

VERY LOW HEAD TURBINE:  
NEWSLETTER N° 3

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[www.vlh-turbine.com](http://www.vlh-turbine.com)

THE 1<sup>ST</sup> VLH UNDER MANUFACTURING

Dear Friends and Partners,

We are now entering the final stretch before commissioning of the 1st VLH.

The very low head turbogenerator unit and its associated electronics are under manufacturing.

Civil engineering works on the Moulin de Troussy demonstration site in Millau are very well advanced and should be finished by the beginning of November.

The commissioning of the VLH should occur within January 2007.

But before getting to that point, let us look back on the months elapsed since the edition of our newsletter n°2 in December 2005.

Since the beginning of year 2006, we are carrying out, in the hydraulics laboratory of Laval University, Quebec, tests on a small scale-model. These tests have provided their first results in May. At the present time, they are continuing to study all possible installation configurations and especially angles below 45°.

The results are very encouraging. They largely exceed our initial assumptions under all tested angles.

In parallel, the design and devel-

opment of the electronics and the command and control software is making great headway.

The manufacturing of the mechanical elements and of the permanent magnet generator is also well advanced.

From a commercial point of view, the project has been disclosed in June as a world premiere in the Hydroenergia 2006 Conference, organized by ESHA in Scotland. On this occasion, our website has been launched ([www.vlh-turbine.com](http://www.vlh-turbine.com)).

Since then, many contacts have been established, we are currently working on some thirty projects, and on the creation of our network of representatives in Europe.

Our next letter will give the return on experience of the first installed machine.

We are waiting for you in spring 2007 for the inauguration of our Millau site in the south of France.

Yours sincerely,

Marc Leclerc  
General Manager

PRELIMINARY RESULTS OF TESTS ON SMALL-SCALE MODEL

Tests have started with the study of the configuration with a 50° angle of the unit with respect to the horizontal plane.

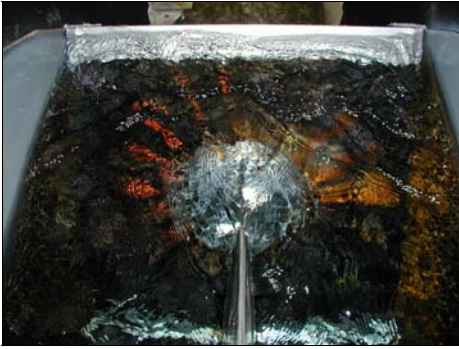
They show that the VLH hydraulic design will enable achieving, on industrial machines, a 90% turbine efficiency at the top of the hill chart. Since the direct coupling permanent magnet gen-



Finished small-scale model wheel Ø 650 mm

erator driven by this turbine also has an outstanding efficiency, the general efficiency of VLH turbogenerator units will be of the same level as the best current modern installations.

It is interesting to mention that laboratory



Turbine on the test stand in upstream view

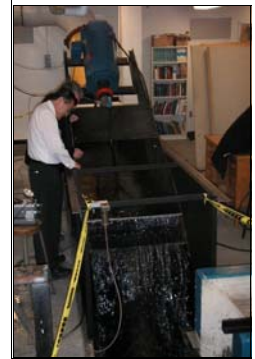
results perfectly corroborate the CFD calculations performed under the care of Professor Kueny since the obtained difference between these calculations and the physical results at the point of maximum efficiency is

lower than 1%.

The tests are carrying on at a 35° angle. The first results in this configuration are excellent. They indicate a quasi-preservation of the performances observed under 50°.

Such very encouraging data allow us to envisage systematically installing the VLH unit with reduced angles (unit close to the horizontal direction) and accordingly limiting the excavation depth and volume necessary for the machine installation. In the case of the Millau site designed for a 45° angle, passing to 35° would have enabled saving 200 m3 of rock excavation and next to one meter high on the side walls at the unit level.

The VLH solution will thus certainly have better performances than expected, in terms of pure performance as well as in civil engineering economy with respect to a conventional solution.



Downstream view of the test device in operation

## ANALYSIS OF THE VLH PERFORMANCES

In addition to the excellent maximum efficiencies announced at the previous point, tests have also revealed a good preservation of the performances under partial load.

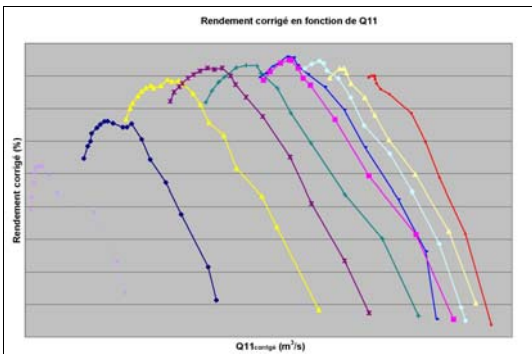
It can here and now be considered that the VLH will be capable of operating with acceptable efficiencies up to approximately 20% of the rated flow.

Further, the variable speed will enable maintaining the working point at its optimum, including when the head will decrease.

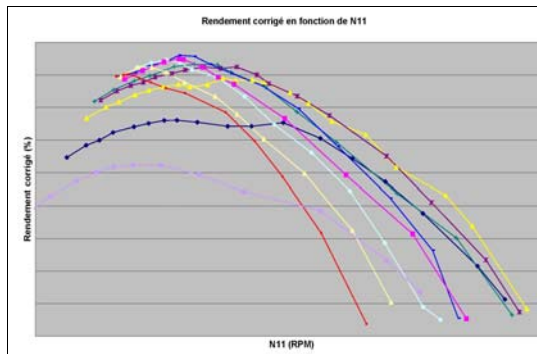
This unique functionality will enable it to adapt to the decrease in the net head in the presence of strong flows. This case, which is very frequent in very low heads, will not prevent the VLH from generating, even under reduced heads that can reach down to 30% of the rated head.

As a conclusion, we now have the confirmation that the VLH turbo generator unit will have performances comparable to those of conventional machines. Given its wide operating range, the production in kWh will be greater for equivalent hydraulic resources.

« *High-level performances* »



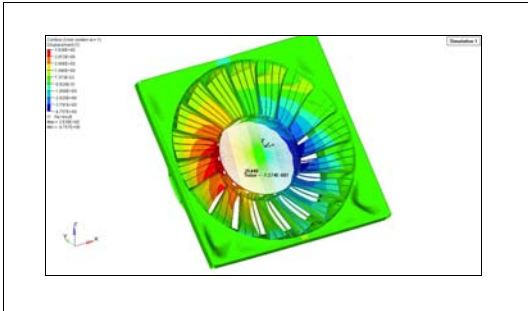
Efficiencies corrected according to Q11



Efficiencies corrected according to N11

# THE VLH UNDER MANUFACTURING

The VLH has started being manufactured in July 2006, once the detail studies and the last structural verifications by simulation and finite elements have been completed. The heavy sheet welded structures are in progress.



Finite element modeling of the efforts on the supporting structure

The manufacturing of the mechanical parts



Distributeur en cours d'assemblage début septembre

has also started and is currently carrying on.



Cercle de Vannage

The blade 3D shapes have been transmitted to the pattern manufacturer who is showing us his almost finished work. We are ready

to start the casting



Wood and resin mould for the blade casting

In parallel, the stator assembly and winding have also started. The coils are under manufacturing and the stacking up of the lamination plates in the stator shell carries on.



Outer stator envelope

These assemblies are expected to be delivered by the end of November.



Coil manufacturing

# MILLAU DEMONSTRATION SITE CIVIL WORK

Everything has started with site survey and cleaning works.



Cleaning and sounding downstream of the mill at the level of the VLH implantation

Upstream, the works comprise cleaning the sediments before the excavation and water



The working site is out of water  
The excavations can start

As soon as the weather has been fairer, it has been possible to start placing the upstream and downstream cofferdams.  
The upstream and downstream cofferdams



Construction of the upstream cofferdam

intake construction works.  
The lowest elevation is downstream.



The excavations are over, below-grade demolitions start upstream

only leave a space necessary to the outlet of leakages of the upstream cofferdam.



The downstream and upstream cofferdams almost join



Downstream excavation at the VLH implantation level

## MILLAU DEMONSTRATION SITE CIVIL WORK (END)

Once the excavations are over, the demolition works have continued to obtain a completely clear passage under the building in the old pumping station.



Completely clear water passage under the old building

Upstream, the water intake works have received two hydraulic gates which will be very useful to isolate the intake channel during fish-friendliness tests.



Installation of the frames of the upstream valves

Downstream of the building, the works are carrying on, bank drainage, partial destruction of the dike, followed by the placing of the floor reinforcements.

Once the floor has been worked, the lat-



Downstream floor

eral walls are reinforced.

They are then sheeted with form panels, and poured worked in two phases

The heavy reinforced concrete works will then start taking shape.



Lateral reinforcements at the level of the VLH unit



Sheeting of the side walls at the level of the VLH unit installation

In parallel, a small flapgate has also been placed at the water intake level for the evacuation of big floating bodies and of floods.



Water intake almost finished, valves in place and flapgate waiting to be placed

Only one month of work left before the end of the civil works

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