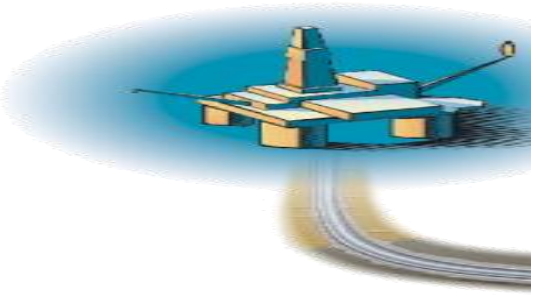
Feasibility of Using Liquid Chemicals vs. Solid Chemicals in the Drilling Fluids



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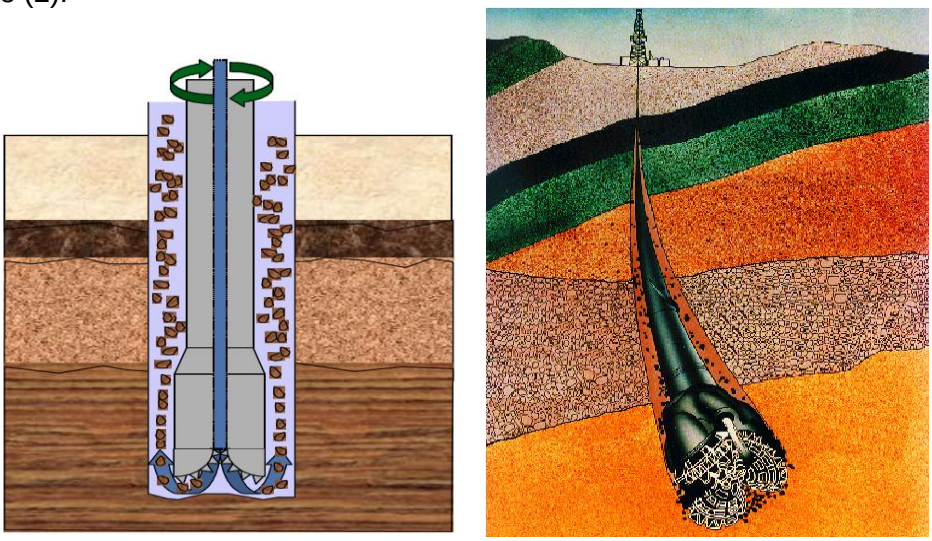
Abstract

This paper attempts to evaluate different scenarios taken from a real world job. The scenarios deal with the different product selections and supply chain strategies for a drilling job. The paper emphasize on the financial impacts of each path. In this paper, only the financial criteria were considered and how they play a major role in the drilling activities. The different scenarios include four distinctive paths of selecting two different types of chemicals (solid and liquid) used for the water based mud, and the two different supply chain strategies that were investigated cover the short term supplies and the long term supply with storing requirements. The outcome of this investigation turned out to favor the solid type with long term supplies as it has the highest value of the future worth profit.

Introduction

Chemical treatments in the drilling and workover jobs play a major role in the quality and the completion of such work as they are the most important additives in the drilling and the completion fluids. Drilling fluids are used in the oil and gas industry for the drilling of bore holes and construction of oil wells. They are typically classified as either water-based or oil-based/invert emulsions. Liquid and solid chemicals are added such that they can be part of the fluid after emulsification processes. Water-based fluids contain clays, weighting agents and other special chemicals in the aqueous. Such fluids fulfill a wide variety of functions in drilling operations, including maintaining pressure in the formation rocks and helping to protect and support the borehole wall, preventing collapse (1). They are also designed to protect permeable zones from damage while drilling, increasing rates of hydrocarbon recovery. Drilling fluids also help to cool and lubricate the drill bit and drillstring and are essential for removing the excavated rock or “drill cuttings” from the borehole. The below figure illustrates how they are fit into the well bore (2).



Rock debris generated during drilling is carried to the surface by the drilling fluid whereupon the cuttings are removed using solids-control equipment. This aim of this procedure is to remove as much of the solid contaminants from the fluid as is economically possible before the fluid is returned to the active mud system and re-circulated back down the borehole. The mud is then received, but it contains natural gases or other flammable materials which are collected in and around the shale shaker / conveyor area or in other work areas (3).

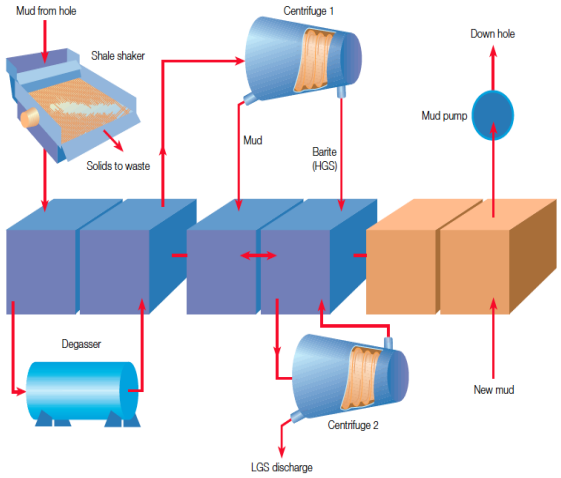
Thus, selecting the right chemical and maintaining it in the healthy conditions help prevent the incompatibility phenomenon that results in swelling susceptibility, which usually causes caving, sloughing, stuck pipe, bit balling, excessive torque & drag, heaving, suspended drilling activity and hence lost revenue (4).

The Synthesis of the Water-based mud (WBM)

The process of making the WBM starts with water, and then clays are added. After getting a good mix thru the centrifugal pump, the required quantity of chemicals is added to create a homogeneous blend that have the required density and viscosity to

carry out the cuttings (5).

Moreover, it is imperative to know that mud management is an essential step such that keeping the Fluid in Shape throughout the whole drilling job. Therefore, to select a reliable chemical formulation for the drilling fluid is one part of the job, and maintaining it is another task of the same importance. As the drilling goes on, the concentration, density and other mud properties keep changing, so it is a continuous process to modify the mud as part of the drilling activities. The diagram below gives a brief logic of how the mud is being continuously renewed . Moreover, processing the solid types usually requires more mixing and blending mechanisms to insure higher qualities of the WBM. This usually incurs an additional cost(6):



Objective

The objective of this project is to investigate the financial decisions that are made with regards to the economics of the selection criteria for the chemical types and strategies of the supply chain.

The financial implications of what type of chemicals to be used and what supply chain approach to be taken has different potential outcomes. There are several types of chemicals with different concentrations, different performances and different applications, and not surprisingly all of these differences accompany different financial inputs (7). Therefore, in this project our main focus is to perform overall cost analysis on two types of chemicals (a liquid type and a solid type) and two different approaches (direct supplies and annual supplies, which requires maintaining a yearly supply) taking into account all the combined factors that contribute in the cost of the chemicals such as manufacturing cost, shipping cost, and storage cost under the category of land operations. This analysis is taken into account this combined factors in order to optimize the price which will eventually reflect good service quality and delivery to the client in the field.

Scope

The project will evaluate four scenarios as follow:

1a: Chemical, Liquid type, continuous shipment (such that the quantity can be brought on site whenever needed: as a base, a monthly or bimonthly shipments will be

evaluated)
1b: Chemical, liquid type with all of the quantity for a period of one year taking into consideration building or buying a chemical store house.
2a: Chemical, Solid type, continuous shipment (such that the quantity can be brought on site whenever needed: as a base, a monthly shipments will be evaluated)
2b: Chemical, Solid type with all of the quantity for a period of one year taking into consideration building or buying a chemical store house.

Storage area requirements

The nature of the drilling jobs requires changing the region very often such that the regional location moves from one place to another at a pace of 3 months to 6 months. As a result of finishing drilling the well and mobilize the rig to a new site to drill another well. Therefore, most of the equipment is mobile such that they can mobilize the whole camp whenever needed.

The liquid chemicals have more stringent requirements with regards to their storage since they are sensitive to humidity and temperature extremes. On the other hand, the solid dry chemicals are less sensitive and they do not require cooling systems, or pressurized rooms (1). However, by having the solid chemicals contained in big bags and moving them from one spot to another may cost wasting so many materials during the rig movement process. However, for this project study, the storage area must have capacity to store one-year supply, which will be calculated under the project scoping section.

General requirements

Storage structures and its specifications are describes as per follow:

Floors shall be constructed to be:

- Impermeable to water via materials and technique of construction.
- Curbed and sloped to contain wash water and control flow to a collection point.
- Designed to withstand loading and weather conditions it will be subject to.
- Spill containment must be provided for unloading areas that will contain (a reasonable size spill up to the volume typically loaded or unloaded is typically 1000 liters).

Warehouse Structure

- Chemical storage area will be covered by a roof and fully enclosed.
- Roofs and buildings must be built to take into account regional conditions such as wind loading, sand storms etc.
- Ventilation must be adequate to prevent collection of hazardous vapors.
- Entrance to main access doors shall have steel reinforced concrete access ramps both internal and external ramps at an incline ratio of 1:10.
- Main access doors shall allow for easy accessibility of forklifts, trucks, bobcats. Clear height 4 meters min. Clear width 5 meters.
- Minimum of one directional sliding crane (6 Ton capacity).

For the liquid type, typical containers will be used as they provide excellent sealing ability against rains and humidity. They are also preferred as they can be mobilized to the rig site. No cooling system will be required, since the area selected does

not have temperature ranges that exceed 55 Celsius degrees (8), and the forklifts have access:

For the dry solid chemicals, a typical warehouse with corrugated shingle roofing will be specified.

Products for evaluation

Disclaimer Note

Data were collected from different companies, based on some past work done. The cost figures included in this report are not current, and shall not be referred to, except for educational purposes. A list of different companies is included in the reference (9) for exact quotes. Furthermore, the quantity calculations differ from one well to another, but for the purpose of this economical comparison, it is assumed to have the same quantities under normal and smooth conditions.

1. **Solid Type**

Potassium Chloride:

The chemical compound is known as Potassium Chloride (KCl). It is a metal halide salt composed of potassium and chloride. It is used to dry kelp, which is then used to produce soda ash. It can also be added to liquids to remove suspended or dissolved water. Therefore, it is used as a drilling/work over fluid additive.

It is a modified potassium sulphonated asphaltic compound. In potassium environments, it is highly effective because it contributes water soluble potassium in to the mud system (9i)

Packaging

The chemical is packed in flat bottom bulk bags of 1000 kg, made out of woven polypropylene bags with fabric minimum thickness 6.5 oz per sq. yard with reinforced panels, plus separate polythene inner bag 3 mil/ h/t or 6 mil LLD polyethylene, with four min 10" cross corner lifting straps 115 x 115 x which are stitched all the way around the bag, safety factor 5:1 and bag dimensions 100 cms. Stackable without pallet and containing of 1000 kg net (9i).

Storage Requirement

The bulk bag is UV treated to the minimum level of 200 kilolangley/cm2/year, capable of withstanding storage in direct sunlight for a minimum period of six months. The residual tensile strength of the bulk bag should at least be 50% after one full year exposure to UV light in Oman (9i).

The cost of this chemical is as follow:
US $ 7,200 / Metric Ton (1000 kg) (9i)

Moreover, the extra costs for the solid type mixing and blending can be estimated to be 1,500 $ per well. Therefore, for the 2-month job= 1,500 X 12 = $108,000

2. Liquid Type

Cloud Point Glycol:

GLO CP 100 is a water miscible cloud point with low toxicity and multifunctional additives for drilling and workover fluids. It is used in the water drilling fluids to improve lubricity and shale stability.

It is a high temperature Extreme Pressure Lubricant for use in all water based mud systems. It is a water soluble lubricant designed to reduce torque & drag and to lower the potential of bottom hole assembly balling in all water base muds under extreme pressure conditions (9ii).

Features

- It is effective and environmentally safe.
- It provides higher efficiency than conventional polymers and water based fluids.
- It reduces torque and drag.
- It is effective for well bore stability

Safety and Handling

- Material is packed in 55gal/208Ltr Barrels or 5-gallon pails.
- Material must be handled as an Industrial chemical, wearing protective equipment and observing the precautions as mentioned in the MSDS.
- It is an aqueous solution of non-toxic surfactant used in sodium based surfactant

muds.

- It provides easier control of rheology and filtration properties.
- It is a powerful detergent and surface active material of anionic-cationic type equally effective regardless of make up water, whether it is fresh, hard or saturated salt water (9ii).

The cost of this chemical is estimated as follow:

US $ 80/5-gallon

Project Basic Scoping (PBS)

The area selected is a previous project performed in the fields of Khurais, Abu Jifan and Mazalij in Saudi Arabia. The job includes 200 oil wells, 100 gas wells, and 100 water wells. The duration of the project is 5 years.

The mud preparation is performed continuously, and chemical additives are required on daily basis. However, in the project, an estimate of the whole well requirement is provided assuming that drilling activities faced during the job execution are normal conditions. The quantity of fluid mud preparation for one well job requires a quantity of 2900 barrels of mud to fill the well (around 9,000 ft in depth):

This requires a quantity of 30500 lbs of the solid chemicals (KCL) and requires 8,000 gallons of the liquid type (GLO CP) (1, 2, &3).The duration for completing the job per well takes around two month (estimation under normal conditions).

For scoping this project, for the economical study, an area of 12 sites (drilling rigs) is selected since they usually fall within one divisional region.

The quantities required for the region of study in one supply is period (2-month) are:

For the Solid type
30500* 12 (sites) = 366,000 lbs (166.4 tons).
The annual required quantity (x6) = 2,196,000 lbs (998 tons)

And for the liquid type
8,000 *12 (sites) = 96,000 gallons
The annual quantity, 576,0000 gallons

Sizing the required area for storage:

The land is usually lent by the client as part of the contract, and can be considered to be well developed and all infrastructures costs can be ignored.

For the liquid type chemical, they come in 5-gallon pails, and the storehouses commonly used are typical containers with dimensions of:

5.4 m in length, 2.3 m in width and 2.3 m in height (10).

Each container can store up to 8 pallets (each pallet carries 64 5-gal pails) =2560 gallons. Therefore, for the 2 months supply, 38 containers are needed, and around 225

containers are needed for the annual supply. The cost of each container is $2750, and the salvage value after 5 years can be estimated to be $500 (11).

The area to be developed for positioning these containers can be estimated to be two arrays of 500 meters in length. The cost for the overall area (fences, pavements, loading/unloading inclined ramps, and other related developments) can be estimated to be in the range of $ 50,000 for the annual storage area, and only $ 20,000 for the two months supply.

The total store area for the annual supply cost= $ 668,000
The 2-month supply store area cost= $ 124,500

These warehouses can be left as is and the client will compensate the service company as they can be used for line maintenance shops and other storing purposes. It can be assumed that the salvage value for the 1,000 m X 500 m can reach up to 50,000$, and only 30,000 $ for the smaller one (500 m X 500 m)

For the solid type, the area required can be estimated to store 2,196,000 lbs (998.2 tons) 1,000 meter by 500 meter. This can be made of two separate corrugated shingle hangar warehouses. The cost to build a standard 500 m by 500 m with height of not less than 10 m, in the area of the project (around 200 miles from the nearest city) can be estimated to cost 200,000 USD. So the total cost of the solid chemical warehouse is *400,000 USD.* On the other hand, for a smaller supply capacity warehouse, a smaller storehouse can be specified as 500 m X 500 m, which can be estimated to cost *150,000 USD.*

Market Inflation/Deflation Analysis

The project was conducted back in the years of 2005 to 2010. The inflation in this period was fluctuating from 0.1% to 4.1% as follow (13):

However, in the project contracts, they usually have fixed prices that do not take into account the inflation/deflation rates.

Market and Banking Evaluation

For well established companies with good credit histories, they have special alliances with certain banks. This is for mutual interests of both sides, since big companies use a lot of investments and frequently needs ongoing loans to run their business. However, for this project, we will use some standard market interest rates that does not take into consideration any special deals. The interest rate will be taken as 7.56 % for 4-year loans, with annual payments, or 7.82% for a 5-year loan (14).

The Financial position of the Company

Usually, the revenues when using the liquid type chemical is higher since less inspection level from the client side is expected as the quality of the mixing management can be reliably assured. The estimation of the increase in revenue usually ranges from 1% to 3%. In this project, the assumption is made to take into account an average of 2% increase. The revenue of one well job is roughly somewhere from 50 to 60 million dollars. However, the focus of this project will be on the chemical portion only, all other peripherals and other usual costs will not be included. The well rig usually costs around 15 millions, and this type of chemicals account for 1% of the total costs. The contract usually dictates payments to be delivered as follow:

15% upon signing the contract, annual 5% payments for four years, and the remaining 65% to be delivered after the completion of the work.

Assumptions

The assumptions are made based on some personal experiences, and have somewhat realistic ratios.

The company will start with the job at year 0, the money allocated for the chemicals will be 15 million dollars when solid type is selected and 15.3 millions for the liquid. And they will be given only 5 million in the following years for solid type and 5.1 million for the liquid type.

Projects Evaluation

1. Solid Type (KCL), with Continuous 2-month Supply

The required quantity for the 2-month is = 166.2 Tons
The cost of the 2- month supply is 166.4 * 7200 $= $ 1,197,818
The Shipment and logistics cost for this quantity = $ 42,000(Appendix B-1)
Domestic Transportation (from Dammam to the project site) = $ 4,000 (12)
Mixing and Mud Enhancement Costs= $ 18,000
The total monthly cost = $ 1,261,818
Storehouse Costs (onetime)= $ 150,000
Salvage Value(at the end of 5 years)= $ 30,000

Revenues:
First year (year 0) = + $ 15 millions
Annual payment (year 1, 2, 3, and 4) = $ 5 millions
Final payment (year 5) = $ 65 millions

Interest rates:
5.41% for investments
7.56% for a 4-year loan
7.82% for a 5-year loan

2. Solid Type (KCL), with annual Supply

The required quantity for the 2-month is = 998 tons

The cost of the 2- month supply is 998 * $7200 = $ 7,185,600
The Shipment and logistics cost for this quantity = $ 193,200 (Appendix B-2)
Domestic Transportation (from Dammam to the project site) = $ 24,000 (12)
Mixing and Mud Enhancement Costs= $ 108,000
The total annual cost = $ 7,510,800
Storehouse Costs (onetime) = $ 400,000
Salvage Value (at the end of 5 years)= $ 100,000

Revenues:
First year (year 0) = + $ 15 millions
Annual payment (year 1, 2, 3, and 4) = $ 5 millions
Final payment (year 5) = $ 65 millions

3. **Liquid Type (GLO CP) with Continuous 2-month Supply**

The 2-month supply cost= 96,000 * 16= $ 1,536,000
The Shipment and logistics cost for this quantity = $ 42,000 (Appendix B-1)
Domestic Transportation (from Dammam to the project site) = $ 4,000
Total of the 2-month supply= $ 1,996,000
Storehouse Costs (onetime) = 2750 X 38 = $ 104,500
Salvage Value(at the end of 5 years)= $ 19,000

Revenues:
First year (year 0) = + $15.3 millions
Annual payment (year 1, 2, 3, and 4) = $ 5.1 millions
Final payment (year 5) = $ 66.3 millions

4. **Liquid Type (GLO CP) with annual Supply**

The annual supply cost = $ 9,216,000
The Shipment and logistics cost for this quantity = $ 193,200 (Appendix B-2)

Domestic Transportation (from Dammam to the project site) = $ 24,000
Total annual supply= $ 9,433,000
Storehouse Costs (onetime) = 2750 X 225 = $ 618,750
Salvage Value (at the end of 5 years) = $ 112,500

Revenues

First year (year 0) = + $ 15.3 millions
Annual payment (year 1, 2, 3, and 4) = $ 5.1 millions
Final payment (year 5) = $ 66.3 millions

Projects Evaluation

All of the costs involved for the projects are summarized below in the given Summary Table.

Table 1 All the costs that are involved for the project

Duration	Type	Total Supply Cost($)	Shipment and Logistics Cost($)	Domestic Transportation (from Dammam to the project site) Cost($)	Mixing and Mud Enhancement Cost($)	Storehouse Cost($) (onetime)	Salvage Value (at the end of 5 years)
2 months	Solid Type (KCL), with Continuous 2-month Supply	1198080	42000	4000	18000	150000	30000
Annual	Solid Type (KCL), with annual Supply	7185600	193200	24000	108000	400000	100000
2 months	Liquid Type (GLO CP) with Continuous 2-month Supply	1536000	42000	4000		104500	19000
Annual	Liquid Type (GLO CP) with annual Supply	9216000	193200	24000		618750	112500

1. **For Solid Type (KCL), with Continuous 2-month Supply**

All of these different inputs were put together in an EXCEL sheet to perform the required economical calculations, taking into account the different periods and the interest accumulations for the investments.

Table 2 illustrates the economical calculations of the Solid Type (KCL), with Continuous 2-month Supply

Cost($)	1262080	**Annual Interest Rate**	5.41
One Time Cost($)	150000	**Bi-Monthly Rate [r]**	0.009016667
Month	Income	Bank Investment [Interest Amount + Income - Cost]	Interest Amount [Investment * (1+ r)]
0	0	13587920	13710437.75
2	0	12448357.75	12560600.44
4	0	11298520.44	11400395.43
6	0	10138315.43	10229729.24
8	0	8967649.241	9048507.545
10	0	7786427.545	7856635.167
12	5000000	11594555.17	11699099.41
14	0	10437019.41	10531126.53
16	0	9269046.531	9352622.434
18	0	8090542.434	8163492.158
20	0	6901412.158	6963639.891
22	0	5701559.891	5752968.956
24	5000000	9490888.956	9576465.138
26	0	8314385.138	8389353.177
28	0	7127273.177	7191537.424
30	0	5929457.424	5982921.365
32	0	4720841.365	4763407.618
34	0	3501327.618	3532897.922

36	5000000	7270817.922	7336376.464
38	0	6074296.464	6129066.37
40	0	4866986.37	4910870.364
42	0	3648790.364	3681690.29
44	0	2419610.29	2441427.11
46	0	1179347.11	1189980.889
48	5000000	4927900.889	4972334.129
50	0	3710254.129	3743708.254
52	0	2481628.254	2504004.269
54	0	1241924.269	1253122.286
56	0	-8957.714221	-9038.482945
58	0	-1271118.483	-1282579.735
60	65000000	62455340.27	63018479.25

Salvage Value = 30000
Future Worth = 30000 + 63.018497 M = $ 63.038497 M

2. **For Solid Type (KCL), with annual Supply**

Table 3 illustrates the economical calculations of the Solid Type (KCL), with an Annual Supply

Cost($)	7510800	**Annual Interest Rate**	5.41
One Time Cost($)	400000	**Bi-Monthly Rate**	0.0541
Year	Income	Bank Investment [Interest Amount + Income - Cost]	Interest Amount [Investment * (1+ r)]
0	0	7089200	7472725.72
1	5000000	4961925.72	5230365.901
2	5000000	2719565.901	2866694.417
3	5000000	355894.4167	375148.3047
4	5000000	-2135651.695	-2251190.452
5	65000000	62748809.55	66143520.14

Salvage Value = 100000
Future Worth = 66143520.14 **+ 100000 = $** 66243520.14

3. **Liquid Type (GLO CP) with Continuous 2-month Supply**

Table 4 Illustrates the economical calculations of the GLO CP, with Continuous 2-month Supply

Cost($)	1582000	**Annual Interest Rate**	5.41
One Time Cost($)	104500	**Bi-Monthly Rate**	0.009016667

Month	Income	Bank Investment [Interest Amount + Income - Cost]	Interest Amount [Investment * (1+ r)]
0	0	13613500	13736248.39
2	0	12154248.39	12263839.2
4	0	10681839.2	10778153.78
6	0	9196153.781	9279072.435
8	0	7697072.435	7766474.371
10	0	6184474.371	6240237.715
12	5100000	9758237.715	9846224.492
14	0	8264224.492	8338740.249
16	0	6756740.249	6817663.524
18	0	5235663.524	5282871.757
20	0	3700871.757	3734241.284
22	0	2152241.284	2171647.326
24	5100000	5689647.326	5740948.979
26	0	4158948.979	4196448.836
28	0	2614448.836	2638022.45
30	0	1056022.45	1065544.252
32	0	-516455.748	-521112.4573
34	0	-2103112.457	-2122075.521
36	5100000	1395924.479	1408511.064
38	0	-173488.9356	-175053.2275
40	0	-1757053.227	-1772895.991
42	0	-3354895.991	-3385145.97
44	0	-4967145.97	-5011933.069
46	0	-6593933.069	-6653388.366
48	5100000	-3135388.366	-3163659.117
50	0	-4745659.117	-4788449.144
52	0	-6370449.144	-6427889.36
54	0	-8009889.36	-8082111.863
56	0	-9664111.863	-9751249.938
58	0	-11333249.94	-11435438.07
60	66300000	53282561.93	53762993.03

Salvage Value = 19000

Future Worth = 53762993.03 **+ 19000 = $**53781993.03

4. Liquid Type (GLO CP) with annual Supply

Table 5 Illustrates the economical calculations of the GLO CP, with an annual supply

Cost($)	9433200	**Annual Interest Rate**	5.41
One Time	618750	**Bi-Monthly Rate**	0.0541

Cost($)			
Year	Income	Bank Investment [Interest Amount + Income - Cost]	Interest Amount [Investment * (1+ r)]
0	0	5248050	5531969.505
1	5100000	1198769.505	1263622.935
2	5100000	-3069577.065	-3235641.184
3	5100000	-7568841.184	-7978315.492
4	5100000	-12311515.49	-12977568.48
5	66300000	53322431.52	56207175.07

Salvage Value = 19000
Future Worth = 56207175.07**+ 112500= $**56207175.07

Summary of Results

Calculating based on future worth solid type (KCL), with annual supply seems to be a better project to consider due to higher future worth of the revenue.

Conclusion and Remarks

Based on the above economical calculations, the project seems to favor the solid type with annual supplies. However, there are a lot of other factors that are involved in the decision-making process and project selections such as the quality level, the weather conditions, transportation feasibility, storehouse's requirements, environmental considerations and others. Furthermore, it is usually agreed upon with the client as which type of chemicals to be used, and the supply amount to be also discussed and agreed upon depending on which one is more feasible.

Appendix A
Reference

1: Kenneth Bridges “Drilling Fluids” Drillbert Engineering, 2nd ed. Jan. 2008.
2: B. Bloys, N. Davis, & B. Smolen “Designing and Managing Drilling Fluid”, *Oilfield Overview 1,* no. 2 (April 1994)
3: C.A. Sawdon, M. Brady and S. Cliffe, “An Integrated Approach to the Development of a Water-Based Mud with Oil-Based Mud Performance” *SPE/IADC-29375*, March 1995
4: N. Gholizadeh & Ehasan Davani “Development of High Performance Water Based Mud Formula” *SPE-121228*, April 2009
5:A. Al-Ansari, & K. Yavadi “Diverse Applications of Unique High Performance Water Based Mud” *SPE/IADC-97314*, September 2005
6:R. Ewy and K. Morton “Wellbore-Stability Performance of Water Based Mud Additives” *IPTC*, December 2009
7: W. Dye, K. Daugereau & N. Hansen “New Water Based Mud Balances High Performance Drilling and Environmental Compliance” *SPE/IADC-92367*, February 2005
8: PME “Surface Annual Climatological Report”, Retrieved 2010-08-17.
9: Companies for Drilling Chemicals
i.LocalineOman (website Address)
http://www.localineoman.com/Products/DrillingChemicals.aspx
ii. Global Drilling Fluids & Chemicals Limited (website Address)
http://oil-drilling-fluids.com/
iii. MI SWACO (website Address)
http://www.slb.com/services/miswaco.aspx

10: SR International Logistics {Online Address}:
http://srinternational.com/standard_containers.htm

11: Buyer zone for reliable quotes {Online Address}:
(http://www.buyerzone.com/industrial/storage-containers/ar-prices-special-storage-containers/)

12:http://saudiarabia.yoolk.com/categories/1/sa11364
13.http://www.usinflationcalculator.com/inflation/current-inflation-rates/
14: http://www.westpac.com.au/business-banking/business-loans/tools-calculators-rates/business-loans-interest-rate/

Appendix B-1

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2530 KNOBLOCK ST TEL: 832-660-6886, Houston, TX 77023 UNITED STATES, Tel: 832-660-6886, Fax: 832-550-2144

Quotation

Contact Info: Razzaghi, Emad

UNITED STATES

Quotation Number:	4588
Date/Time:	Nov/15/2011
Expiration Date:	Dec/15/2011
Employee:	Administrator

Origin:	Destination:

Type of Move:	Truck, Containerized	Origin:		Destination:	Dammam

Cargo Information

Pieces	Description	Weight	Volume	Volume Weight
14		0.00 Kg 0.00 lb	0.00 m³ 0.00 ft³	0.00 VKg 0.00 Vlb

Description of Charges	Quantity	Price	Amount
Ocean Freight Service 1 X 40 HC HOUSTON TO DAMMAM	14.00	3000.00	42000.00
		Total USD	42000.00

Notes:

Signature: _____

Magaya Cargo System. www.magaya.com

Appendix B-2

INTERSHIP, INC FMC 021902F

2530 KNOBLOCK ST TEL: 832-660-6886, Houston, TX 77023 UNITED STATES, Tel: 832-660-6886, Fax: 832-550-2144

Quotation

Contact Info: Razzaghi, Emad

UNITED STATES

Quotation Number:	4588
Date/Time:	Nov/15/2011
Expiration Date:	Dec/15/2011
Employee:	Administrator

Origin:	Destination:

Type of Move:	Truck, Containerized	Origin:		Destination:	Dammam

Cargo Information

Pieces	Description	Weight	Volume	Volume Weight
161		0.00 Kg 0.00 lb	0.00 m³ 0.00 ft³	0.00 VKg 0.00 Vlb

Description of Charges	Quantity	Price	Amount
Ocean Freight Service 1 X 40 HC HOUSTON TO DAMMAM	161.00	2400.00	386400.00
		Total USD	386400.00

Notes:

Signature: _____

Magaya Cargo System. www.magaya.com