Pressurised submerged hydroelectric plants in basins with lifting and oxygenation.

Pressurised submerged hydroelectric plants in basins with lifting and oxygenation.

Italian demand patent N. 102016000111938 dated el 08/09/2016

Abstract

The invention of the pump with two separate supply until the impeller on the suction side has allowed the invention of hydropower by recycling water in an open vessel. With this system we have, at the same time, lifting water and the production of energy, mainly by exploiting the dynamic pressure (or kinetic energy) of the water flowing from the upper reservoir.

This invention, in turn, has inspired the present invention, which interacts positively with the environment. In fact, in pressurized systems with pumps with double separate power supply, the continuous internal recycle to the volume of water accumulated allows balance the hydrostatic pressure in inlet and outlet of the pump and therefore to circulate the water with very little energy.

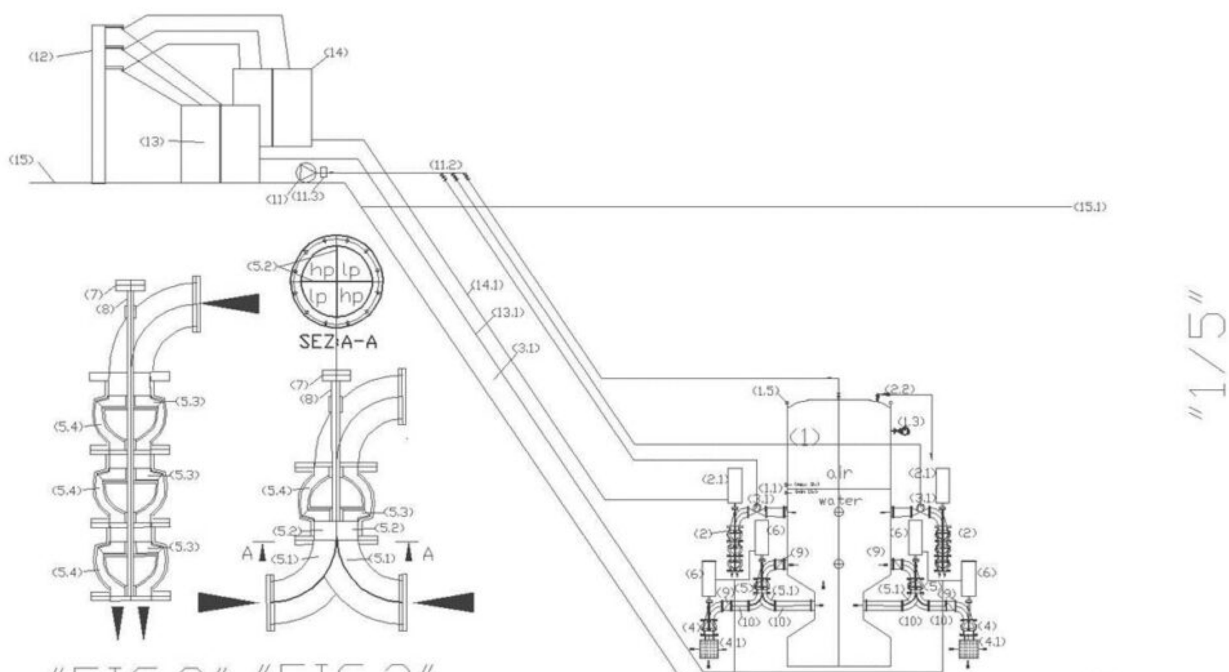
With the second separate supply until the inside of the impeller, it is possible to introduce water at low pressure in the pressurized tank. Since water cannot be compressed, the same amount is excreted in high pressure by the cushion of air through a tube that feeds a turbine, transforming the energy of static pressure into dynamic and producing electricity. The compressed air volume does not vary, therefore the air behaves

like a spring, but due to of the principle of Dalton on the partial pressures of the gases and Henry on the solubilization of the gases, neglecting the effect of nitrogen that is neutral and of the other gases that are in negligible percentages, we have an important effect of the oxygen solubilization due to the pressure which increases proportionally according of the same. This involves an increase in capacity of water purifying, without increasing the cost of production of electricity. Considering that to state of the art pressurized water power does not exist, it is clear that this invention involves huge economic and environmental benefits. If with the pump with double separate supply introduce polluted water into the pressurized tank, we can produce energy while we clean instead of consuming energy. We can realize submerged pressurized water power plants in the depths of lakes and seas. But the same application can be produced in a reduced version even in small treatment plants. All the hydraulic systems, including those depurative, of the future will be able to produce energy because the power of compressed air always allows to have residual energy to be exploited in a turbine and all will be with the water recycling, because the recycling of water by the pumps with the dual separate supply allows to circumvent the force of gravity and the pressure. The compressed air will be used as an accumulator of energy that disperses only the part of the energy due to the components that dissolve in the water chemically. This dispersion in global systems, which are also depurative, cannot be considered a loss of yield. With this invention we move towards the elimination of energy costs and multiplies environmental protection.

Description

In the introduction of any patent filing is standard practice to cite the state of the sector concerned. But in this case there is not much to say because the hydroelectric pressurized does not exist. This is the real situation, which penalized the environment and the world economy, since it is a clean energy system, not bulky economic, which has the capacity of continuous production, and greatly superior to the existing energy yields.

This way of lifting the water and produce energy is not only economically advantageous but also from the environmental point of view. It can halve the costs of depuration, which require immense energy costs, having the oxidation air to be compressed specifically to such pressure over the opposition of the hydrostatic water pressure to provide oxygen to the air diffusers used for this task. The hydro submerged pressurized transfers oxygen free to the water both through the water recycling to the process, both through the multiplication by tens of times the specific pressure on the water surface inside the pressurization tank.



"FIG.3" "FIG.2"

"FIG.1"

The “pressurized submerged Hydroelectric plants” in Fig.1, are resting on the seabed and produce energy with very high yields, even higher than coal, without the need to purchase fuel and release the dissolved oxygen in the water for free thanks to high tank pressure fed by an air compressor located on the shore, which also provides pressure energy, which becomes kinetic energy tath is transferred to the water and exploitable by the turbines.

This solution has the great advantage to provide pressures up to about 35 bar (since the air at pressures up to 37 bar becomes liquid) also placing the plant a few meters deep. shown in Figures 4, 5, 6, 7.

This invention, as some previous inventions of the undersigned related to energy production with water recycling, it would not be possible without the invention of pumps with double separate supply until the impeller, which as shown in Figure 2, allows you to bypass the hydrostatic pressure of the pressurized tank (1) dividing the flow of water at the pump inlet in two or four sectors kept separate even into the pump impeller. These sectors, are separately fed with water taken from the pressurized tank and the basin of the water in which the plant will be submerged, while the pump output is always connected with the same pressurized tank, so as to recycle about 50% of the total flow that circulates in the tank. Since the supplies fixed, while the impeller is rotating, the same sector of the impeller is alternately fed with a flow having a different pressure and very similar flow rates, therefore, the flow of water with increased pressure pushes in the impeller the flow of water with minor pressure, which comes from outside the tank (1), while the rotation of the impeller, further increases the water pressure according to the characteristics of the same rotor (axial, axial seeds, radial, open, closed, etc.), winning the losses load in the pump, valves and special pieces that make up the circuit.

The figure. 1 illustrates how are designed the hydroelectric pressurized submerged oxygenator of water plants, which shows the following legend:

Legenda: (1) Steel pressurized tank; (1.1) level regulator with capacitive probes; (1.2) Safety valve with exhaust air in the water; (1.3) pressure gauge with shut-off valve; (1.4) of the exhaust valve; (1.5) Start-lifting eyebolts; (2) pump used as a turbine; (2.1) submersible alternating current generator; (3) motorized valve with flow regulation; (3.1) on-off valve with pneumatic control; (4.1) suction filter; (5) electric pump with double separate supply until the impeller; (5.1) Double curve with septa crossed separators in low pressure (lp) and high pressure (hp); (5.2) baffles of flow separators; (5.3) pump impeller; (5.4) diffuser of the pump; (6) drive motor of the pump with variable speed, controlled by an inverter; (7) motor or alternator coupling; (8) transmission shaft; (8.1) pipe for the passage of the shaft; (9) check valve; ; (11) electrocompressor with the storage tank (11.1) network for supplying compressed air; (11.2) solenoid valve and check valve of compressed air; (11.3) pressure switch with regulator; (12) network for the electricity distribution ; (13) electric panel and control system; (13.1) electrical system power cables; (14) up transformer for the supply of energy produced to the public network; (14.1) electric cables for transport of energy produced; (15) altitude of the land; (15.1) Maximum water level; (15.2) altitude of the seabed, lake or reservoir.

As can be seen from Fig. 1, the pressurized tank (1) is fed with the water of the basin in which is immersed through the filter (4.1), (the pump (4), which feeds a side of the pump with dual power supply separate is present only in the cases in which the hydrostatic head of the basin is very low) but at the same time in the tank is also recycles the pressurized water from the compressed air through the second supply to the pump. The internal recycling the pressurized tank serves to balance the static pressure in the impeller of the pump and allow the entrance of the water from the outside of the pressurized tank in the pump through the second inlet, bypassing the opposition of the tank pressure. In fact, the static pressure is not opposed kinetic Energie that develops within the accumulated volume, therefore, recycling the water on one side of the pump which is fed also from the other side with a flow of water produced by only hydrostatic height not pressurized, sometimes increased by a special circulation pump (4). Although the flow rates on the two sides of the pump are not perfectly equal, increasing the number of revolutions of the pump with the dual supply increases the flow rate introduced, since the recycling only serves to introduce the external water to be ejected from the air cushion without expand, oscillating between the minimum and the maximum level of the tank (1.1), which can be governed only by the volume of water introduced in the tank pressurized by the second suction mouth of the pump and by pressure of the air cushion and the control valve placed before the turbine , that in the plants submerged for limiting the risks of water infiltration, it is preferable not to use, by mounting an on off valve with pneumatic control (3.1). Therefore, to maintain constant the water level in the pressurized tank and produce energy with the maximum of the pressure of compressed air, it is necessary to realize well-balanced sound systems between the flows in the entry, exit, and the compressed air pressure, which must be preserved to the greatest possible time by restoring only the amount of air that is dissolved in the water. Obviously the greater the pressure of the air cushion, the greater the amount of producible energy through the pump used as a turbine (2) with related alternator (2.1). To make sure that the flow rates are perfectly equal, the control circuit acts simultaneously on the motorized valves (3), and the variable speed motor coupled to the pump (4), when they are inserted in the circuit, but above all, with the engine rpm variables (6) of the pump (5) with the dual separate supply. Therefore, since the plant consisting of more input and output circuits, the regulation of all the motors in operation will take place simultaneously.

In figure 1 it is shown a multiple system with the circuits arranged radially around the pressurized tank, but in many cases will be more practical to implement line installations, with circuits mounted on one side only, which can travel in the shape of the road means of transport and therefore, prefabricated, which they will merely be lowered from above and resting on concrete platforms arranged on the seabed. Will be best to carry small plants with submerged electrical cables intubated in steel pipes anchored to the seabed. Only the terminal part will be contained in a flexible steel sheath of the length necessary to allow the lifting and extraction of the entire plant by means of a crane mounted on a barge equipped for the maintenance of the installations. Will be best to realize small size systems, to not only extract them and do not perform repairs in immersion, but also to better distribute the soluble oxygen in the seabed, which produce the implants.

To the starting up of the plant all the valves (3 -3.1) are open. The water enters through the filters (4.1) with the pump (4 and 5) stationary, until fill the tank (1). Then you start pressurizing with compressed air so that the level is stabilized at the maximum level (1.1). After closing the valves (3 – 3.1) and pressurizing the tank (1) to the operating pressure established by means of the compressor (11) and the pressure switch (11.3). If there are no leaks and the pressure is kept constant, together with the water level, the plant is put into operation by turning the pumps (4 and 5). Then open the valves (3 – 3.1). The variable speed control of the pumps must guarantee the constant maintenance of the water level between the minimum and the maximum of the regulator (1.1), while the compressor must restore the pressure to effect solubilization of the air is reduced.

For energy purposes it is important to note that, by entering and exiting the same flow of water, does not change the volume of water inside the pressurized tank and therefore, does not change even the circuit pressure. There is no energy expenditure, to restore the air cushion, apart from the air which dissolves in water, which from an environmental point of view, it is certainly not a waste, given that, solubilize the oxygen in the deep water would be necessary in all coastal basins of the world, but with other systems would have unsustainable energy costs. While in the plants in question the energy expenses due to hydraulic circuits are limited to the compensation of the load losses in which hardly exceed the 50 cm of water column valves and pump. In fact, in this solution they coincide simultaneously in addition to chemical and biological advantages, especially those physics of the air that being compressible is the the most economic energy accumulator that can be used as a compressed spring, which diverts the water, which is incompressible, to the turbine without energy costs. Finally, precisely because incompressibility of water, at the exit of the turbine, at any depth unload the water, we have always a loss of load which depends only on the residual water speed (V2 / 2g).

In proposed plants, water is enriched with oxygen with high pressure in the tank (1) and is discharged from the turbine in the bottom of a deep basin at least fifteen meters, not to create problems for navigation. The oxygen which becomes insoluble due to the lower pressure compared to that inside the pressurized tank, still has an excellent chance of reacting chemically with the polluting particles contained in the water before reaching the surface. In other words, not only the production of energy will be without appreciable costs but will also allow us to oxidize the water directly in the basins in which they are to neutralize unwanted nutrients and toxic substances arriving in themselves without being intercepted by the purifiers. The latter, over all, as currently designed, not only are not efficient, but are also an immense source of energy waste. In fact, the concept of global purification expressed with 4,5,6,7 figures are eliminated both large purifiers, both large power plants, because the depuration of the water and the air and the production of energy takes place during the management drinking and industrial water to be purified, as published in other patent deposits of the undersigned. Obviously, with this system, it becomes an unnecessary expense the energies simply neutral, except in exceptional cases, for reasons of cost, efficiency, encumbrances, environmental stumble. In fact, in the world they serve only sustainable energies that interact positively with the biologically and chemically environment, which, after all, cost less, are less bulky and can be produced everywhere. . It would benefit even the lagoon city that would make use of this way of producing energy (Venezia, Amsterdam, Birmingham, San pietoburgo, Kerala, Suzhou, Mopti, Fort Lauderdale, Xochimilco, etc), which they are nice to see but smell of sewage for the big water pollution that can not be purified if the treatment does not become a beneficial side effect of energy production.

The phenomenon of solubilization of gas in the water is quantifiable in milligrams of water per liter of gas (nitrogen, oxygen, CO2, helium, etc) according to the law of Dalton, on the partial pressure of the gas and Henry on the solubility in water of the same. Below the main formulas that explain the concepts, without considering the merits of the calculations: in a mixture of ideal gases contained in a volume V and the temperature T, the molecules of each gas molecules behave independently from the other gases; as a consequence of this is that the pressure exerted by the gaseous mixture on the walls of the container and on the water surface is given by: where, R is a constant that that is 0,0821;   , … represent the number of moles of each component of the mixture. This law is valid under the conditions by which it is valid the ideal gas law is approximated at moderate pressures, but becomes more and more accurate as the pressure is lowered. By defining the molar fraction as the ratio between the number of moles of the ith component and the number Total of moles present: It is obtained that in a mixture of ideal gases, the partial pressure of each component is given by the total pressure multiplied by the mole fraction of that component: .

According to Dalton's law, the sum of the corresponding partial pressures must be equal to atmospheric pressure (1 atm = 101.3 kPa) and in fact:

Nitrogen: 79.014 kPa; Oxygen: 21.232 kPa; Carbon dioxide: 0.04 kPa; Argon: 0.8104 kPa;

other gases: 0.2127 kPa. Total (air): 101.3 kPa.

The Henry's law says that at constant temperature, the solubility of a gas is directly proportional to the pressure that the gas exerts on the solution. Reached equilibrium, the liquid is defined saturated with the gas at that pressure. This state of equilibrium is maintained until when the external pressure of the gas will stay the same, otherwise, if it increases, more gas will enter into solution; if it decreases, the liquid will be in a situation of supersaturation and the gas is freed back up to the outside when the pressures are again balanced. The speed, with which a gas enters or is free in solution, varies as a function of the difference of the pressures (external and internal) and is conditioned by its molecular composition and the nature of the solvent liquid.

To compare among them the solubility of gases in liquids, you may consider their absorption coefficient, which is the volume of gas at normal conditions (T = 20 ° C and p = 1 atm) and expressed in milliliters which was dissolved in a milliliter of liquid. In the table are reported the absorption coefficients in water of some gases at different temperatures at atmospheric pressure:

Gas	Temperature	

0°C	20 °C	30 °C	
Elio	0.0094	0.009	0.0081
Azoto	0.0235	0.015	0.0134
Ossigeno	0.0489	0.028	0.0261
Anidride carbonica	1.713	0.88	0.655

In order to understand the meaning of the data in the table, for example, consider the value of 0.028 corresponding to the coefficient of absorption of oxygen in water at 20 ° C at atmospheric pressure. This means that in a vessel containing water at 20 ° C, the gas phase above the liquid contains oxygen to the partial pressure of 1 atm, in a milliliter of water is dissolved O2 equal to a volume of 0.028 mL. In a pressurized tank 10, 30. 30 bars, at the same temperature, this value is multiplied for approximately 10, 20, 30.

With current systems, if we wanted to oxidize all the polluted waters of the basins of the world there would be enough energy, because it would take powerful air blowers (which do not exist) can enter air blown in deep waters at least twenty meters and a ‘immense amount of air diffusers distributed in polluted waters. In the absence of the existence of sustainable energy like hydropower pressurized submerged can not only assume the cleaning up of polluted groundwater from an industrial development that was also economically untenable since the advent of the industrial age. In hydroelectric pressurized clean-up would become automatic and free.

In hydroelectric pressurized clean-up would become automatic and free. Global rules should make mandatory this way to produce energy even if it cost much more than other renewable energies. Instead, this energy will cost hundreds of times less, because no energy can benefit from an inexhaustible source of energy, free and clean as the compressed air, which also adds the hydrostatic head of water that is not opposed to the kinetic energy but it makes you feel its strength fueling pumps with aspiration under the head.

In fact, when the polluted lake water, sea, basin or well enters, as mentioned above, with a very low energy cost in the pump with the dual separate supply (5) and from this into the tank (1), automatically increases the drive capability purifying due to higher solubilization of oxygen in the water that when it comes to produce energy in the turbine, transports outside the oxygen that is released to oxidize organic and inorganic compounds precipitated in the depths and groundwater. Only for this this energy environmental aspect that does not exist, it should be the main source of energy on the planet. Without oxygen supply that only this energy can provide are intended to fossilization and death all the world’s water bodies. It’s just a matter of time. Where there is no oxygen there is no life.

But from the hydraulic viewpoint, the hydroelectric pressurized circuit is not against the principles of conservation of energy, but enhances them, producing huge cost savings by exploiting the synergies between the compressibility of the air and the compressibility of water.

This plants is similar to a in open vase circuit always full of water, where the water comes out to infinity from the surface to the effect of atmospheric pressure, as in artesian wells. In fact, in artesian wells is not the air cushion that expands (being the universal atmospheric pressure) but the water comes out and water is raised to the maximum level for the principle of communicating vessels, by the uniformed by common atmospheric pressure. In our case, the air can be compressed in a tank, up to about thirty-five times atmospheric pressure, and making it not expand, all the energy accumulated transfers it to the water that comes out of the overflow, which is not conditioned by the level hydrostatic a natural basin. Theoretically, the water in a tube emptied of air can be raised up to 10,33 meters to the effect of atmospheric pressure and up to about 350 meters when we use compressed air, respect to the position of the pressurized tank (1).

But the compressed air pressure can also be exploited to produce energy in a turbine with about half the capacity of the pump, since the other half of the flow circulates continuously in the tank to balance the hydrostatic pressure in the water renewal input in the pump impeller. In fact the water, which is incompressible circulates freely within the volume accumulated in the pressurized tank by means of the pump with the double separate supply until to the impeller, and in the system of FIG. 1 continuously renews, about 50% of the capacity of the pump only spending the energy for the recycling of the total capacity, while the outside of the tank, the pump used as turbine uses the flow rate discharged from the overflow of the pressurized tank to produce energy in ‘alternator coupled to it, taking advantage of the existing dynamic and static pressure jump between the pressurized tank and the hydrostatic height of the basin, lake, sea, the well, which exists at the exit of the turbine. Obviously, the flow that enters is slightly lower than that of recycling, also by subtracting the pressure drop and efficiency. Whatever happens will always be the cleanest energy and economic world. It will also be the only one not to be neutral but purifying of the environment.

Observing the Fig.1 it can be seen that the heart of the system is the pump with the double separate supply (5), without which it would be possible to circumvent the compressed air pressure present above the water (1). The modified pump bypasses this pressure by bringing water to the suction side not connected to the recycling, replacing the water coming out due to the opening of the valve that feeds the turbine. The replacement of water that comes out with the water that enters (or vice versa). In fact, with the pump in operation and the air cushion to the nominal pressure the flow of water inside and outside the tank becomes automatic and only small adjustments with the adjustment of the variable speed motors are needed (6) and the pressure of the compressor. The circuit does not allow expansion of the air cushion. In fact, the expansion would require a higher prevalence of the recycle pump to the decrease of the air-cushion pressure in order to recompress, that would reduce the energy advantage of the solution. Even in this case, reduce efficiency but not the advantages of the solution, which, as said has yields hundreds of times higher than current energy systems and a drop in performance does not invalidate the system. Over all, however, the pump must have performance with higher prevalences, since a circuit of the abnormal operation can always take place and to restore the nominal operating higher performance are required. This is a normal fact that occurs in all systems of the world pumping. In the energy plant calculations, as described, as an example, they consider the nominal conditions, not the abnormal cases.

In Fig. 1 the flow rates of water in output and input from the tank (1) are adjusted by means of variable speed motors (6), the valves (3 and 3.1) are used primarily to close the circuit when the pumps with the dual separate supply to the impeller are firm. In fact, the almost hermetic separation of the two supply areas of the pump is the basic condition for the operation of these systems and will only work when the pump is in operation and already has stabilized a single-way flow in the flow, which sums the two flow inside the tank, which is forced to expel through the one output provided the excess water: passing through the pump used as a turbine. In non-submerged applications, the shut-off valves can also play a role in the aid of the flow rate adjustment.

It ‘also important to the way in which it feeds the pump that has to start from a certain distance from the pump, so that in the inlet section, represented by the section AA of Fig. 2, we have four separate streams of which two high pressure (hp) and two low-pressure (lp), arranged diagonally to balance the hydraulic pressures in the impeller and the bearings. In order that this separation of the flows can take place it is necessary to start from the flow diverting logs (10) in that the double curve with separator baffles (5.1), must already receive the stream channeled by separation baffles (5.2) in the correct position, so that it can cross as represented in the section. A-A. Then, the half curves of the particular (5.1) using only half of the passage section, already arranged diagonally, that flow in only one input section of the pump already divided into four sectors seamless until to the fins of the impeller. In fact, with this type of power supply, when the impeller is rotating, receives in the same quarter section, of water flows with the alternating sequence hp – lp, using the water thrust with higher pressure (hp) to push forward, the water with less pressure (lp). On the other hand this hydraulic principle is already used in multistage pumps (FIG. 3), which in this case, we use as turbines, but when they are used as pumps, inside the same, the water retains its total dynamic pressure (flow rate * unit pressure * the passage section), and increases from stage to stage, entering the center of the impeller, exiting at the periphery of the same, and returning to the center of the next stage, along the diffuser (5.4) to effect, especially , the strength of the total dynamic pressure that follows the path of the impeller blades (5.3). The multi-stage pumps with closed impeller can reach pressures up to hundred bars because they have very precise mechanical machining, but also to physical phenomena that develop within each individual impeller, where the rotation determines in the central area a depression which allows the ‘ entry of new water, despite the high pressure existing in the flow. The depressive phenomenon affects the whole of the impeller inlet section, for which, if the water is in an intermediate stage, increases the pressure of the next stage, but if it is located at the first stage enters the impeller (5.3), that the It distributes to the diffuser (5.4) with the total increased pressure. Furthermore it should be noted that in all the proposed hydraulic pump applications with the dual supply separated never works in the inlet, but it is always fed under a hydraulic head on both sides and the side with lower pressure always has a check valve that prevents , even with the pump stopped, that water can pass the pressurized tank to the supply reservoir. Therefore, when the pump with double separate supply until the impeller is in operation, this, enter the same time, four streams separated with two different pressures, the impeller cannot do anything that go ahead the whole, as in the multi-stage pumps. For the transitive property, if they work the multistage pumps, the pumps with the dual separate supply also work, if they meet the same manufacturing tolerances friction and arrivals to the impeller, so that the flows with different pressures will only meet in the impeller, not before entering the same.

As is known, the applications of hydraulic lifting pumps are endless. Sometimes you need very large flow rates with very small heads, for the defense of the territory and at times very small flow rates with high prevalence, for the most distant lifting from the water supply source. This resulted in a remarkable variety of pumps and impellers, which are produced throughout the world, being the lifting of water, along with transport, the increased energy expenditure of the planet Earth.

In any hydraulic system for the current water distribution the energy that is spent for the water internal recycling is hundreds of times less than the energy that serves for lifting water.

Suffice it to say that a piping DN 1000 with a flow rate of 1000 L / s, a water velocity of 1.27 m / s according to the tables calculated with the formula of Bazin-Fantoli has a load loss of only 1.5 m / km. Therefore, with the energy spent to lift of 1.5 m, 1000 L / s, we can move the same flow rate to a kilometer of distance in the horizontal We can find an equivalence between the inner pressurized water circulation in the tank and the equivalent length of a horizontal tube of wide section where the load you predict exist only by friction with the pipe walls without geodetic differences in level or pressure to be overcome. In fact, an internal recycle loop to the volume of water accumulated does not need to overcome differences in height and pressure and allows to enter renewal of water that is drawn from the inside of the impeller by the energy of water recycled dynamic pressure through the same impeller, but with separate power supply.

Therefore, it pays to double and if necessary, even triple the flow and producing plants always full of water, or pressure, with pumps with double separate supply, even without any energy production, just to save energy in lifts. In fact, those who assert that it can not produce energy from nothing, does not understand that the energy we produce is nothing more than the energy we save by raising the water in a different way from that used currently. But once saved energy in lifts, should be obvious that should also produce it on site creating small civil and hydraulic works and installations submerged in existing reservoirs without large hydro works by creating dams and flooding the mountain valleys, in many cases , and wasted immense economic damage caused alluvial resources. In fact, when you are expecting heavy rains, they should empty the hydroelectric reservoirs, but nowadays this can not happen because water reserves are used to produce energy and make up for the summer droughts. This type of handling dangerous for the environment and for the world economy can only be avoided if we can produce sustainable hydropower without the hydraulic jump. As a result, freshwater accumulations if needed, can be made where they are needed and also become producers of cheap energy, moreover, keeping the water in a constant state of oxidation and purification without CO_2 emissions.

The famous experiment of Pascal, since 1647 has shown that in a closed tank the hydrostatic pressure expands in all directions. But to produce electrical energy is needed the dynamic pressure which ensures the exercise in time on the poles of a turbine. This application requires adequate passage sections and the continuity of the flow, which in small volumes of water can be secure only if it does not disperse the water and exploit advantageous hydraulic schemes in the energy production phase (water drop or pressure drop) and thrifty energy regimes in the phase of recovery of the water, without charge for lifting water. In these systems the dynamic pressure is equal to the unit pressure for the passage section for the flow of water, therefore the pump with dual supply must be dimensioned for the sum of the two flow and with a delivery passage of a large section, which returns to autoclave, as in Fig.1. In fact, in this circuit on the pump delivery should not win the external resistors to the recycling circuit, as the pressure of the compressed air cushion. The water circulation occurs within the stored volume of water with a very small head of the pump. But the body of the pump has to withstand high hydrostatic pressure, otherwise it falls apart as the barrel of Pascal.

So, suppose you create a small submerged plant of FIG. 1 which produces energy by means of six circuits with six submersible alternating current generators (2.1) coupled to a pump used as a turbine (pat), which exploits the useful height Hu = 35 m and an electric pump with double separate supply DN 150 with flow rate 35 L / s. Assuming the turbine efficiency is 0.75, applying the formula Pu = η * 1000 * Q * Hu / 102, we have an energy output of 9.0 kW (0.75 * 1000 * 0,035 * 35/102) for each circuit . Assigning to the pump a prevalence of 0.4 me a yield 0,6, the power absorbed by the same, which leads a double flow of that which passes into the turbine, calculated by the formula 0.4 * 1000 * 0.070 / 102 * 0, 6 = 0, 0456 KW. The plant consists of six water inlet circuits and six output circuits produces a total of 53.7264 kW (54 to 0.0456 * 6) excluding the energy absorbed by the compressor to maintain the pressure constant of 35 m column of water, which is even more negligible the energy consumed for recycling, the pressure having to provide only the amount of air that solubilizes in water.

In this case the relationship between energy expenditure and yield is 196.36 (53.7264 / 0.0456 * 6). We should not be surprised by this result whereas in hydroelectric with hydraulic jump does not consume even the few watts required to internal water recycling circuit. The energy reasoning is also valid for much higher size installations, obviously with different yields of the electric pumps, in function of the mounted type of impeller, the flow rate, the nominal point of operation, etc. But in any case the ratio between the energy produced and energy expenditure will depend on the water by the pressure of the air cushion and will always have a higher value of several tens of times, or some hundreds. In fact, the 35 meters of water column used in the formula can be ten times higher in some applications.

For high yields, the pressurized energy with water recycling, apparently, is against the principles of conservation of energy. But in reality the energy produced has no connection with the energy spent, in that, the energy produced exploits the water pressure jump that exits to the effect of compressed air pressure that is not produced by the hydraulic system. So the energy miracle, does not happen because they violate the principles of conservation of energy, but because they realize synergies between physical and technological principles ever made previously. In fact, in these systems, not only we save water but also the energy used to compress air, which exerts its pressure on the water surface at a constant volume. In fact it is much cheaper to circulate the incompressible water to keep the pressure constant which allow expansion of the volume of air to then compress it again, creating a discontinuous and with low performance system. On the other hand also the atmospheric pressure is a pressure that acts on all the water surfaces of the planet without expanding. To exercise you do not need the expansion pressure. The air in the autoclave is made only expand for a few seconds to limit the number of engine starts, not to save energy, since the recovery of the air-cushion pressure involves an energy expenditure equal by the pumps.

The importance of the static air pressure of the water surface is tested by the fact that in the presence of a large volume of water stored in a covered basin with a geodetic difference, an air inlet hole is sufficient, and a hole water outlet to produce energy in a turbine for an indefinite time, without energy costs, which depends only on the volume of water and from the water system that feeds it.. This is demonstrated by a number of hydroelectric plants in operation for over a century, like that of Niagara Falls, in operation since 1879. These plants, once written off the capital invested, produce free energy because it feeds them the same nature. May not work if the water surface of the pool from which there was no atmospheric pressure or the gravitational force that produces it.

But, in the presence of static waters and in the absence of geodetic differences in level, the problem to be solved to produce hydroelectric energy was to create artificially geodetic differences in height and the internal pressure of the water volume accumulated by exploiting the physical principles of water and air favorable to the creation of the same. In the elaborate solutions, including the one shown in FIG. 1, it was not a problem to create the geodetic difference in level between the water surface and pump suction placed in the bottom so that it can be powered by a positive head on the intake of water. It was not a problem to create the artificial pressure difference in height with the compressed air, for each turbine pump unit, between the water entering the turbine and exits the same, to be discharged in the volume of water accumulated static. In fact, the use of a water tank pressurized with compressed air is known for several centuries. What has escaped, to the insiders of the past and present, although known, is the fact that to circulate the water within a closed circuit pressurized serves a small energy, which is independent of the static pressure exerted by the cushion of air, being water incompressible. Therefore it required an invention that allows the entry of water from the outside into the internal recycling loop without spending a lot of energy. This can take place only by entering from the suction side of a recycling pump, provided that the two streams do not meet before entering the impeller. For this reason it was invented the double separate supply until to the impeller. In fact, recycling the pressurized water of the tank on itself with one side of said pump, for an effect of the increase of speed at the center of the impeller, a vacuum is created which also favors the entry of water from the powered side with the only geodetic difference of the static basin, (which in Fig. 1 contains the pressurized system to a higher pressure). Therefore, the water that enters the filter 4.1 and in a side of the hermetically separate pump, until to the impeller, has the same direction of the water flow of the pressurized tank recycling. It can not be counteracted by the hydrostatic pressure existing in the pressurized tank, especially, if in the meantime, by the same pressurized tank comes out the same amount of water. Then, it creates a continuous flow of kinetic energy to which the static pressure, to physical laws, cannot oppose (being the incompressible water). It could oppose only if the air cushion expands up to prevent the water outlet from the hole that powers the turbine (2). Therefore, the plant in question, when it is not in operation, must have all the valves (3 – 3.1) closed (if they do not close the valves (3 – 3.1) of the turbine, the air expands through the turbine and the entire system is submerged and filled with water. the valves must only be opened when the pumps are in operation.

Description of the drawings and of industrial applications.

Fig. 1 shows a system completely submerged in a water basin, which may be a lake or the sea, where the electrical panels and the compressor are positioned on the shore. It can be noted that the pump used as a turbine (2) discharges the pressurized water enriched with oxygen in the bottom of the basin, while the water that enters the tank (1) is taken independently of the seabed through the filter (4.1). A suction side of the pump with the dual separate power supply (5) constantly maintains the level (1.1), while the same pump with the other suction side recycles about 50% of the flow in the pressurized tank (1). The regulation of the water level (1.1) and compressed air inside the pressurized tank (1) takes place by means of the variable speed motor (6) coupled to the pump and the operation of the compressor re-establishing the operating pressure. In fact, the precise control of the level and pressure allows the output of a quantity of pressurized water from the air cushion without that this will expand, perfectly equal to the water inlet with only the static pressure of the basin. When the plant is not in operation, all the valves (3.1) are always closed, to avoid emptying of the pressurized tank (1) water, due to uncontrolled expansion of the air cushion.

Fig. 2 shows the detail of the pump with the dual separate supply until to the impeller, with closed impeller, which is common also to the other figures. In plants submerged in enough clean water using a pump with a closed impeller, amended on the suction side through a 90 degree curve that enters the water from the outside of the pressurized tank. This curve intersects with a curve that does enter in the pump the water contained in the pressurized tank. The two curves are equipped with flow baffles internal separators (5.2), divided at 90 degrees, which converge in the circular section that enters the pump and supplies the impeller (5.3). Therefore, having the two sections four sectors each, only two supply of can be fed. The other two are plugged so that the complete flow that enters the impeller is present as shown in section. A-A, with the separators 5.2 that arrive sliding to the pump impeller (5.3) and with the cross-flow in the high and low pressure (hp and lp). This solution is preferable with clean water and closed impellers. With dirty water sectors will be two and the open impeller. The important thing is that the flow of separators always arrive sliding to the impeller, so that during the rotation of the pump, preventing that the waters with different pressure be brought together before entering the impeller. If this were to happen the recycling of the pressurized water tank would prevent the entrance of the impeller water coming from the basin of immersion, which has lower hydrostatic pressure. For this purpose, when the system must not produce energy, all the valves (3.1) are closed and the implant departure depart before the engines that power the pumps and then open the valves.

Fig. 3 shows the detail of a multistage pump used as a turbine. It can be noted that the power is supplied from the opposite side to the pump with single power supply (4) and the pump with the dual separate power supply (5). These pumps, with the invention of the pump with double separate power supply no longer have any reason to exist, having been invented to challenge the force of gravity by raising the water with high energy costs. But the technology developed for the construction of these pumps and the investments made by the manufacturers will not be wasted because these pumps used as turbines will find a much larger use in energy production. Infact, if it is true that we need to lift the water, it is even more true that we need clean energy and sustainable and at state of the art, from the economic point of view and environmental no energy can compete with hydropower with the pressurized water recycling with compressed air, for cost-effectiveness and versatility of the raw materials. For these plants, as seen in the various applications described in this patent application, of the pumps used as turbines they are most useful of the turbines, being less bulky and less expensive, having already acquired a diffuse series production.

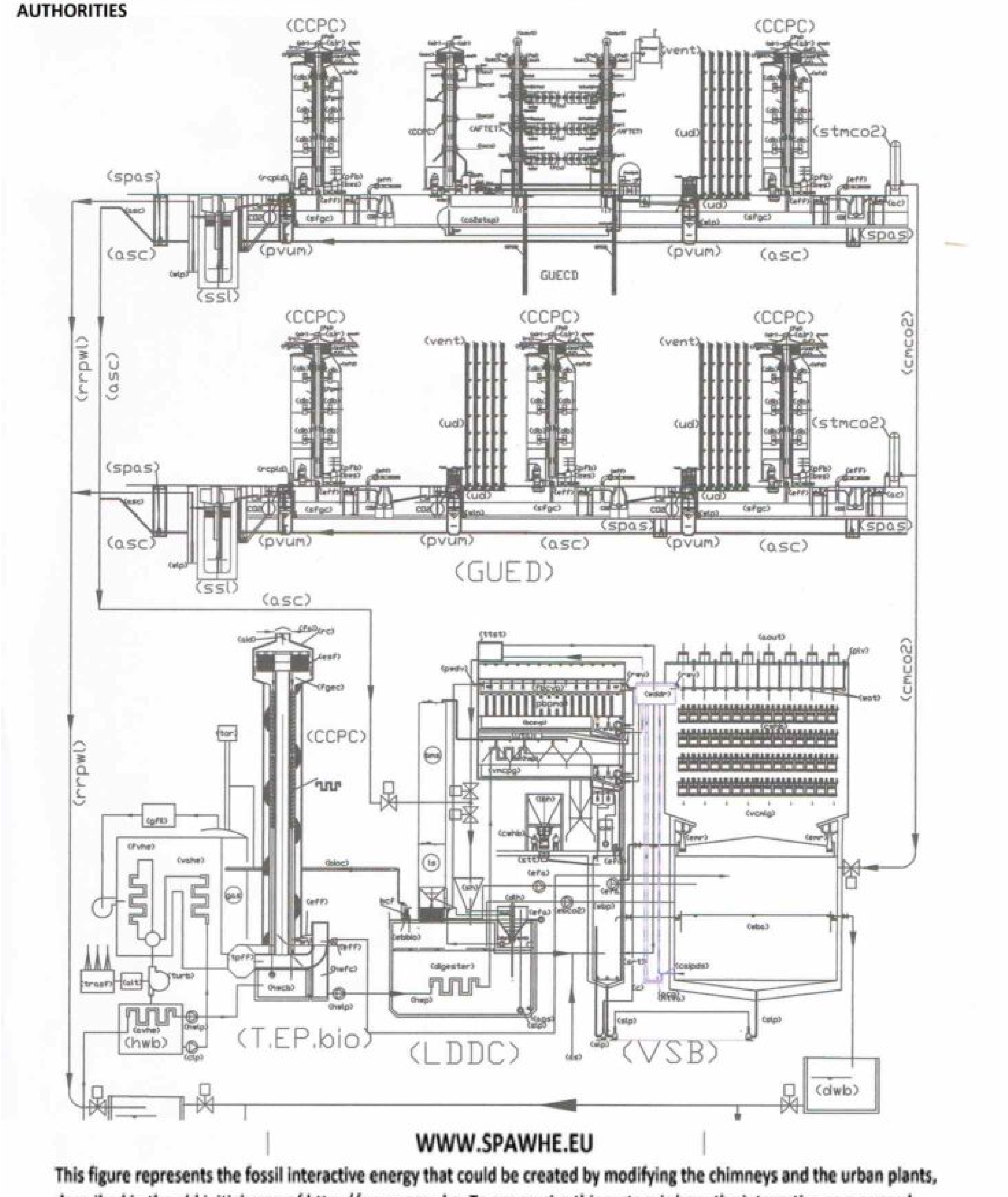
Fig. 4 shows the global urban sewage system already filed as a patent by the undersigned at an international level, which has had no luck for unknown reasons, but easily conceivable, as for myself are due mainly to the inability of world public agencies to coordinate specializations and the various technologies in the common interest. This inability has led to achieve great purifiers outside urban centers that are of little use against global warming and large fossil power stations that are even worse because they can not neutralize the carbon cycle in a natural way, as would happen in the diagram in the picture where water and air are treated together in each condo along the coastal shores, ports, etc. separating at source sludge which for anaerobic via (ASSC – asc) would reach the central sewage treatment plant in the digestive section (LDDC), while the semi purified water and alkalized to source it (pvlm – pvmm) combined with limestone mini greenhouses, would reach same central system to the water and air purifying section (VSB). The two treatment sections would meet with the thermal section (TEP. Bio) to properly close cycles in overlapping biological ponds (bcsvp) and limestone mechanized greenhouses (vcmlg) without wasting even thermal energy.

The global water treatment system, although decayed internationally as patent filing, having not found public and private investors is still technically valid. It is a concrete example that shows that state of the art in protecting the global environment can not advance if public authorities do not establish universal rules on how to put together the purification and power plants on the territory. In fact, in this system there is both the cleaning of fossil energy, both the production of energy, not neutral but protective environment, which can not be realized with existing treatment plants, thermal power plants current and the current renewable energy that do not interact with purification systems, to help recover heat, CO2, using them in the environment, not harm, as at present. Today even the biological energy production is a work incomplete because it is not carried out globally. For environmental purposes, the biological energy is comparable to solar energy and wind power because it does not add or subtract CO2 environment, while in the global system may even subtract CO2, closing cycles completely in urban limestone greenhouses and in those adjacent to thermal plants industrial and energy. To do this the small and large combustion plants should jointly manage water, air and energy. So important are water pumping systems, which are globally the second energy expenditure, after the transport.

Therefore, the energy solution of Fig. 1, which produces hydroelectric power submerged that oxygenates the water, in a shortened version, can also enter in global purification systems, if finally, environmental and energy authorities learn that energy can be produced by protecting the environment, without to distribute incentives for renewable energy uncoordinated from global projects.

The global purification shown in Figure 4 and in the enlarged details of Figures 5, 6, 7 becomes even more efficient and sustainable, replacing the pumps of the main hydraulic lifting with pressurized systems of this patent deposit, to reduce fuel consumption, improve the ‘ oxygenation of the water purification systems and make energy producers even in the purification processes in addition to the digestive. In fact, in these systems have been replaced some pumps with complete installations (plhpow = pressurised lifting hydroelectric plants with oxygenation water) These systems are always in operation. They produce energy while oxygenate the water and when it is necessary to divert the flow through the valves (3) lifting the water. Obviously, the latter function may also play facilities placed in the lake and reservoirs bottoms to distribute water to agriculture, or to defend the territory against flooding.

THE INTERACTIVE FOSSIL GLOBAL ENERGY DEAD IN THE BAND KILLED BY THE SILENCE OF THE ENVIRONMENTAL AUTHORITIES



WWW.SPAWHE.EU

This figure represents the fossil interactive energy that could be created by modifying the chimneys and the urban plants, described in the old initial page of http: //www.spawhe. To economize this system is born the interactive compressed hydroelectric energy, which does not emits pollution and CO2 and can be mounted even on means of transport, which is described in the new home page of htt: //www.spawhe. These two models of universal development, sustainable and protective of the environment were developed by a Neapolitan inventor, but ignored both by the world environmental authorities. On the other hand, UNESCO has recognized Neapolitan pizza as a World Heritage. The Neapolitans can not have both awards.

Legenda Fig. 4, 5, 6. 7: (ac) air compressor; (ae) air extraction; (aec) air expansion chamber; (af) air filter;

(AFTET) air filtration and thermal exchange tower; (ags) agitator sludge; (aid) air inlet dampers; (aout) air outlet; (apt) atmospheric pressure tank; (asc) anaerobic sludge collector ; (assc) anaerobic sludge submergible collector; (bcf) biogas cyclone filter; (bcsvp) biological covered superimposed ponds; (bms) biomass silo; (CCPC) capture cooling purification chimney; (cfcu) channeled fan coil unit; (CO2stap) CO2 storage tank atmosphere pressure; (clp) condensate lift pump; (CMCO2) collector transport compressed mixture of air and CO2; (cwhb) calcareous wheeled hanging baskets; (cwlp) cold water lift pump; co2 compressor; (etrwap) expansion tank and refill of water at atmospheric pressure; (dp) drainage pump; (dlh) digester loading hopper; (dwb) downstream water body; (ebbio) elettroblower for biogas; (ebCO2) electroblower for CO2; (efa) electric fan for air inlet; (efae) electric fan for air extraction; (eff) electric fan for fumes; (emr) equipped motorized rack; (esf) electrostatic filter; (ethw) espansion tanks for hot water; (etcw) espansion tanks for cold water; (ew) external wall; (fai) fresh air intake; (fgec) flue gas expansion chamber; (fgwe) flue gas water exchanger; (GHP) gas heat pump; (fcu) fan coil unit; (GPCG) geothermal pit coated with gres; (gas) gasometer; (GMLED) global marine and lacustrine environmental depuration; (GUECD) global urban environmental conditioning and depuration; (GUED) global urban environmental depuration; (gwrp) geothermal water recirculation pump; (hwb) hot water basin; (hwp) hot water pipes; (hwcb) hot water covered basin; (hwcp) hot water circulating pump; (hwcs) hot water consume supply; (hwfc) hotwater and fumes channel; (hwlp) hot water lift pump; (hws) hot water recovery supply; (lbh) Limestone boulders hopper; (LDDC) linear digester dehydrator composter; (ls) lime silo; (mgg) mini glazing greenhouse; (paw) purified and alkalinized water; (pawe) purified air water exchanger; (pcws) public cold water supply; (plhpow) pressurised lifting hydroelectric plants with oxygenation water; (plv) rain; (pvlm) purifying vertical lacustrine module; (pvmm) purifying vertical marines module; (pvum) purifying vertical urban module; (pwdv) purified water drain valve; (pwo) purified water outlet; (rrpwl) recovery rainwater and purified water line; (sfgc) settling flue gas collector; (sh) sludge hopper; (spas) submersible pumps for anaerobic sludge; (ssl) settler in sewer line; (stamco2) storage tank of the mixture of air and CO2; (stt) sludge tape transport; (ttst) transit tank of sludge to be thickened; (tco2pt) transport CO2 pressurized tank; (TEPbio) thermoelectric power plant fueled by biogas; (upwb) upstream water body; (vcmlg) vertical covered mechanized limestone greenhouse; (VSB) vertical synergic building; (wb) water body; (wba) water basin to be alkalize bacino delle acque da alcalinizzare; (wbc) water cooling basin; (wbp) water basin to be purified; (wlp) water lifting pump; (wot) water overflow tray; (ws) water supply; (wss) water sofned supply.

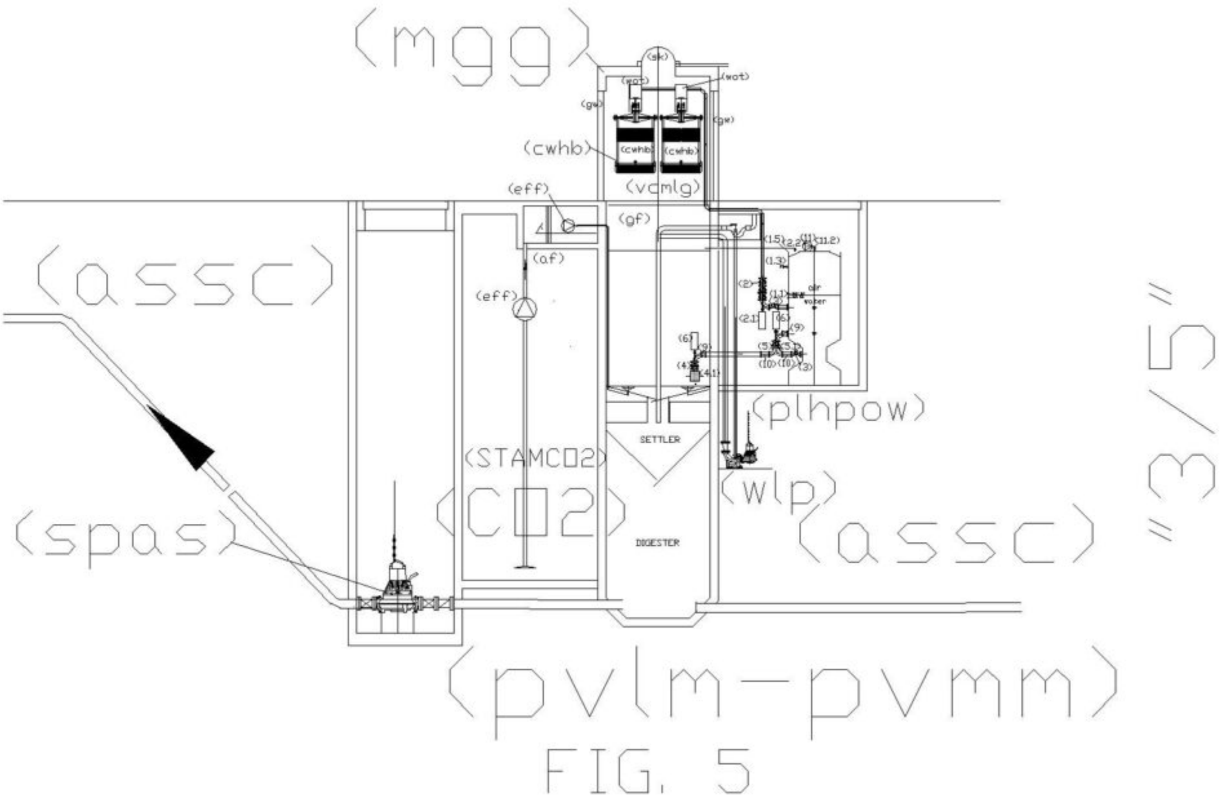


FIG. 5

Fig. 5, shows an enlargement of a detail of FIG. 4, where the purification modules “pvlm and pvmm” (purifying vertical lacustrine module e purifying vertical marines module), They are complemented by a pressurized hydroelectric plant: (plhpow) pressurized lifting hydroelectric plants with oxygenation water, that contributing to oxidation and producing hydropower in the turbine (2) make it sustainable both purifications that energy productions. In fact it is sufficient little energy for lifting water up to the overflow trays that produce artificial rain on baskets “cwhb” (calcareous wheeled hanging baskets), that alkalized water and consumes CO2 storaged in the tank “stamCO2” (storage tank of the mixture of air and CO2), entered into the top of purifying of the pit by the fans (eff). The excess of energy that can be manufactured with the compressed air pressurisation of the autoclave tank (1) can be transformed into electrical energy.

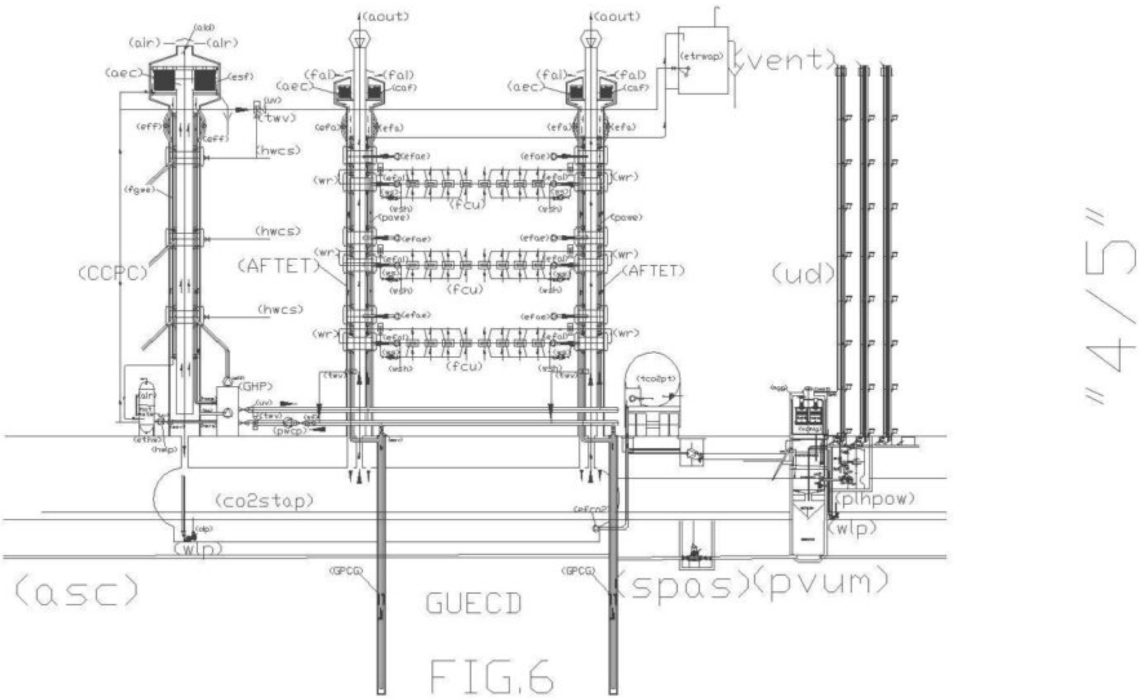


FIG.6

Fig. 6 shows an enlargement of a detail of FIG. 4, where the purification modules “pvum” purifying urban vertical module, are complemented by a pressurized hydroelectric plant: (plhpow) pressurized lifting hydroelectric plants with oxygenation water, which replaces the normal lift pump, contributing to oxidation and producing hydroelectric power in the turbine (2). In fact it is sufficient little energy for lifting water up to the overflow trays that produce artificial rain on baskets “cwhb” (calcareous wheeled hanging baskets), that alkalized water and consumes CO2 storaged in the tank “stamCO2” (storage tank of the mixture of air and CO2), entered into the top of purifying of the pit by the fans (eff). The excess of energy that can be manufactured with the compressed air pressurisation of the autoclave tank (1) can be transformed into electrical energy. This solution should not scare for spaces that require in urban centers, because the limestone greenhouse (mgg) is not required to be positioned directly on purifying the pit. It can also be realized in a room near the pit. It ‘important to the hydraulic connection of return of the water.

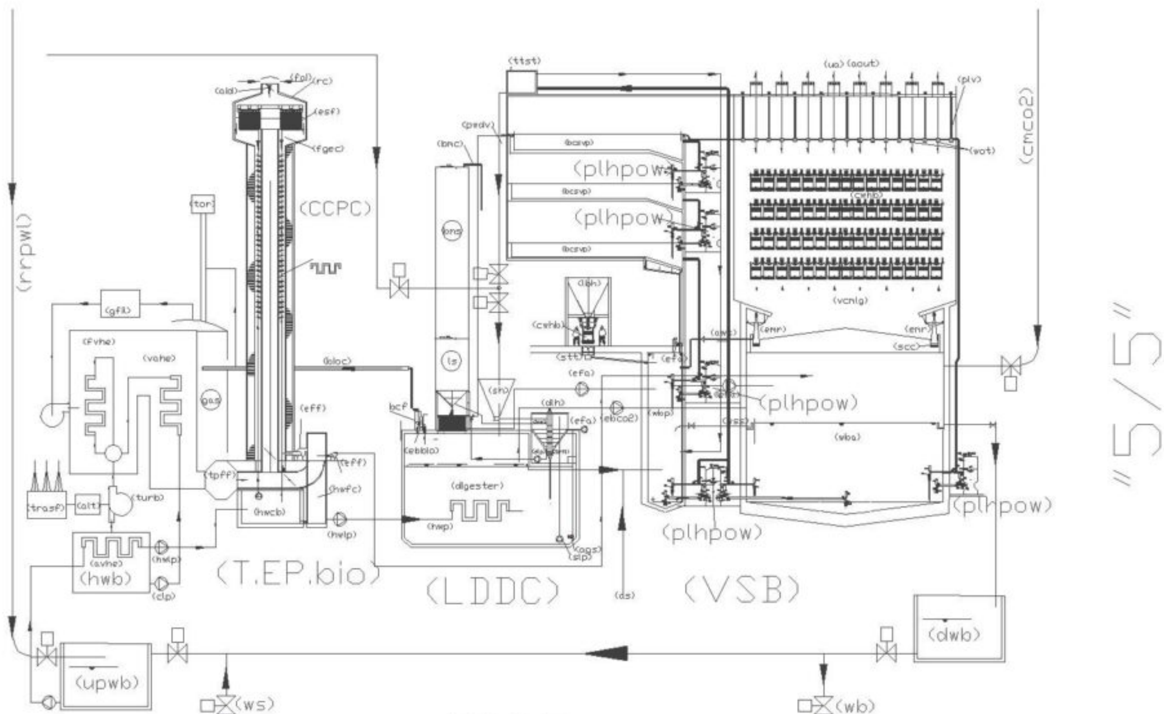


FIG.7

Fig. 7 shows an enlargement of a detail of FIG. 4, where the lifting pumps were replaced with pressurized lifting installations, production energy and oxygenation of “plhpow” waters, which interrupt the production of energy totally or partially only when it is necessary the lifting of the water. These are the cases of overlapping biological ponds that purify the water through photosynthesis as the water rises to the top, but do not disdain the oxygen supplied by the free energy production allowed by water recycling; but it is also the case that the plant alkalized water consuming CO_2 in greenhouses “vcmlg” vertical covered mechanized limestone greenhouse, which can be combined with a large industrial or energy heating system.

Luigi Antonio Pezone