command affords to prepare, amongst other things, an optical part for its milling. The goal is rather simple, wathever is the skew NURBS surface, restricted or not restricted, it is necessary to be able to lengthen the surface in tangency so that, during machining by numerical milling, the attack of the tool respects the good angle.

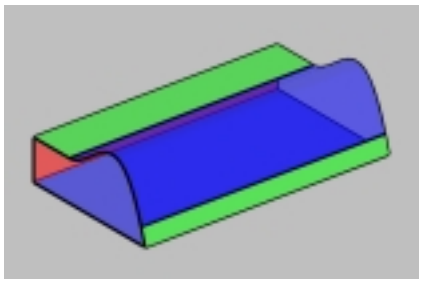
But to build clean surfaces in edge of part on restricted NURBS surfaces, is not a so simple work. A specific calculation algorithm of the surface was carried out by using recursive principles in order to ensure a given tolerance.



Optical surfaces to be manufactured



Optical surfaces to be manufactured (blue)
Extended surfaces in tangency (green)



Final part for manufacture

On same work, it was built up a command of tangency extension with reduction of a given angle in order to design the same part in other cases (as per moulding).

It is while working with the XITRON company, that the inventors of Fluid Optics built up this command and today a step moreover was constructed towards the manufacture of prototypes increasingly in conformity with the design. For more information you can consult the Web site of XMOLD: http://www.xmold.com or to join company XITRON, by recommending inventors of Fluid Optics to you, at the address email: contact@xmold.com.

NEWS

If there is a subject you wish to see treating in this letter, you can directly contact us by email at the address:

syzygies@optique-fluide.org

You can also join MEGALUX, the company charged to exploit Fluid Optics at the address:

info@megalux.com

NEXT LETTER

The next Letter of the Syzygies will appear for the autumnal equinox, end of September.