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Design new ways to optimize and reduce the use of chemical solutions costsin National Iranian Drilling Company

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Abstract

The purpose of this plan is to reduce laboratorial solution and optimization of material in the oil dependent company, avoid waste and increase of its consumption date. Also, the purpose of the plan is to avoid purchasing and importing tampon buffer and alcohol and the other materials in experiments on recovery fluids and recovery of materials to consumption cycle and the economic profit for one year, estimated as 1410000000 Rials. All stages of field test and guidance in the paper were sent with the images and tables.

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Introduction

The National Iranian drilling is with 70 active drilling systems all over the country and an international company and each of the machines has a laboratory in which fluids expert provides materials of fluids and its experiment. Avoiding wastage of materials and finding a method for optimal use and access to new technologies to be consistent with other firms and laboratories, the solution of laboratory is investigated and the reason of high consumption and waste is investigated to find a better scientific method for saving and avoiding its wastage. In addition, most of the materials exiting the operation reservoir and the relevant tests are done by fluids expert. This laboratory has 10 to 12 chemical solution samples and different types of fossil materials exiting the well are tested. Despite the increase of costs and shortage of solution and technology progress, this is done traditionally. Avoiding wastage of materials and finding a method for optimal use and access to new technologies to be consistent with other firms and laboratories, the solution of laboratory is investigated and the reason of high consumption and waste is investigated to find a better scientific method for saving and avoiding its wastage. Also, we can minimize its inefficient consumption and wasting half of it due to expiration and appropriate care of the products. Silver nitrate solution is one of the highly applicable, costly and rare solutions with high waste. National drilling company of Iran is one of the consumers of this mater. This is purchased as raw and it is provided by central lab as liquid silver nitrate with varied concentration and is sent as liter on systems. These materials are used in Lab by combination with some other solutions to obtain the salt value in condensate and fluids exiting the well. With regard to consumption and cost calculations are tables،By saving consumption and reversibility and recycling of materials by new equipment and training, we can avoid considerable consumption and reduce the consumption to ½ and ¾ of past wasted materials can be recycled by scientific computation principles and recycle methods.

The aim of this study is to reduce laboratorial solution and optimization of material in the oil dependent company, avoid waste and increase of its consumption date.

Materials and Methods

Silver nitrate solution 0.282 normal mole 10000 reagent ($AgNO_3$)

For 12 months, the mean of silver nitrate consumption for oil well derrick. Day, Month and year with current consumption mean 19, 25 to 29 cc

$$\text{saving} = \frac{9.5cc + 12.5cc}{2} = 11 \times 30 \times 50 \times 12 = 198000cc = \frac{198000}{1000} = 198\ litr$$

In a fluid oil-based system O.B.M, there are two phases of water and oil and by adding emulsifiers and additives in this system, a single-phase emulsion system is created in which oil phases surround water phase and it cannot be separated as water phase is very small (without the detailed specialized discussion). Now consider the brief performance of solution in fluid test.

C_3H_6O Chemical formula: Acetone

C_3H_8O Alcohol propanol

Combination of Methyl, Ethyl and Ketone

Brief scientific explanation of consumed solution analysis

a. Fluid sample (titrant emulsion) releases water molecule under the influence of acetone and alcohol (two phase) and the environment is released of organic materials by acetone and mineral materials quality is increased by alcohols and they can be prepared for titration. Thus, distilled water is used to increase volume. Then, silver nitrate solution is added gradually to reaction point (Equivalent). Immediately after dissipation of $Cacl_2$, the next drop of $AgNO_3$ is combined with potassium chromate and red dissipation is created and it shows the end of reaction. In blue-based fluid, this is done without the interference of alcohols.

b. Water is polar and oil is non-polar and oil enters water and it is disappeared in water due to the entrance of light alcohol (ethanol) (propanol) and

based on chemistry term, water absorbs oil and this is the same as detergents act on fat and this separates solid particles from each other and fluid salt in water and clays are dissipated (above explanation).

Based on the brief analysis of above, chemical solution value of nitrates and alcohols are determined based on which factors?

1. Titrant sample volume
2. Iterator solution quality
3. Observing test principles and accuracy
4. The volume of consumption of solutions based on sample volume, etc

Note: The fixed volume of consumption in test formulas and what we should do in case of abundance and cheap price in other conditions?

Note: Each kg raw materials of dry silver nitrate with process cost is now 105000000 Rilas and produces 20lit silver nitrate 0.282 normal 10000 mole and in case of performing this method, 228 liter saving is considered.

Titration method

In titration, standard solution is added by a burette to the solution its concentration is measured and this continues till the chemical reaction between standard and titrant solution is completed. Then, by standard volume and concentration and titrant solution volume, the concentration of titrant solution is computed.

The result of practical test on oil-based fluid sample

The following table is based on new formula to achieve PPM value of calcium chloride and sodiumchloride in oil-based fluid of drilling. As shown in row 2, nitrate consumption of test depends upon the sample and this law is considered for all tests on fluids.

Table 1. The table of field tests on fluids and conclusions about the changes of consumption value.

Conclusion Mg/litr.	Silver nitrate/CC/	Potassium Chromate (drop)	Distilled water/CC	Acetone /CC	Methyl Ethyl Ketone/CC	Sample volume\CC	No.
384000	16	10	10	15	10	2	1
384000	8	7	10	10	10	1	2
378000	7.8	5	10	7.5	5	1	3
384000	8	5	10	7	5	1	4

The changes in one of the instructions of lab test (specialized discussion of drilling fluids engineering) (The measurement method of sodium chloride and calcium chloride in oil fluid)

1. Volume percentage of water is measured by retort kit.
2. Add 1mL of tested mud in titration dish.
3. Add 5mL of methyl ethyl ketone in the dish and stir it.
4. Add 7 to 8 mL acetone and stir it.
5. Add 10mL distilled water and stir it.
6. Add 5 to 10 drops of potassium chromate reagent and stir it.
7. Add drop by drop of silver nitrate 0.282 normal to turn into yellow-reddish color.

Take a note of silver nitrate application and obtain concentration of sodium chloride or calcium chloride (Specialized formula)

$$NACL.^{Mg}/_{litr} = \frac{A * 2 * 16.5 * 10^6}{(A * 2 * 16.5) + B\ CURRENT}$$

$$CURRENT\ \ CACL2.^{Mg}/_{litr} = \frac{A * 2 * 15.6 * 10^6}{(A * 2 * 15.6) + B}$$

Thus, based on direct relationship of sample volume and solution consumption volume, we can be economical regarding the costly and rare materials

The following formula is the ratio of converting dry raw nitrate to liquid

One kg dry raw silver nitrate costs 100/000/000 Rilas equal to 10 million Toman purchased by company and it is turned into liquid nitrate in central lab.

1000 g dry raw nitrate produces 20lit nitrate 282% normal 10000 mole and 17lit 20000mole.

The factors of destruction of materials (silver nitrate) and the proposition of changing maintenance method

1. Non-standard package and the relevant barrel (it is industrialized)
2. light, by changing its dish, making it thicker or opacity and being away from direct light
3. Oxidation of oxygen and it is solved by changing the dish for example, a cork is put under the lid to avoid oxygen and light and the tester can take nitrate by a 10-cc syringe as penicillin and vial of suspension
4. Its application method, label or M.S.D.S is written on nitrate dish to show it is dangerous for skin and lung.

Empirical determination of speed rules in determining the reaction degree of concentration changes

a. The continual experience method (curve method)

b. Van't Hoff method (differential)

The calculation of two similar solutions via reaction point

c. The method of determining the percentage ratio of reaction and in this method, percent ratio determination of materials is compared during fixed time, volume and temperature (old and new materials and calculating the difference of reaction time and oxidation in consumption of two materials).

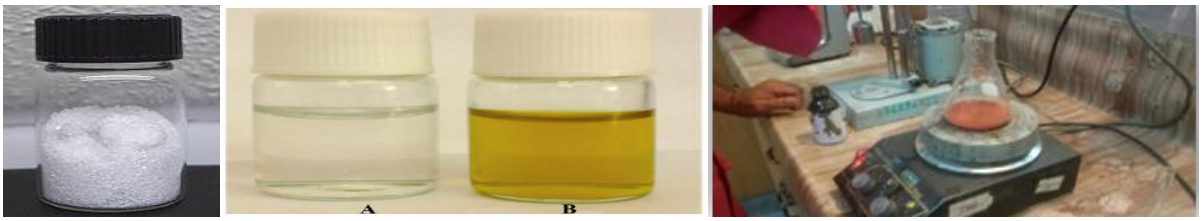
Reversibility of silver nitrate

This solution is not destroyed due to temperature, air and light and time as it reacts in its specific reaction and in case of evaporation, its concentration is increased compared to its volume and in case of oxidation, its concentration is decreased but its nature is not changed and it is not turned into another element

$$AgNo_3 \rightleftharpoons Ag\text{---}NO3$$

The method of using old materials compared to new materials

To obtain the oxidation of slow-reacting or rapid–reactingsilver nitrate A2 by equivalence method



A1 ⟶ B

A2 ⟶ B

Example: Standard concentrationA1=10000

Continuing the formula of next page

Standard= (1.65 chloride in mg = Nacl salt in mg) Salt (Nacl) = (1.65) Clor

Saturated salt mg/liter x=320000

Nitrate consumption value/K=cc

A2=Concentration of oxidized nitrate solution

Y=Oxidation value

Mg/lit (formula) = nitrate concentration *1.65*CC/ silver nitrate consumption value

A standard nitrate

A2 required nitrate solution

B titrant studied sample

A1=10000 standard mole concentration

X=320000 liter/mg

K1, K2=cc/nitrate consumption value

A2=Concentration of oxidized nitrate solution

Y=Oxidation value

A2*1.65*K=X

320000=19.4*1.65*10000

340000=K2*1.65*A2

K2= 20.61 (K1-K2) = 19.4-20.61=(1.21)

A2*1.65*20.61=320000

slow-reacting silver nitrate 10000-9410=590

$\left(\frac{320000}{1.65} = 193939\right) \quad \frac{193939}{20.6} = 9410$

y= 590
K= cc/nitrate consumption
A2= 9410 for next tests by silver nitrate with concentration 9410, we have
A2*1.65*K=Mg/litr9410*1.65*20.61=320000

The structure and recovery of buffers
The reaction of strong acid and strong alkaline to neutralization by combination of hydronium and hydroxyl ion
Acid and alkaline and equivalent point
$OH^- + H_3O \dashrightarrow 2H_2O$

A definite volume of 1 normalityis selected and is added of solution 2 gradually and neutralization is performed if the alkaline grams is equal to acid.
y N = ý Ń

Highly applied sample
Based on the latest information, one kilogram dry raw silver nitrate costs 100/000/000 Rials equal to 10 million Toman for the companies purchased by national drilling company and in a process in central lab, it is turned into liquid nitrate.

The most important saving method is continual experience method and lab knowledge at small scale and the following plan is the result of the following item.

The following formula is the ratio of turning dry raw nitrate to liquid with varied concentrations.
20.850 lit-47.94 ÷1000g with concentration 10000 mole
17.123 lit-58.4÷1000g with concentration 20000 mole
1000g dry raw nitrate produces 20lit nitrate 282% normal 10000 mole and 17 lit 20000 mole. Estimation of 50 active machines. One test. For example, $Cacl_2$ or Nacl salt.

Overview (buffer solution)
Sometimes it is required to provide and store the solution with definite PH. keeping such solution is more difficult than providing it. If this solution is exposed to air, carbon dioxide (one acid anhydride) is absorbed and becomes acidic.

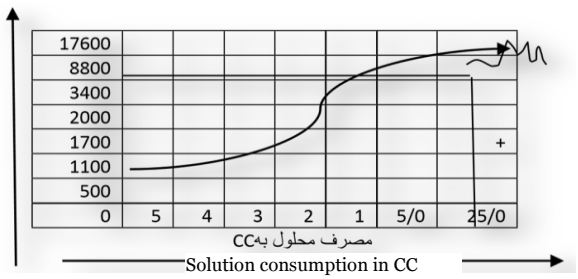
If the solution is kept in a glass dish, alkaline impurities are washed due to wet glass and it changes PH. In buffer (Tampon) solution, PH is fixed, even when little acid or alkaline is added can be kept.

Buffer solutions are composed of a weak acid and its salt or a weak alkaline and its salt: Buffers are analyzed widely in chemistry and they are used to grade PH meter.
CH3COOH, CH3COONa
HF, KF

Important
Recovery of buffer solution and silver nitrate, acid and alkaline

A review of executive method and specialized experiment sciences of chemistry at low scale Based on the investigations of executive methods in laboratorial sciences, we can find saving and reduction of consumption and the effect of environment and relevant solutions are considered by scientific methods in most of the laboratories of state and private medical sciences and chemistry. Almost more than 10 laboratorial solutions in drilling industry are used in chemistry laboratory of Universities and Medical Sciences.

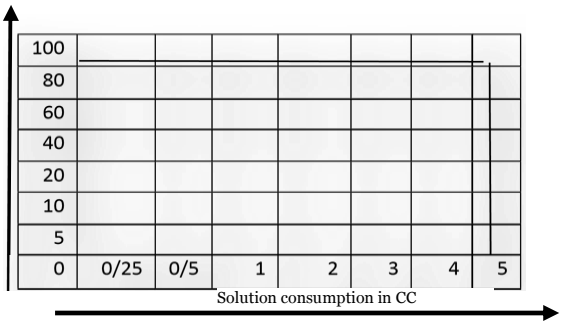
chart 1. The consumption value, accuracy and precision



Curve 1 indicates less consumption, high precision

The experiment of these solutions and cheap price of this process is done easily but today, by the progress of science and technology, we can reduce the problems and costs by scientific researches. By new method of laboratorial sciences of drilling industry and based on the lack of advance facilities in laboratories, by changing the traditional method, only we can decrease the consumption to ½ and reach it to 2/3 in reversibility.

Chart 2. Sample value curve in cc and consumption value in CC



Fluids expert Omid Ali Mombini

Advanced method (new) in case of having equipment

Today, a unit less than CC is used in laboratories and it is called Lambda and is denoted by **(λ)**For example, the less the sampling value, the lower λ of kit consumption (1000λ=1cc) and sometimes it is called Landa and the consumption is reached to 400 λ and 100 λ but with specific conditions and accuracy in calculations curve and this curve exists as electronic software of machine in laboratories and it has a red line and if the sample is less than 200 λ (0.2CC), error percent is increased and its value is computed.

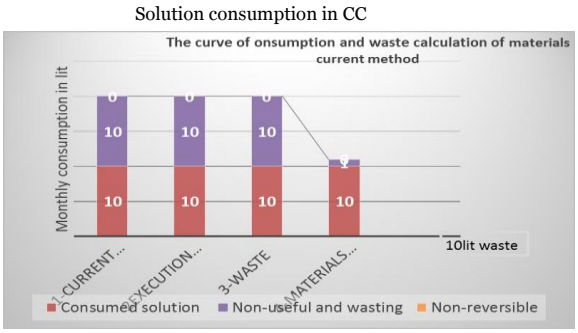


Fig 1. Current traditional method

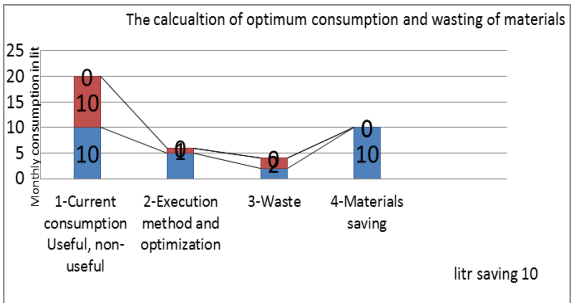


Fig. 2. After performing the plan

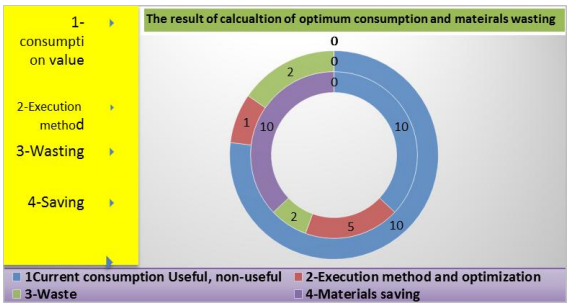


Fig. 3. The curve of general conclusion based on human error and natural wasting.

Table 2. Tables of financial calculation, The general calculation of consumption reduction and materials recycle and minimum economical practical profi.

Annual / Rial	Monthly /Rial	Profit daily /Rial		Value/lit	Execution cost	Materials
912000000	76000000	2498630	198	Consumption reduction	No	Silver nitrate
			30	Returning to consumption		
4931280	410940	13698	50	Reversibility		
35506800	2958900	98630 Rial	20	Consumption reduction	No	Alcohols
19724400	1643700	54790	20	Reduction	###	Relevant materials
972162480	81013540	2665748	318	----	--	Total

Table 3. General calculation of the mean of saving in case of complete execution of plan.

Based on chart, map and additional calculations			
Saving/ profit of (expenditure incomes)	**Score/ economic income proposition 2012**	**Executive costs of proposition**	
4samples (3948480 Rials)+1200CC	50%+ current cost	No	Daily
####	####	No	Monthly
1441195200=438lit=438000 Rial	For 4 samples of laboratorial solutions (mean of saving for all of machines)	No	Annual
7205976000 Rial		In case of providing equipment	Five years

The distance between equivalent point and end point is less than 50 to 100 **λ.** In traditional method at low scale, it is defined by naked eye and high precision. In advanced laboratorial sciences, low consumption and error percent in experiment reaches 0 to 10 λ and by achieving advanced facilities, we can determine it. Chart 1, 2 are associated to sample volume and consumption volume and accuracy (accuracy hypothesis)

Conclusion

With regard to consumption and cost calculations are tables، By saving consumption and reversibility and recycling of materials by new equipment and training, we can avoid considerable consumption and reduce the consumption to ½ and ¾ of past wasted materials can be recycled by scientific computation principles and recycle methods.

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