

CODEART asbl – JLA & Co sprl



JLAKit, the small turbine for rural communities and handymen

Objective

To deliver an efficient technical solution for the mastery of hydro power in developing countries

Summary

Presentation of a BANKI / CROSS-FLOW hydraulic turbine, with a unique approach to its manufacture: this is a hydraulic machine built from a kit. The parts are designed to be assembled in a basic mechanical workshop.

CODEART and JLA & Co sprl offer 3 options depending on the available equipment:

1. Completely galvanized turbine ready for installation
2. The supply of an assembled and equilibrated rotor, with the rest of the machine in detached parts
3. The supply of the whole turbine in detached parts

Objective >> JLAKit

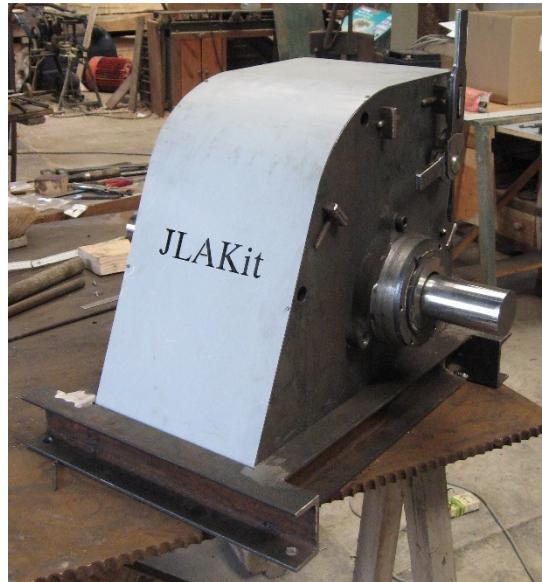
Observation: despite the abundant hydraulic potential in various developing countries, energy access is still a major problem

Handcraft production and processing raw material all need energy.

Our contribution to the struggle for improved livelihoods in developing countries is a new concept of hydraulic turbine designed for maximal cost-effectiveness without loss of performance.

In South-East Asia, the local manufacture of small turbines is an important and growing activity. The JLAKit project is born from the study of the different problems faced in the local construction of small turbines.

The JLAKit is the outcome of cooperation between the manufacturer of hydraulic equipment JLA & Co sprl (www.jlahydro.be) and CODEART asbl (www.codeart.org), an NGO regulated by Belgian law. The development of these turbine results from the long experience of the Willot JLA workshop in the construction of Banki turbines (since 1988) and from the experience of CODEART in technology transfers to developing countries (also since 1988).



The JLAKit meets the following double objective:

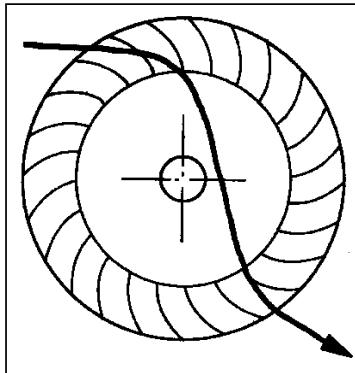
- A turbine tailored to sites whose civil works are within range of local means
- A turbine which can be assembled locally

1. Description

The JLAKit is a crossing flow turbine generally called "Banki" or "Cross-flow".

As the heart of the turbine is the rotor, the JLAKit inherits from the JLA29 rotor (diameter 292 mm), whose blades are especially designed for optimal efficiency. Those are made of rolled profiled steel, adapted and welded to the two end disks, the whole following a procedure specific to the JLA & Co workshops.

The water intake is horizontal, with a profiled guide vane manually controlled.



The width of the water intake is limited to a maximum of 300 mm, and is adjusted to the flow and head characteristics of the site.

The JLAKit has not been designed to work in "suction" mode. However this could be achieved with a meticulous assembly work.

The machine is made from 8 mm thick metal sheets, standard profile bars to go strength to the assembly, and specific pieces including cast iron bearing housings, roller bearings, seals, gaskets and other common mechanical components, all provided in a standardised kit. The different parts of the kit are fit together and welded following a simple and clearly established procedure. No assembly mistake can be made if the guidelines are respected.

The JLAKit can be easily assembled in any basically equipped workshop. The list of basic equipment essential to the assembly of the machine is provided to the purchaser in form of a questionnaire. These equipments are needed for the client to carry out operations such as bending, drilling, milling, metal spinning, welding, etc.

The concept of a Do-it-yourself kit for local assembly enables an appropriation of the technology and allows the JLAKit to be sold at a competitive price.



2. Typical uses of the machine

It is clearly possible to generate electricity, but it should be noted that direct hydromechanical uses have higher efficiencies, because they avoid the stage of electricity generation. For small powers, the combination of losses in every stage of energy conversion (transmission losses → generator losses → line losses → engine losses → transmission losses), often lead to a total efficiency of 50% of the available power.

Hydromechanical uses make best use of the available hydraulic power and enable the users to avoid technical and financial constraints in relation with electricity generation (electrical equipment box, velocity regulation, electrical lines, etc.).



Unless otherwise specified, both ends of the turbine shaft can provide driving force, and thus can drive 2 different machines: a mill and an electrical generator for example.

The use of a steel frame common to the turbine and the driven machine is not required: driven machines can be mounted on a smaller steel frame linked directly to the turbine body, and secured by a pivot junction. By using a pivot junction, it is easy to use various driven machines for different uses.



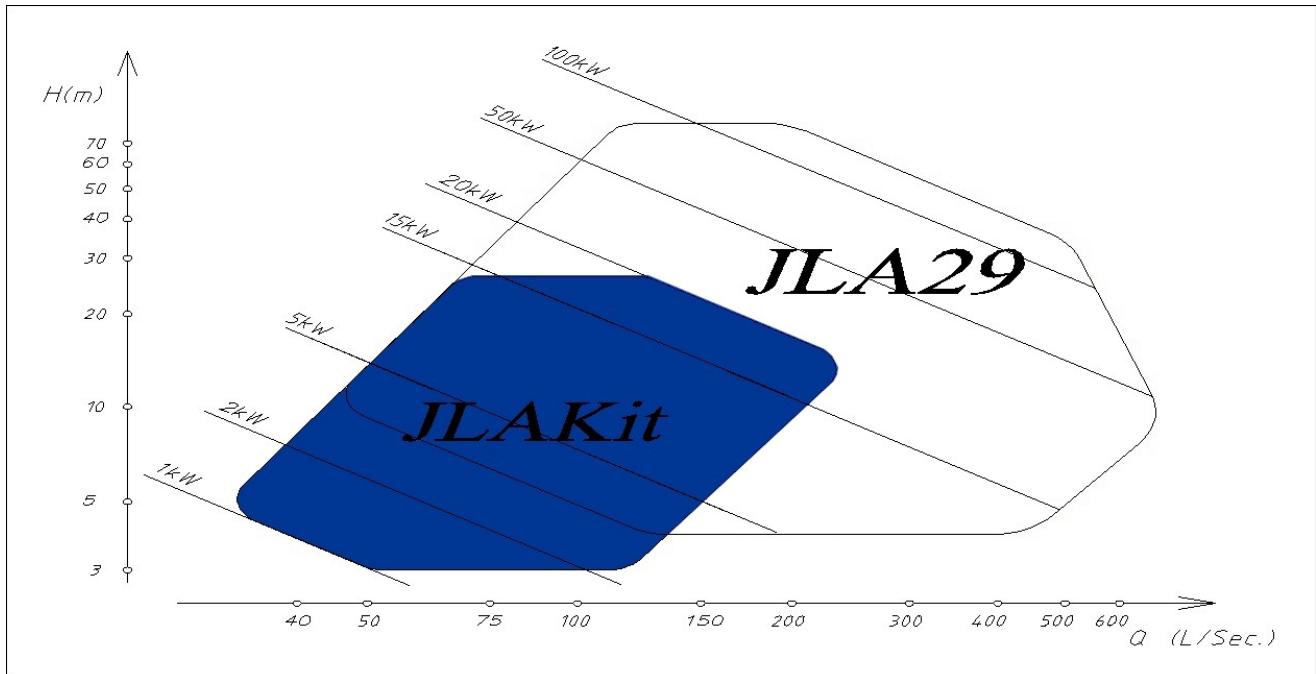
The JLAKit can drive, for example:

- Farm machinery
- A small DC generator for battery charging
- An asynchronous generator (3 phased motor) which, by the mean of a regulation and a bank of capacitors, could provide electrical power for resistive loads: LED light for example.
- A pump, a wood saw, etc.

According to the power range of small hydroelectric facilities, the available power will be limited to the essential needs of most people, to economic activities profitable for everyone and able to take the best advantage of the produced energy. Indeed, in a village, it is more profitable to share the services of a hydromechanical mill than to distribute a small quantity of electricity. This implies a reorganization of the community's practices and a mutation of some ways and customs so as to adapt them to the sharing of a common resource.

3. Characteristics and range of use

The following graphic determines the operational range of the JLAKit. Note the overlap in performance with the JLA29, built by JLA & Co sprl since 1988.



JLAKit hydro turbine is suited to sites with head between 3 and 25 m. The nominal flow needed is between 20 and 220 l/s. The mechanical power produced goes from 0.5 to 26kW.

The range of use can seem modest, but this makes the JLAKit suitable for a large number of sites that can be easily equipped with basic civil work.

Larger flow usually needs more complex civil works and bigger machines.

Bigger head and rated power need meticulous constructions which are not always feasible locally.

4. List of components

The set of pieces provided includes:

A set of metal sheets of 8mm thickness, for the structure of the machine/nozzle and other parts	
3 metal sheets of 1mm thickness for the hood	
A metal sheet of 4mm thickness to be used to make the inlet guide vane	
Valve bearing housings / knuckles	

<p>Cast iron rotor bearing housings, roller bearings</p>		
<p>Complete rotor or unassembled components</p>		
<p>Guide vane axle and dynamic sealing elements</p>		
<p>Fastenings, greaser, joints and minor parts</p>		

5. JLAKit offer

5.1. Equipment

Various options are possible :

1. Complete turbine galvanized and ready to be installed

A turbine - casing and rotor - fully assembled and galvanized.

Beyond a head of 5 m (which corresponds to a rotor rotating speed of 300 rpm), a dynamic balancing of the rotor is tuned by JLA & Co. The turbine provided in this way is ready for use.

2. Assembled and balanced rotor - casing in detached parts

The rotor is assembled and balanced if necessary.

The pieces of the casing are provided in unassembled to be assembled by the buyer. The detailed assembly procedure and plans are provided.

3. Turbine in detached parts

All the pieces of the rotor and the casing are provided to be assembled by the buyer. The detailed assembly procedure and plans are provided

5.2. Training

For partners who intend to be local constructors of JLAKit turbines, training is recommended. A technician will be sent on temporary assignment to their workshop. If available, Internet access can also be used to ensure daily contact and to provide expert advice to solve any problems faced during the assembly work.

Requests for options 2 and 3 above - provision of detached parts for local assembly - will be considered in detail according to the availability of equipment in the workshop. Only work that cannot be performed by the customer will be carried out by the supplier, with the aim to transfer a maximum of operations to the partner and minimize costs, ensuring the JLAKit is accessible to rural communities in developing countries. At the request of the customer, extra tools can be provided by JLA & Co.

For partners interested in assembling rotors, access to a lathe is essential, and it would require investment into template and static balancing equipment. Such an investment is only possible in the perspective of assured large demand.

6. Appendix: a few photos of JLAKit components

