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Atmospheric Pressure: The Untapped Unlimited Source of Green Energy (Vacuum Turbine)

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Abstract - *The world is rapidly shifting towards the use of green energy sources to avoid the evils of fossil fuels which are not only limited in quantity but also cause pollution and global warming. Hydroelectric power is mostly tapped, the use of wind and solar energy is expanding but still has to go a long way, and new sources of green energy are being explored. Atmospheric pressure can be an unlimited, always available source of green energy which has so far remained untapped. The present study explores how it can be used to generate power. Water flowing through vertical rainwater pipes under gravity is observed to develop additional force when a partial vacuum is generated at the top end of the pipe. This phenomenon may be used to generate green energy.*

Key Words: Green Energy, Renewable Energy, Sources of Energy, Atmospheric Pressure, Vacuum Turbine, Fluid Flow through Vertical Pipe, Rainwater Pipe.

1.INTRODUCTION

The quest for new sources of green energy is going on the world over to replace the fossil fuels which are limited in quantity, cause air and water pollution and lead to global warming.

The use of green energy sources like solar and wind energy is increasing day by day, still we are depending on fossil fuels to meet more than 80% of our energy demand.

Atmospheric pressure can be potentially a great source of green energy. It is a renewable, unlimited source which has so far remained untapped.

In this paper an effort is made to emphasize the possibilities of utilizing this untapped source of energy which has the potential to change the world energy scenario completely.

2.WORLD ENERGY SCENARIO

The world energy demand is increasing day by day. It has more than doubled in the last 50 years [1]. Chart -1 shows the contribution of various sources of energy in the world in 2023 as per the data published by the Energy Institute [2].

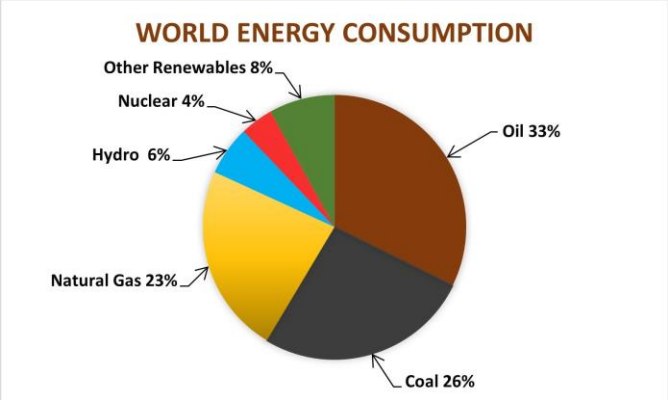

Chart –1: Contribution of various sources of energy

The importance of renewable and green energy sources like wind and solar energy is now well understood and their use is increasing day by day. Still, it may take decades to replace the fossil fuels as the rate of growth of energy from these sources is very low.

It can be seen from the above chart that hydro and other renewable sources of energy contribute to about 14% of the world's energy consumption. The composition of various sources of renewable energy is shown in Chart -2 (data source: Rahman et al. [3]).

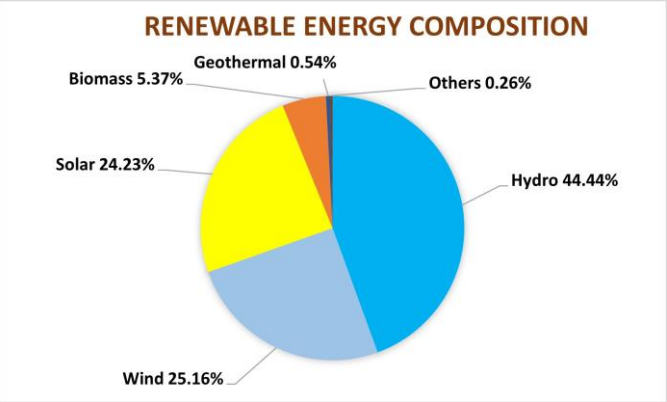

Chart –2: Composition of Renewable Energy Sources

Hydropower energy resources are already largely tapped. Solar and wind energy resources are increasingly being tapped. However, the availability of these renewable sources depends on the environmental conditions. Windmills will run when the wind is blowing, solar panels will work when sunlight is there, and hydroelectric power will be generated only when there is enough water at the source.

Atmospheric pressure can be a big source of green energy. It is available all over the world. It does not depend on environmental conditions. It is unlimited and, so far, untapped as can be seen from Charts 1 and 2. How it can be used to generate energy is the theme of this paper.

3.ATMOSPHERIC PRESSURE: THE POTENTIAL SOURCE

There is hardly any need to overemphasize the need for green energy today. Let us examine the good old atmosphere as the probable newest source of green energy. The best thing about it is, it will never exhaust its reserves and it's free and available everywhere.

It is the same energy that powers the whirlpools, storms, tornados and cyclones. We have been seeing for centuries and millenniums the power of these heavenly activities and were too scared about them, but perhaps we had never thought of asking them to share some of their power with us. This paper examines how to achieve that sharing of power with the huge and unlimited energy of atmospheric pressure.

Storms, tornados and cyclones are created by the difference in air pressure in two regions. Thunderstorms and lightning sometimes add to the size of these activities. The difference in pressure is created by nature. How about creating our own storms by creating the difference in air pressure ourselves and controlling them in such a way as to be able to use the power generated for our good instead of letting it destroy us.

4. HOW THE CONCEPT EMERGED:

One fine day in the monsoon season the first author went to the terrace of his house to remove the accumulated water, which could lead to seepage if not removed in time. However, he found the drain hole blocked by the loose leaves of surrounding trees. As he removed the leaves the water flowed down with great force. It made a huge noise as if an airplane was passing above his head. He was surprised. But the real shocking surprise came when in the evening he saw that on the ground floor 6 tiles of the floor were uprooted near the drain chamber where the drainpipe was connected. The cover of the drain chamber was also dislodged. The tiles were otherwise firmly fixed to the floor in cement mortar, and it required a lot of force to uproot them. The schematic diagram of the rainwater pipes and drain chamber is shown in Figure 1. The actual pictures of the pipe inlets and drain chamber are shown in Figure 2 and 3 respectively.

To his mind this force of water was much more than that due to gravity alone. While he was still struggling to get a suitable plumber to fix the tiles, the incident repeated. Again, while removing the leaves from the drain hole, he heard the huge sound. But this time realizing the heavy impact it might have on the floor structure, he removed the leaves one by one gradually to contain the flow of water downwards, guessing it from the intensity of sound it produced.

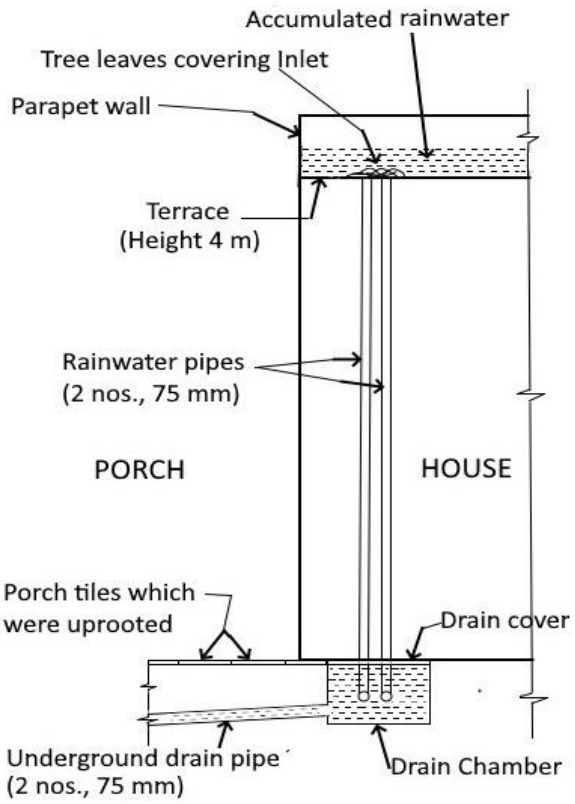

Fig -1: Schematic diagram of rainwater pipes and drain

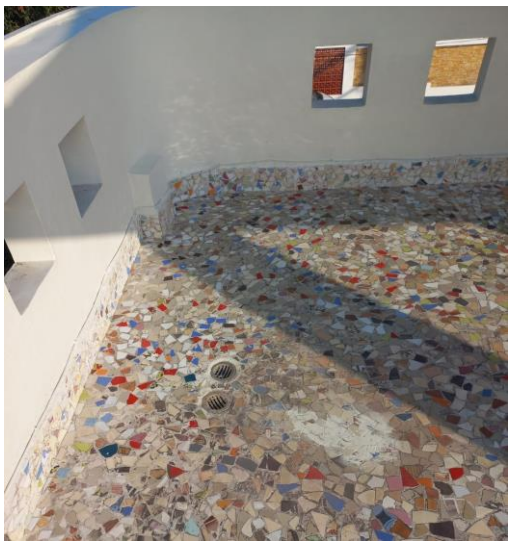

Fig -2: Inlet mouths (drain holes) of the rainwater pipes

Fig -3: Drain chamber (black) and the broken tiles (refitted)

After he got the tiles refitted, one day while sitting free and thinking about the incident he realized that perhaps the repeat of the incident is trying to tell him something. As he thought, the force with which the water was flowing down the drainpipe was much more than what can normally be expected due to the gravity alone. Did it mean that this phenomenon was generating power?

To prove that this phenomenon can generate power, it was enough to successfully pump the water drained from the outlet to the terrace where the drain hole was located by using the power generated by the outflow of the drain water. This can be done by either sending the water back to the terrace through a pipe directly connected to the outlet or by generating electricity through a hydroelectric power model from the outgoing water and then using the electricity to pump the water back to the terrace.

But before the experimentation let us examine whether this is possible in theory? The desired results will be obtained if the water flows out at a force which is more than that due to gravity alone. And to generate power, the force has to be so much more that it overcomes the efficiency factor of the reverse pumping mechanism (pumping back to terrace). The vacuum created by the deposited leaves on the drain inlet leads to a push on the water by the atmospheric pressure creating a whirlpool (observed by the first author). This push due to atmospheric pressure and the normal pull due to gravity, both act on the water towards the drain. Thus, the force is certainly more than that due to gravity alone. But the extra force must be enough to generate power in excess of what is required to pump it back to the terrace. This needs to be experimented and established.

The experiment can be conducted by filling water in a tank with a drain hole at the bottom. The drain hole must be air and watertight to disallow any leakages of water or entry of air. The drainpipe can be connected to either a pipe feeding the tank directly from the drain water or it can be connected to a generator of electricity. The generator can pump the water back to the tank and give away the extra power if any. The figures 4 and 5 below show both these arrangements.

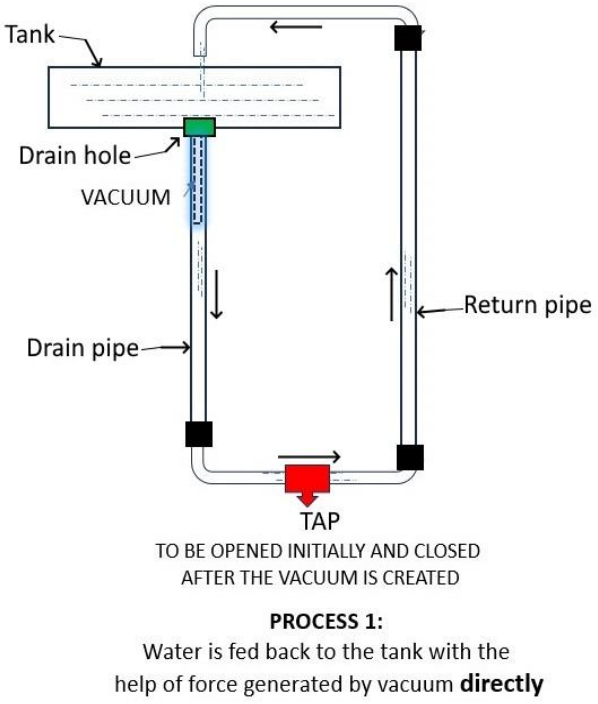

Fig -4: Process 1

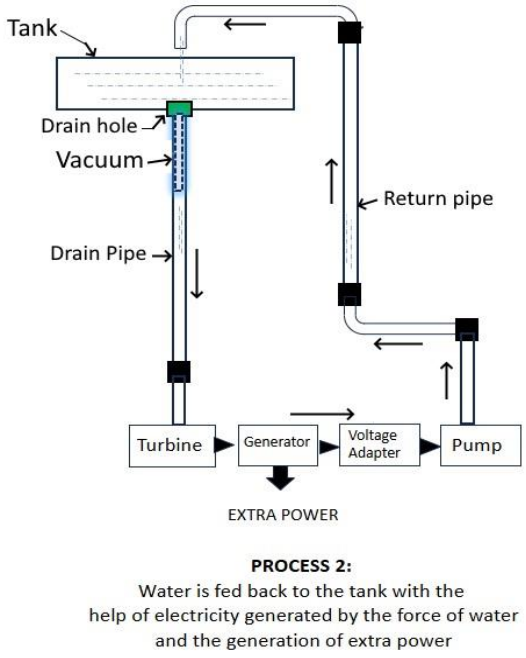

Fig -5: Process 2

5. PROCESS:

The tank is filled fully with water, keeping the tap closed at the bottom. Now the drain hole in the tank is closed by the palm of the hand or any other means, such that no water can enter the hole. The tap at the bottom is now opened. The water in the pipe will flow down to some extent till it is prevented by atmospheric pressure from the bottom end. This creates a partial vacuum in the pipe equivalent to the column of water gone down. At this stage the bottom tap is closed, and the hand is removed from the hole of the tank to allow the water to flow down. The water flows down with great force which is the combination of atmospheric pressure due to vacuum and gravitational pull.

Here a question arises that soon the vacuum will be filled by the water flowing down, leading to normalization of the situation i.e. the flow of water with normal force due to gravity. But the observations as stated earlier did not support this normalization theory. Then what was happening with the terrace water as stated earlier?

Bernoulli's principle of fluid mechanics tells us that when fluid flows with high velocity through an enclosed medium (like a pipe) it can generate vacuum [4]. This may possibly explain our observations. The water in the drainpipe is pushed and pulled with high velocity in the pipe. While the water entry destroys the vacuum, the fast flow of water creates further vacuum. So, if we can create a vacuum because of fast waterflow which is equal to or more than the vacuum destroyed by the entry of water itself in the pipe, our fast flow of water will continue forever. And if it is fast enough to generate power in excess of what is required to feed the water back to the tank, we have created green power using atmospheric pressure. The following are the variables in this process:

1. Pipe height
2. Pipe diameter
3. Water head in the tank
4. Tank area
5. Amount of vacuum

By varying these variables suitably, we may be able to achieve the desired results. In the example we have created vacuum by closing the hole with hand etc, but in practical models we can create vacuum with the help of vacuum pumps. Closing of the hole may be done once or multiple times as may be required for achieving the process by using mechanized solenoids and timers etc.

These variables may also allow us to design the turbines for power plants, based on this concept (which we may call "VACUUM TURBINE") of various sizes as per the requirement of the site, house or industry.

6. OTHER APPLICATIONS

Vacuum turbine is a concept which may materialize in future through further research and testing. Meanwhile, the observations, as stated earlier, lead to a definite conclusion that extra force is generated when water (which may be any other liquid as well) is flowing down through a vertical pipe under gravity and a partial vacuum is introduced at the upper end. This may be quite useful in situations where vertical flow of fluid is already taking place like that in the penstock pipes of hydroelectric power plants.

As such, this phenomenon may find applications in generating additional power in hydroelectric power plants by introducing partial vacuum at the upper end of the penstock pipe. The vacuum may be introduced by using gravitational force acting on the flowing water by closing the inlet valve for a while and then reopening the valve quickly, or by artificial means. This may require thorough testing and redesigning of the penstock pipe for the extra force.

7. CONCLUSIONS

The vacuum turbine connects us to the free, unlimited and ubiquitous source of green energy by using the atmospheric pressure. The need is to develop appropriate implementable technology. With the current technological scenario in the world, it should not be very difficult.

Even till the development of such vacuum turbines, we may use the phenomenon to generate additional power in hydroelectric power plants.

Atmospheric pressure is a potentially unlimited source of green energy, and it can be tapped.

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BIOGRAPHIES

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