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Research Article

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The Answer to the Global Competition against Climate Change with A Price of $ 100 Million was Initiated and Sponsored by Billionaire Elon musk.

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1-Pose the problem.

The greenhouse effect caused by greenhouse gases, especially CO2, causes global climate change, causing many disasters for humans. Until today, people still have no effective measures to fix it, billionaire Elon Musk, the richest person on this planet, not only rich in finance but also extremely rich in compassion, dares to sacrifice a large amount of money. US$10 million sponsors and initiates this contest. If we don't quickly overcome the greenhouse effect, human civilization will collapse

2-Contest content.

The participants of the competition must research to find possible solutions from the laboratory to capture and sequester CO2 at the scale necessary to prove to the world that it is possible for humans to capture and sequester CO2 with large enough scale and the greenhouse effect will be eliminated. The winner must be a proponent of a viable RD technology for CO2 separation and CO2 sequestration on a scale of 1000 metric tons of CO2 per year and then up to 1 million tons of CO2 per year.

3-The problem has been solved.

We have been continuously researching for more than 15 years to separate CO2 from industrial emissions, and find a possible solution to sequester it. First, we have answered the question of why so far humans have not been able to separate CO2. large-scale emissions from thermal power plants using fossil fuels. This is due to the following four reasons:

The first reason: From large thermal power plants, industrial emissions can reach millions of cubic meters per hour, for example, a 1000MW thermal power plant that uses coal as fuel to escape to the atmosphere 3 ,4 million cubic meters per hour [1].The equipment and technology available today are completely unable to handle this large emission stream. That means we have to research to find new devices together with it are new technologies suitable for industrial exhaust gas treatment.

Reason 2: Researchers who separate CO2 from industrial exhaust often conduct CO2 separation without cleaning up the exhaust gas, and do not remove all dust and harmful chemicals before using Ethanolamine to separate CO2 from the gas. industrial waste.

Reason 3: Use Ethanolamine to separate CO2 from industrial emissions.

Reason 4: It's that the process of separating CO2 from industrial emissions, transporting it to store it as well as burying it in the ocean floor is too expensive and unreasonable. All our research results have been published [2-6]

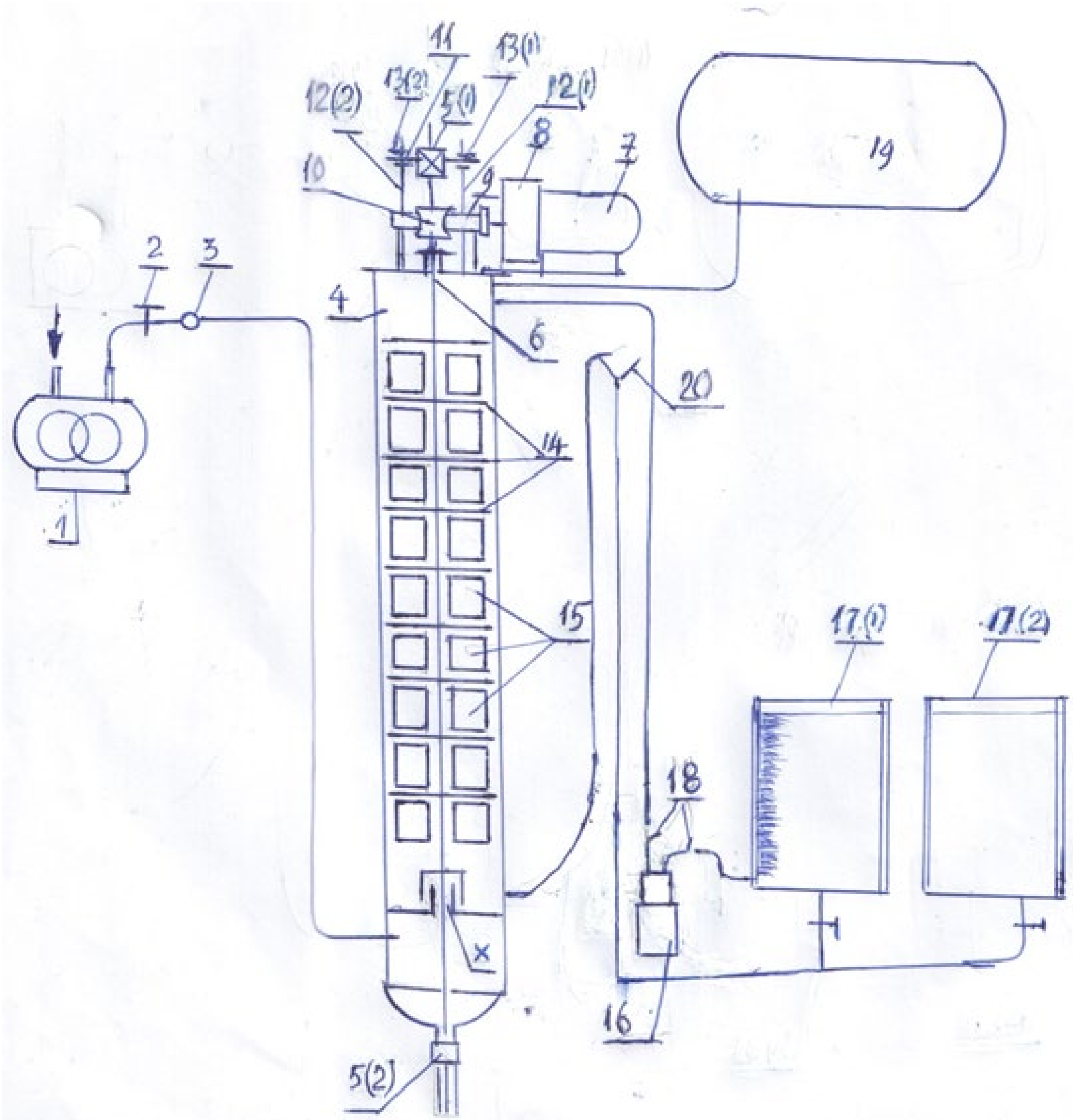
4- Propose appropriate RD models.

The first step is to clean up when industrial waste, completely remove industrial dust.

4.1- Industrial exhaust gas cleaning technology.

The technology is shown on figure 1 below. The pump sucks and pushes the exhaust gas (1) to the exhaust speed regulating valve (2) then passes through the exhaust gas velocity meter 3 and the exhaust gas source is pumped into the bottom of Solid-liquid-gas heterogeneous reactor (GLSHR) 4, the exhaust gas must pass through a special structure X, thanks to the special structure, the liquid from the upper compartment cannot flow to the lower compartment, so that the stirring shaft 6 is fitted with bearing 5(1) and 5(2) at both ends of the stirrer shaft.

Electric motor 7 and reducer 8, screw 9, worm gear 10 make stirring shaft 6 rotate at the required speed. Bearing 5(1) is located on floor 11, this floor is located on 4 vertical columns 12(1), 12(2), 12(3) 12(4) (there are 2 vertical columns not shown). Thanks to the pairs of canopies 13(1), 13(2), we can position the floor 11, stirrer shaft 6 and all flat stirrups 14, we can raise or lower so that the blades plane 14 is always located between the distances of two layers of bumpers 15.



Exhaust gas cleaning solvent is a dilute alkaline solution contained in tanks 17(1) and 17(2), from which by means of a metered piston pump 16 pumps for TBPUDT RLK 4. Clean exhaust gas is stored in the bag when 19. Residue contains dust that escapes from the bottom of TBPUDT RLK and flows out into one of two barrels 17(1) or 17(2). We use coagulants such as PAC to precipitate the dust, the clear water after dust separation is added and used again for the technology.

4.2- Proposing an industrial RD model of 1000 T/Year scale.

Every year we need to separate and isolate 1000 T/year CO_2, if the flue gas contains 10%ob CO_2, the flue gas flow will be 581,382 m3/h. From the research results in the laboratory, and choose the flow velocity The gas passing through the device is 0.1 m/s, the height of the soda solution layer is 4 meters, we can calculate the TBPUDT RLK with a diameter of 1,615 meters and a length of about 6 meters. Technology is shown in figure 2. : Technology to separate 1000 tons of CO_2 per year.

The technology works as follows. The screw suction pump 2 sucks the clean exhaust gas stream from the clean exhaust bag 1(1), the air flow must pass through the speed control valve number 3(1), the speedometer 4(1), then put into the bottom of TBPUDT RLK 8.Soda solution contained in tank 5(2), thanks to liquid pump 6(2) pump through flow control valve number 3(2), speed meter 4(2), then go through heat exchanger 18(1) to maintain a temperature of 40oC, then meet the catalyst flow pumped up by 5(1) from tank 5(1), after passing through control valve 3(3) , speedometer 4(3). The two liquid streams meet and mix together and enter the top of TBPUDT RLK 8. A chemical reaction between CO_2 and the soda solution took place. Thanks to motor 13 and worm gears, screw 1, TBPUDT RLK works. The reaction temperature is automatically adjusted at 40 oC by thermostat 7. The product is a mixture of crystals of $NaHCO_3$ flowing continuously from the bottom. of TBPUDT RLK 8, and thanks to a metered piston pump 19, the pump sucks and pushes through 2 one-way valves 17 to enter the heat exchanger 18(2) with a hot soda stream of 120 oC pumped up from the liquid pump 6(3). The product stream after being heated by 18(2) flows continuously into the pressure cooker 20, the boiling process is at 1.2 Atm with a boiling point of 120 o C by the heaters 21(1), 21(2), 21(3). At the boiling point of 120 oC, about 10 minutes, the whole precipitate is thermally decomposed to give CO2 and hot soda solution, it will overflow into the pressure control valve 22 and then be stored in 5(4). CO2 gas is obtained. Escape through condenser 18(3) to be stored in air bag 1(2). From here, it is led through a 4-stage 24 compressor to liquefy CO2, and is stored in high-pressure metal bottles 25. In the previous announcements [2-6], we carried out thermal decomposition of the reaction products. Application by rotary kiln, in this technology we use pressure cooker to decompose. Since this pressure cooker is easy to manufacture and cost will be reduced, in pressure cooker is divided into compartments so that the product moves according to ideal displacement. .

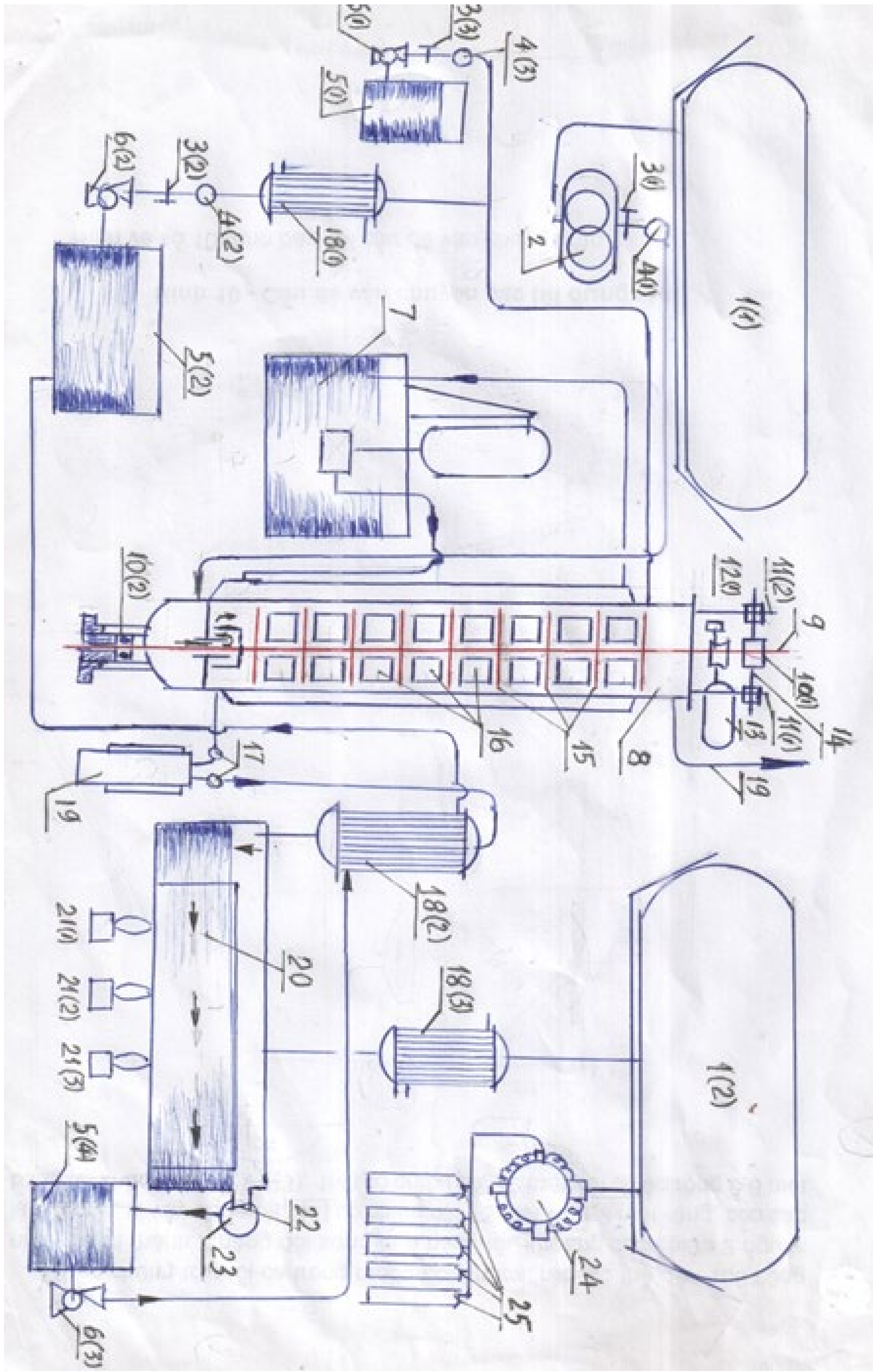


Figure 2: CO2 separation and sequestration technology on a scale of 1000 T/N

4.3- Proposing an industrial RD model with a scale of 1 million T/year.

From the data of 1 million tons/year of CO2, we can calculate 387,35.3.m3/hour the exhaust gas stream contains 10% vl.of CO2, and this must be the combined TBPUDTRLK with a total cross-sectional area of 1076.2 m2.TBPUDTRLK this complex has 120 single TBPUDTRLK with a diameter of 5 meters (the above concepts have been presented in [2-5,6].

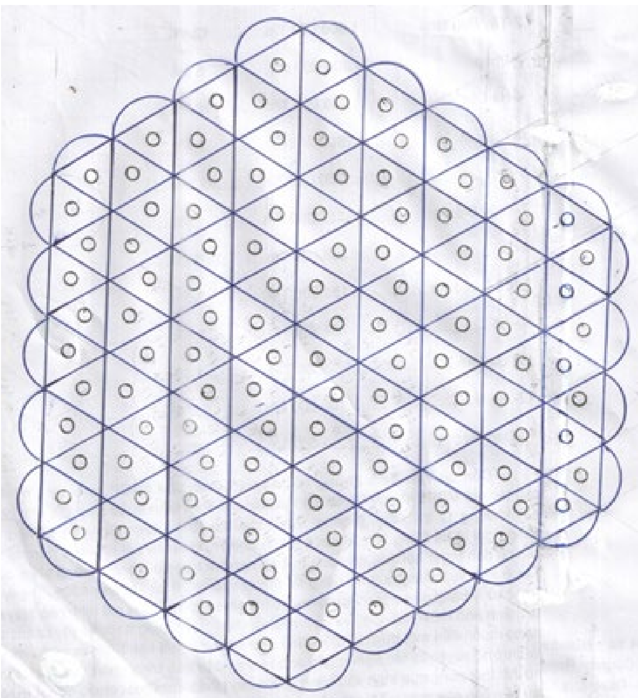


Figure 3 shows the combination according to the principle of an equilateral triangle 120 TBPUDTRLK single.

In this combination device there are meeting points of 6 equilateral triangles. this is where the 6 stirrers go through and they rotate clockwise, so the vortex flow is strongest, and we'll put heat exchangers to adjust the reaction temperature in the TBPUDT RLK.

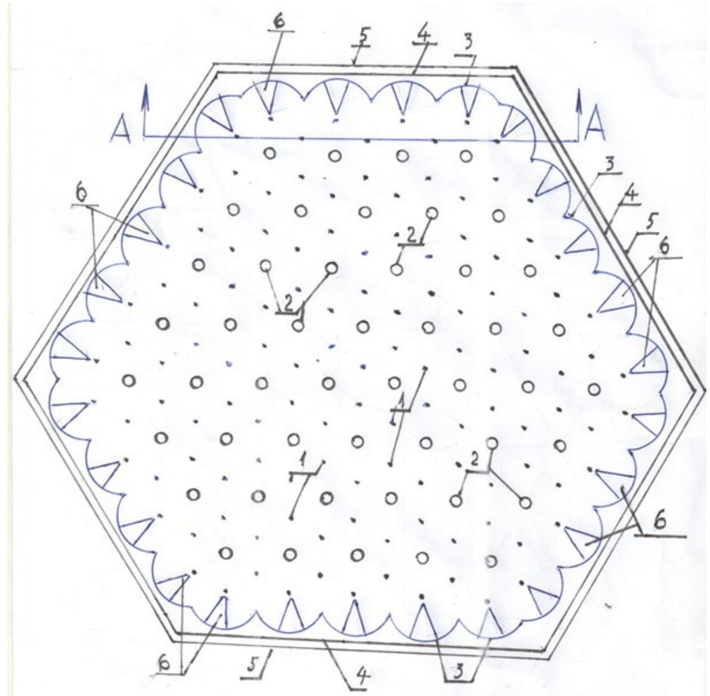
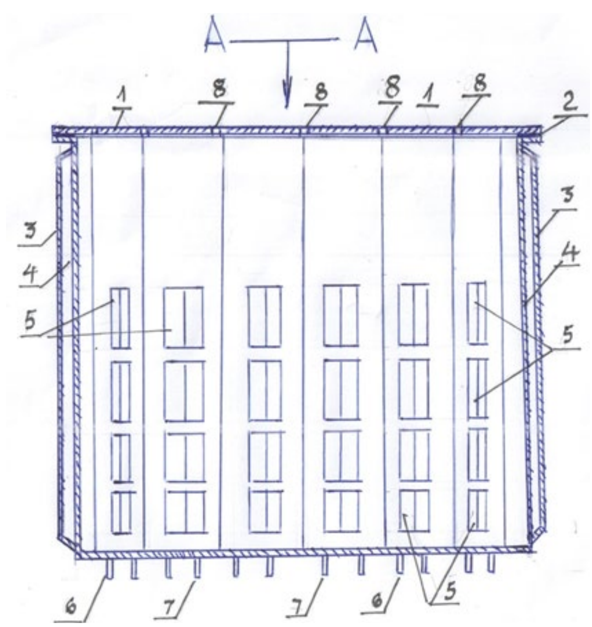


Figure 4: Cross-section of the combined TBPUDTRLK.

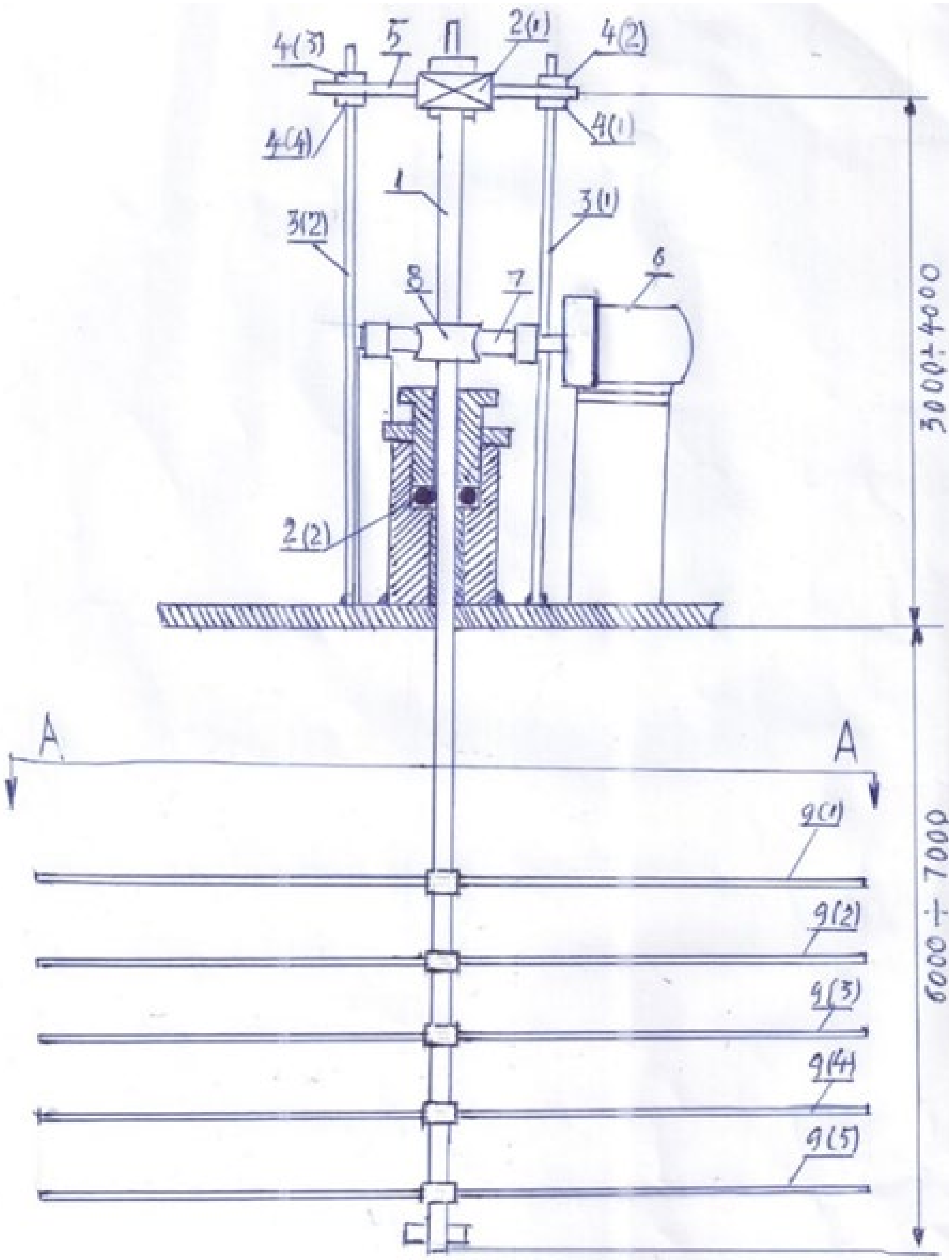
To better understand this combination device, we show Figure 4, Points No. 1 are the centers of equilateral triangles and also the centers of stirring axes of combination TBPUDTRLK, Numbers 2 are the locations where the devices will be installed temperature regulators, number 3 is the wall of the device, number 4 is the flange of the device, number 5 is the outer surface of the shell containing the heat carrier to regulate the reaction temperature. The 6 are the bumper plate of the combined TBPUDT RLK. Points 1 and 2 will exist on the cap of the combination TBPUDTRLK.

The following figure 5 is an A—A sectional view from device 4.

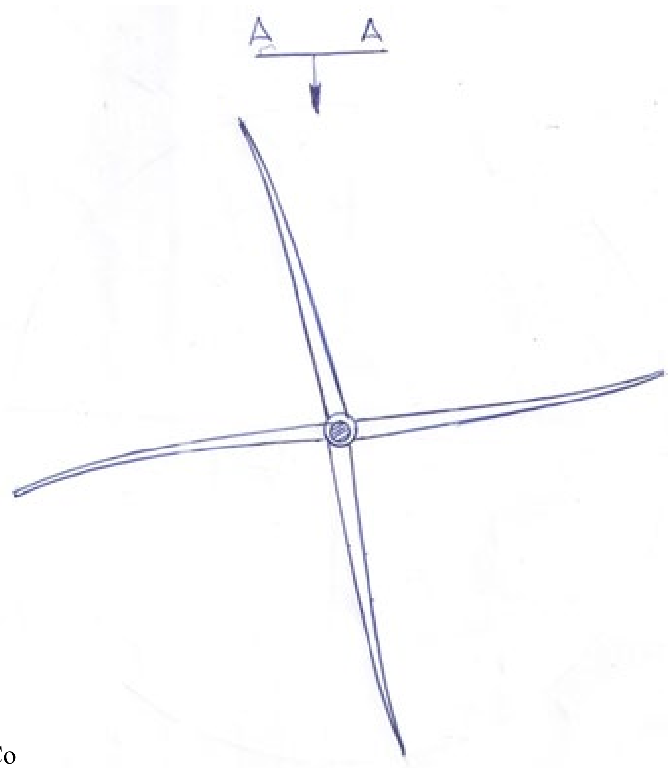


Picture 5: Section A—A from device number 4.

Figure 6 below shows the shaft and impeller. The thing to note here is that the bearings of the agitator shaft are moved out, and to reduce the shaking oscillations, we have to extend the distance between the 2 bearings. The stirring shaft No. 1 rests on the 2 bearings of the No. 2 bearings. (1) and 2(2), Bearing 2(1) alone includes 2 types of normal bearings and pressed bearings for locating the drum shaft This bearing is 2(1) positioned on deck 5, which is positioned on 4 vertical columns 3(1), 3(2), 3(3), and 3(4) (2 vertical columns). not shown). Thanks to the canopies 4(1), 4(2), 4(3), 4(4), we can adjust the entire stirrer shaft as well as the flat stirrer 9 up or down, to determine position the agitator blades in the appropriate position. The electric motor 6 and the electric stepless reduction gearbox rotate the worms 7, and the worm gear 8, and finally make the stirring shaft 1 rotate at the required speed.



Picture 6: stirrer shaft and flat impeller



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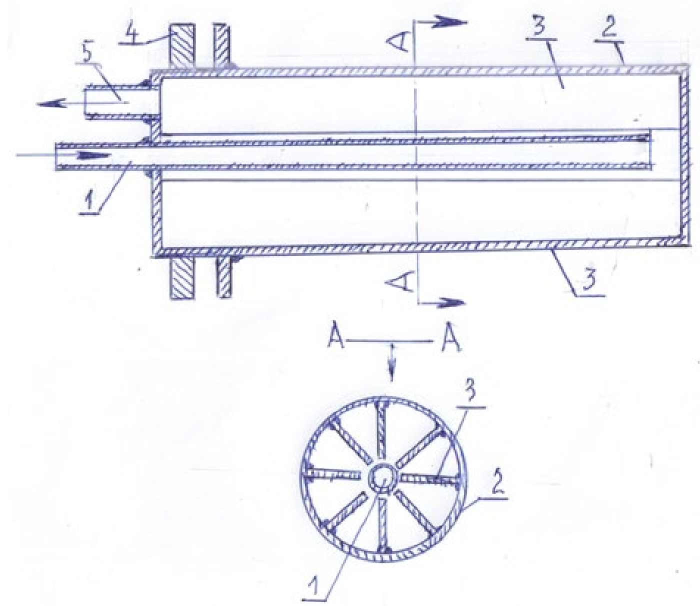
Picture 7 : Section A—A of figure 6.

In the work [2, 3,], we calculated that the height of the liquid layer in the combined TBPUDT RLK is about 4 meters, so the height of the device part to contain the amount of liquid in the combined TBPUDT RLK is about 5-6 meter is suitable so we think the size shown in figure 6 is appropriate, acceptable. The combined TBPUDTRLK has a very large size, so in the central regions there is quite a distance from the shell containing the heat load, while the reaction between CO2 and the soda solution is exothermic, so adjusting the temperature will not perform well without a solution to capture heat in these remote areas. Let's look at figure 3 again with 44 converging points 6 equilateral triangles, these are the points with very high water speed created by 6 different types of flat agitators rotating clockwise, this is 44 position number 2 in figure 4. At these points we place the heat exchanger as shown in figure 8 below.



Picture Number 8: Heat exchanger.

Thus, in the combined TBPUDT RLK, there must be 2 reaction temperature regulators, the first is a temperature regulator through the heat carrier pumped into the outer casing of the combined TBPUDT RL K, while the other is a thermos regulator. The second thermostat is a direct temperature regulator for the reaction solution, and it works as follows. From the thermostatic coolant tank, liquid is pumped into all 44 heat exchangers, in this particular case, into pipeline 1 see figure 8, after the heat exchanger has been carried out, this heat carrier flows out through tube 5 and returns to the thermostat, which works fully automatically to maintain the reaction temperature in TBPUDT RLK.

The operation of the technology to separate 1 million tons of CO2/year, in principle is completely similar to the operation of technology to separate 1000 tons of CO2 per year, the main difference is in the number of similar machines in the industrial process. Turmeric. The pump draws and fills the clean exhaust stream and distributes it to 120 inlets 6 (fig. 5) to execute the reaction in a single 1 20 individual TBPUDT RLK, the product obtained from a 120 individual TBPUDTRLK exiting from 120 outputs 7 (see Figure 5), 120 metered piston pumps are pumped to the heat-refractory device by a 1.2 Atm pressure cooker with a boiling point of 120 o C.

4- Equipment and Technology Solutions to Sequester CO2.

Figure 9 below shows the dry ice container and its lid manufactured from suitable steel, the dry ice manufactured into a cube of the appropriate weight. Figure 9 shows the dry ice container with the lid on from the outside, with cross-sections in sections A-A or B-B showing the dimensions of the dry ice container, and of the lid with a suitable seal. We will study the existence of dry ice in metal containers, If dry ice can be stored for a long time on land, what are the necessary conditions for dry ice containers. Assume that dry ice has can be stored on the ground outdoors, we can get ordinary metal containers to store ice as shown in the pictures below.

5. Conclusion.

In the published document [2, 3, 4] we have implemented the design of the main equipment of the technological process to separate CO_2 from the industrial exhaust gas stream of 3.4 million m3/h of 1000MW thermal power plant when using coal as fuel, if the exhaust stream contains 10%TT CO_2, this technology already contains 8.8 million tons of CO_2 per year, that is, the RD model 1 million tons of CO_2 every year is too small for us. In short, we can completely enforce the requirements that billionaire Elon Musk

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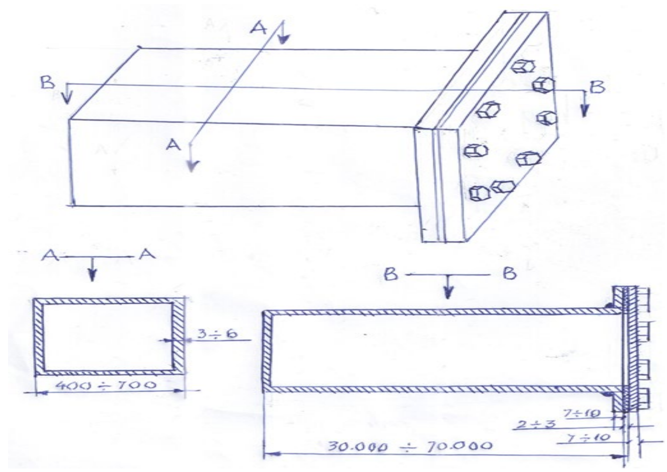


HÌNH VẼ SỐ 9 : Thùng và nắp đậy đựng các khối băng khô.

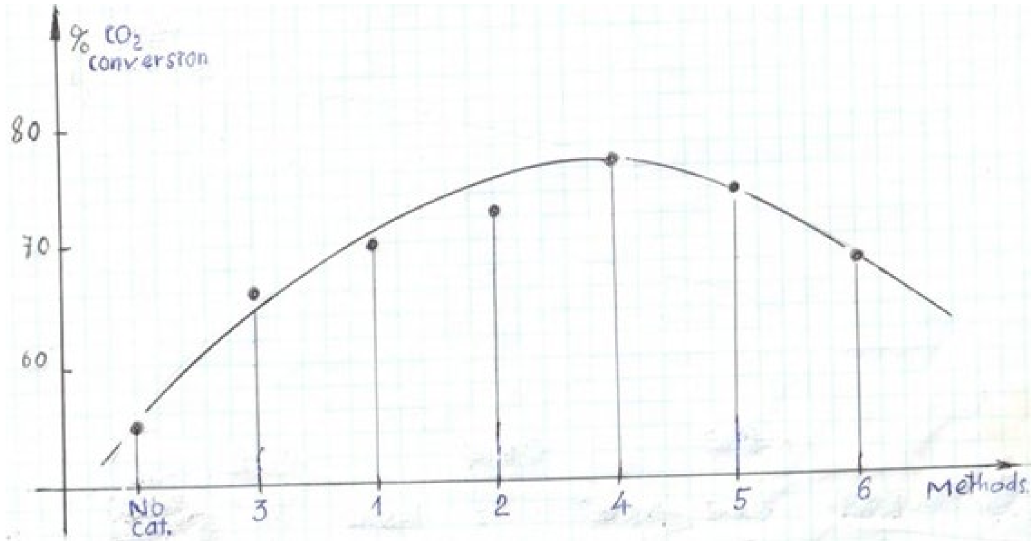
5-Chất xúc tác cho phản ưng giữa CO2 và soda.

Chất xúc tác cho phản ứng hoá học gửa CO_2 và dung dịch soda được sản xuất từ các nguyên liệu ban đầu khác nhau.

Catalitic active was prepared by different plans.

N	Date of experiment	plans	Optimal. Consent.	% CO2 conversion on the reaction time (hr.)					
			(0/00)	0,25	0,5	0,75	1	1,5	2
1	19/9-2011	1	1	70,00	76,15	70,00	70,76	70,76	73,84
2	19/9-2011	2	1	77,09	75,57	72,51	72,51	70,22	-
3	20/9-2011	3	0,25	60,53	68,53	66,40	65,62	67,18	74,22
4	20/9-2011	4	1	76,66	70,00	73,33	76,66	80,10	75,83
5	22/9-2011	5	1	69,25	69,62	72,59	74,07	74,07	75,55
6	22/9-2011	6	0,25	70,37	70,37	72,59	68,14	69,62	78,52
7	5/9/2011	No catal.	0	-	62,6	-	55,3	71,00	65,00

Từ số liệu của bảng số trên đây ta có thể vẽ đồ thị sau đây



DRAWING 87: The activity of the catalyst was prepared in the different schemes, are evaluated at the optimal concentration (data taken from table in 1 hour of experience time)

Qua bảng thực nghiệm chúng tôi nhân thấy chất xúc tác điều chế theo phương án 4 có kết quả tốt nhất, chung gọi nó là ECa -4 (xúc ta môi trường)

Table No. 13. Testing results the effects of EnCa 4 catalytic concentration on % conversion of Soda

No	Exp. dates	Con. of cat.	% conversion of CO2 on reaction time (h)								
		o/oo	0.25	0.5	0.75	1	1.25	1.5	1.75	2	2.25
1	9/11/2011	0.5		81.39		77.51	80.62	79.05	72.8		
2	9/11/2011	1	100	96.37	93.47	87.68	84.05	84.78		84.02	
3	9/13/2011	1.5	92.3	95.1		95.1	90.9	81.1		81.1	
4	9/13/2011	2	90.78	81.56	83.18	82.26		82.97		79.43	
5	9/5/2011	0		62		55.28		71.54		65.04	69.91

Over drawing 89, we find the optimal concentration is 1o/oo, that every 1 kg of 20% soda solution, then just 1 gram EnCa – 4. We can execute the reaction with 100% conversion, in that time, if there is no catalytic, % conversion can only be achieved 62% Nhờ có chất xúc tác mà thời gian tiếp xúc của phản ứng đả giảm xuống từ 220 giây nay chỉ con 40 giây, nghĩa là năng suất công nghiệp đã tăng lên 5 lần. [1, 2].

KẾT LUẬN ;

Trong tài liệu đã công bố [23, 4] chúng tôi đã thực thi việc thiết kế các thiết kế ác thiết bị chình của quy trình công nghệ để tách CO2 từ giòng khí thải công nghiệp 3,4 triệu m3/h của nhà máy nhiệt điện 1000MW khi sử dụng than đá làm nhiên liệu, nếu như trong giòng khí thải chứa 10%TT CO2, thì công nghệ này đã chứa 8,8 triệu tấn CO2 mỗi năm, nghĩa là mô hình RD 1 triệu tấn CO2 mỗi năm đối với chúng ta đã quá bé. Tóm lại chúng ta hoàn toàn có thể thực thi những yêu cầu mà tỷ phú Elon Musk

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