BASIC FORMULATION OF FLUIDS

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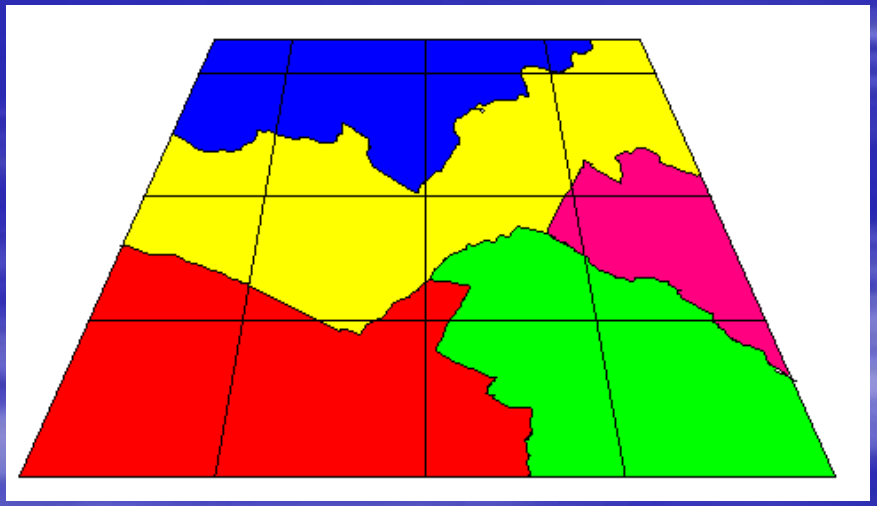
Fluid Fertilizer Foundation
Dec 8- 9 , 2015
Louisville, KY

PRECISION STARTS HERE !!

PRESCRIPTION FORMULATION AND PRODUCTION

The First Step In Precision, Site Specific Application Is To Produce a High Quality Prescription Blend.



The Correct Analysis and Quality Product

Repeated Stopping To Cleaning Nozzles or Strainers Defeats Precision Application

POOR FORMULATION PRODUCES POOR PRODUCT

ADD, SUBTRACT, MULTIPLY & DIVIDE

UNDERSTANDING THE TERMS

FERTILIZER GRADE or ANALYSIS:

The plant nutrient content of the product expressed as a percent by weight.

N-P-K

3-9-27

3%Nitrogen, 9% Phosphorus (P_2O_5), 27% K-Potassium

Total 39% Plant Food

61% Non-Nutritive Materials

FORMULATE TO A TON

- 1 TON, 2,000 POUNDS
- A TON FORMULA CAN BE EXTENDED OR REDUCED TO FIT ANY BATCH SIZE
- MIXERS READOUT IN POUNDS, BUT HAVE A TON RATING
- 10 TON BATCH IS 10 X EACH INGREDIENT
- IF YOU CALL ME WITH A PROBLEM, GIVE ME YOUR TON FORMULA, NOT BATCH POUNDS

USE A “FORMULATION SHEET”

- DO NOT “FORMULATE” ON A PIECE OF SCRATCH PAPER
- USE A DOUBLE CHECK FORM
- COPIES OF THE ONE WE USE ARE AVAILABLE ON REQUEST
- NO FORM, DRAW A TABLE FORM BEFORE STARTING
- DOUBLE CHECK YOUR MATH !!!

J. May *Equipment Group* **FORMULATION WORKSHEET** **Date:_____**

Customer: _____ Field #/ Location

Number of Acres	**X**	**Pounds Per Acre =**					**Total Pounds Required**			**1 to 3 Ammonia N to P_2O_5 Ratio**				
Total Pounds Required		**÷ 2,000 =**	**Total Tons÷ Batch Size=**				**Number Batches**			**Total P_2O_5 ÷ 3=**		**Total Ammonia N**		
		GRADE						**Total % Units**		**Less MAP/DAP N**				
		N	**P**	**K**						**Total**		**N from NH_3/Aqua**		
		%	**%**	**%**	**%**	**%**	%	*** Credit Equiv.**						
Material	**Pounds**	**Lb.**	**Lb.**	**Lb.**	**Lb.**	**Lb.**	**Lb.**	**Lb. H_2O**	**Lb. Clay**	**Cost/ Ton**	**Cost / Lb.**	**Total Cost**	**Pounds/ Batch**	**Scale Stop**
TOTALS														

TEMPERATURE CALCULATION

HEATERS				**VS**	**COOLERS**			
Pounds	**Product**	**BTU/ Lb.**	**Total BTU**		**Pounds**	**Product**	**BTU/ Lb.**	**Total BTU**
	NH_3	**1750**				**Urea**	**< 110**	
	Aqua	**1400 / Lb. NH_3**				**Ammonium Nitrate**	**< 145**	
	Phos Acid	**100**				**Ammonium Sulfate**	**< 110**	
	Steam	**1000**				**Potash**	**< 100**	
	160° Water	**120**						
	Total Heaters					**Total Coolers**		

Total Heaters		
Less Total Coolers		
Net BTU		
Net BTU ÷ (Batch Weight X .8) = Degrees Temperature Change		**° F**

Example: +16,000 Net BTU ÷ (2000x.8) 1600 = +10° F *Starting Water/ Batch Temp + Change = Final Temp. (55°+10°= 65°F)*

***H2O CREDIT % EQUIVALENT**

32-0-0 20%	**28-0-0 25%**	**Aqua 70%**	**10-34-0 25%**	**12-0-0-26 25%**
10-30-0 20%	**Phos Acid 15%**	**High K-Base Grades 15%**		


NOT ANOTHER FORMULA!!!

FIGURIN' IT OUT !!

- *BASIC MATH*
- ADD
- SUBRTACT
- MULTIPLY
- DIVIDE
- *FORMULATION IS KNOWING WHEN TO DO WHICH*

DIVISION= A PILE OF SOMETHING

- PHYSICAL SIZE OF A MATERIAL USED IN THE FORMULA
- POUNDS OF PLANT FOOD, DIVIDED BY THE PRECENTAGE CONCENTRATION OF THE RAW MATERIAL= PHYSICAL POUNDS
- 75 K ÷ .62 (0-0-62) = 121 Pound Pile

MULTIPLYING=WHAT IS IN THE PILE

- YOU CAN NOT SEE THE PLANT FOOD IN THE PILE
- A PRECENTAGE OF THE PHYSICAL PILE IS THE ACTUAL NUTRIENT CONTENT

SIMPLE FORMULA

CUT 32-0-0 TO 28-0-0

HOW MUCH WATER?

N-P-K (1 TON) 28% OF 2,000=560 Nitrogen

28-0-0

560-0-0 (560 ÷ .32 = 1,750 POUNDS)

WATER 250

32-0-0 1,750 *(2,000 MINUS 1,750= 250 POUNDS WATER)*

TOTAL 2,000

FORMULATE TO AN ANALYSIS

PREDETERMINED ANALYSIS

N	P	K
5	10	10

ANALYSYIS IS

5% NITROGEN

10% PHOSPHATE (P_2O_5)

10% K – POTASSIUM

FORMULATE TO A TON, 2,000 POUNDS

J. May *Equipment Group* **FORMULATION WORKSHEET** **Date: 12-8-2015**

Customer: JOHN SMITH **Field #/ Location Jones Place**

Number of Acres 40 X 500 Pounds Per Acre = 20,000 Total Pounds Required
Total Pounds Required 20,000 ÷ 2,000 = 10 Total Tons÷ Batch Size (10)= 1 Number Batches

1 to 3 Ammonia N to P_2O_5 Ratio		
Total P_2O_5 ÷ 3=		Total Ammonia N
Less MAP/DAP N		
Total		N from NH_3/Aqua

		GRADE						Total % Units 25%						
		N	P	K										
		% 5	% 10	% 10	%	%	%	* Credit Equiv.						
Material	Pounds	Lb. 100	Lb. 200	Lb. 200	Lb.	Lb.	Lb.	Lb. H_2O	Lb. Clay	Cost/ Ton	Cost / Lb.	Total Cost	Pounds/ Batch	Scale Stop
Water	960												9600	9600
0-0-62	323			200									3230	12830
10-34-0	588	58.8	200										5880	18710
32-0-0	129	41.2											1290	20000
TOTALS	2000	100	200	200									20000	

TEMPERATURE CALCULATION

HEATERS				VS	COOLERS			
Pounds	Product	BTU/ Lb.	Total BTU		Pounds	Product	BTU/ Lb.	Total BTU
	NH_3	1750				Urea	< 110	
	Aqua	1400 / Lb. NH_3				Ammonium Nitrate	< 145	
	Phos Acid	100				Ammonium Sulfate	< 110	
	Steam	1000				Potash	< 100	
	160° Water	120						
	Total Heaters					Total Coolers		

Total Heaters		
Less Total Coolers		
Net BTU		
Net BTU ÷ (Batch Weight X .8) = Degrees Temperature Change		° F

Example: +16,000 Net BTU ÷ (2000x.8) 1600 = +10° F *Starting Water/ Batch Temp + Change = Final Temp. (55°+10°= 65°F)*

*H2O CREDIT % EQUIVALENT

32-0-0	20%	28-0-0	25%	Aqua	70%	10-34-0	25%	12-0-0-26	25%
10-30-0	20%	Phos Acid	15%	High K-Base Grades	15%				

SUSPENSIONS

- SAME FORMULATION PROCEDURE
- THEY HAVE SOME SOLIDS THAT TEND TO SETTLE OUT
- REDUCE PARTICLE SIZE OR INCREASE VISCOSITY
- MOST DO BOTH
- SUSPENSION AGENT “ATTAPULGITE CLAY”
- SUSPEND THE SOLIDS WITH CLAY
- CLAY FORMS A MATRYX LIKE HAY STRAW
- PARTICLES SET ON THE “STRAWS”
- CLAY CONTENT DETERMINED BY PLANT FOOD CONCENTRATION AND EXPERIENCE

Clay Rule of Thumb

Liquid clay is only 25% clay but twice as effective as dry clay

PERCENT PLANT FOOD	% DRY CLAY	% LIQUID CLAY
35% TO 40%	1%	2%
30% TO 34%	1.5%	3%
24% TO 29%	2%	4%

COLD MIX SUSPENSION

- USE A 10-30-0 PHOSPHATE BASE GRADE
- A SUSPENSION AGENT IS REQUIRED, CLAY DRY OR LIQUID
- TAKE CREDIT FOR THE BASE GRADE CLAY CONTENT
- CLAY BEFORE NITROGEN SOLUTION

J. May *Equipment Group* **FORMULATION WORKSHEET** **Date:_____**

Customer: Charles Smith Field #/ Location Field #7,

Number of Acres 40	X 600	Pounds Per Acre = 24,000	Total Pounds Required
Total Pounds Required	24,000 ÷ 2,000 = 12	Total Tons÷ Batch Size=	1 Number Batches

1 to 3 Ammonia N to P_2O_5 Ratio		
Total P_2O_5 ÷ 3=		Total Ammonia N
Less MAP/DAP N		
Total		N from NH_3/Aqua

		GRADE						Total % Units 36%						
		N	P	K										
		% 10	% 8	% 18	%	%	%	* Credit Equiv.						
Material	**Pounds**	Lb. 200	Lb. 160	Lb. 360	Lb.	Lb.	Lb.	Lb. H_2O	Lb. Clay	Cost/ Ton	Cost / Lb.	Total Cost	Pounds/ Batch	Scale Stop
WATER	406							406					4872	4872
10-30-0	533	53.3	160					106	8				6396	11268
CLAY	22												264	11532
32-0-0	458	146.7						92					5496	17028
0-0-62	581			360									6972	24000
TOTALS	2000	200	160	360				604						24000

TEMPERATURE CALCULATION

HEATERS				VS	COOLERS			
Pounds	**Product**	**BTU/ Lb.**	**Total BTU**		**Pounds**	**Product**	**BTU/ Lb.**	**Total BTU**
	NH_3	1750				Urea	< 110	
	Aqua	1400 / Lb. NH_3				Ammonium Nitrate	< 145	
	Phos Acid	100				Ammonium Sulfate	< 110	
	Steam	1000				Potash	< 100	
	160° Water	120						
	Total Heaters					Total Coolers		

Total Heaters		
Less Total Coolers		
Net BTU		
Net BTU ÷ (Batch Weight X .8) = Degrees Temperature Change		° F

Example: +16,000 Net BTU ÷ (2000x.8) 1600 = +10° F *Starting Water/ Batch Temp + Change = Final Temp. (55°+10°= 65°F)*

***H2O CREDIT % EQUIVALENT**

32-0-0	20%	28-0-0	25%	Aqua	70%	10-34-0	25%	12-0-0-26	25%
10-30-0	20%	Phos Acid	15%	High K-Base Grades	15%				

HOT MIX SUSPENSION

- 10-30-0 PHOSPHATE BASE GRADE
- DRY CLAY, 1 ½%
- ***CAUTION,*** 1 TO 3 AMMONIA NITROGEN TO P_2O_5 RATIO APPLIES
- BEST SEQUENCE
- CALCULATE THE HEAT OF REACTION

J. May Equipment Group

FORMULATION WORKSHEET

Date: 12-8-2015

Customer: INVENTORY Field #/ Location

Number of Acres	X	Pounds Per Acre =	Total Pounds Required
Total Pounds Required		÷ 2,000 = Total Tons÷ Batch Size=	Number Batches

1 to 3 Ammonia N to P_2O_5 Ratio		
Total P_2O_5 ÷ 3=	200	Total Ammonia N
Less MAP/DAP N	126	
Total	74	N from NH_3/Aqua

		GRADE						Total % Units 40%						
		N	P	K										
		%	%	%	%	%	%	* Credit Equiv.						
Material	Pounds	Lb. 200	Lb. 600	Lb. 0	Lb.	Lb.	Lb.	Lb. H_2O	Lb. Clay	Cost/ Ton	Cost / Lb.	Total Cost	Pounds/ Batch	Scale Stop
WATER	726													
11-52-0	577	63	300											
NH3	45	37												
11-52-0	577	63	300											
NH3	45	37												
CLAY	30													
TOTALS	2000	200	600	0										

TEMPERATURE CALCULATION

HEATERS				VS	COOLERS			
Pounds	Product	BTU/ Lb.	Total BTU		Pounds	Product	BTU/ Lb.	Total BTU
90	NH_3	1750	157500			Urea	< 110	
	Aqua	1400 / Lb. NH_3				Ammonium Nitrate	< 145	
	Phos Acid	100				Ammonium Sulfate	< 110	
	Steam	1000				Potash	< 100	
	160° Water	120						
		Total Heaters	157500				Total Coolers	

Total Heaters	157500	
Less Total Coolers	-----	
Net BTU	157500	
Net BTU ÷ (Batch Weight X .8) = Degrees Temperature Change		+98 ° F

Example: +16,000 Net BTU ÷ (2000x.8) 1600 = +10° F *Starting Water/ Batch Temp + Change = Final Temp. (55°+10°= 65°F)*

*H2O CREDIT % EQUIVALENT

32-0-0	20%	28-0-0	25%	Aqua	70%	10-34-0	25%	12-0-0-26	25%
10-30-0	20%	Phos Acid	15%	High K-Base Grades	15%				

FORMULATE TO AN ACRE

- EVERYTHING IS STILL %
- SIMPLE STEPS
- #1 ADD UP THE PLANT FOOD (N+P+K)
- #2 PICK A CONCENTRATION
- #3 TOTAL PLANT FOOD ÷ CONCENTRATION = RATE PER ACRE
- #4 EACH NUTRIENT (N-P-K) ÷ RATE PER ACRE= ANALYSIS
- #5 FORMULATE TO THE ANALYSIS, 1 TON

QUICK WITH CUSTOMER, EASY FOR THE MIX PLANT

- SOIL TEST CALL FOR:
- 180 Pounds Of N
- 90 Pounds Of P
- 130 Pounds Of K
- 400 Nutrient Pounds Per Acre
- 40% Concentration
- 400 ÷ .40 = 1000P/A

- 180 ÷ 1000 P/A= .18N
- 90 ÷ 1000 P/A =.09P
- 130 ÷ 1000 P/A =.13K
- Analysis To Formulate
- 18-9-13
- Every pound of the product will contain
- 18%N-9%P-13%K

J. May *Equipment Group*

FORMULATION WORKSHEET

Date: 12-8-2015

Customer: Billy Williams Field #/ Location #10

Number of Acres 25 X 1000 Pounds Per Acre = Total Pounds Required													1 to 3 Ammonia N to P_2O_5 Ratio	
Total Pounds Required 25000 ÷ 2,000 = 12.5 Total Tons÷ Batch Size= 1 Number Batches													Total P_2O_5 ÷ 3=	Total Ammonia N
		GRADE						Total % Units 40%					Less MAP/DAP N	
		N	P	K									Total	N from NH_3/Aqua
		% 18	% 9	% 13	%	%	%	* Credit Equiv.						
Material	Pounds	Lb. 360	Lb. 180	Lb. 260	Lb.	Lb.	Lb.	Lb. H_2O	Lb. Clay	Cost/ Ton	Cost / Lb.	Total Cost	Pounds/ Batch	Scale Stop
WATER	92												1150	1150
32-0-0	960	307.1											12000	13150
0-0-62	419			260									5237	18387
10-34-0	529	52.9	180										6613	25000
TOTALS	2000	360	180	260										25000

TEMPERATURE CALCULATION

HEATERS				VS	COOLERS			
Pounds	Product	BTU/Lb.	Total BTU		Pounds	Product	BTU/Lb.	Total BTU
	NH_3	1750				Urea	< 110	
	Aqua	1400 / Lb. NH_3				Ammonium Nitrate	< 145	
	Phos Acid	100				Ammonium Sulfate	< 110	
	Steam	1000				Potash	< 100	
	160° Water	120						
	Total Heaters					Total Coolers		

Total Heaters		
Less Total Coolers		
Net BTU		
Net BTU ÷ (Batch Weight X .8) = Degrees Temperature Change		° F

Example: +16,000 Net BTU ÷ (2000x.8) 1600 = +10° F *Starting Water/Batch Temp + Change = Final Temp. (55°+10°= 65°F)*

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32-0-0	20%	28-0-0	25%	Aqua	70%	10-34-0	25%	12-0-0-26	25%
10-30-0	20%	Phos Acid	15%	High K-Base Grades	15%				

ONE MORE ACRE FORMULA

- SOYBEAN BLEND
- 15 Pounds Of N
- 45 Pounds Of P
- 110 Pounds Of K
- 170 Nutrient Pounds Per Acre
- 40% Concentration
- 170 ÷ .40 = 425P/A

- 15 ÷ 425 P/A= .035N
- 90 ÷ 425 P/A =.106P
- 110 ÷ 425 P/A =.259K
- Analysis To Formulate
- 3.5-10.6-25.9
- Every pound of the product will contain
- 3.5%N-10.6%P-25.9%K

EASY BLEND

- ROUND OFF THE 3.5-10.6-25.9
- FORMULATE TO 4-11-26
- REAL FORMULATORS GO FOR THE DECIMAL POINTS
- IT IS JUST AS EASY TO FORMULATE TO THE EXACT NEED
- PRECISION AGRICULTURE STARTS AT THE FORMULATION SHEET

J. May *Equipment Group*

FORMULATION WORKSHEET

Date: 11-8-2015

Customer: Ted Johnson Field #/ Location Soybeans

Number of Acres	X	Pounds Per Acre =	Total Pounds Required
Total Pounds Required		÷ 2,000 =	Total Tons÷ Batch Size= Number Batches

1 to 3 Ammonia N to P_2O_5 Ratio		
Total P_2O_5 ÷ 3=		Total Ammonia N
Less MAP/DAP N		
Total		N from NH_3/Aqua

		GRADE						Total % Units 40%						
		N	P	K										
		% 3.5	% 10.6	% 25.9	%	%	%	* Credit Equiv.						
Material	**Pounds**	Lb. 70	Lb. 212	Lb. 518	Lb.	Lb.	Lb.	Lb. H_2O	Lb. Clay	Cost/ Ton	Cost / Lb.	Total Cost	Pounds/ Batch	Scale Stop
WATER	438													
10-30-0	707	70.7	212						10					
CLAY	20								20					
0-0-62	835			518										
TOTALS	2000	70.7	212	518					30					

TEMPERATURE CALCULATION

HEATERS				VS	COOLERS			
Pounds	Product	BTU/ Lb.	Total BTU		Pounds	Product	BTU/ Lb.	Total BTU
	NH_3	1750				Urea	< 110	
	Aqua	1400 / Lb. NH_3				Ammonium Nitrate	< 145	
	Phos Acid	100				Ammonium Sulfate	< 110	
	Steam	1000				Potash	< 100	
	160° Water	120						
	Total Heaters					Total Coolers		

Total Heaters		
Less Total Coolers		
Net BTU		
Net BTU ÷ (Batch Weight X .8) = Degrees Temperature Change		° F

Example: +16,000 Net BTU ÷ (2000x.8) 1600 = +10° F *Starting Water/ Batch Temp + Change = Final Temp. (55°+10°= 65°F)*

***H2O CREDIT % EQUIVALENT**

32-0-0 20%	28-0-0 25%	Aqua 70%	10-34-0 25%	12-0-0-26 25%
10-30-0 20%	Phos Acid 15%	High K-Base Grades 15%		

REVIEW FOR PER ACRE

- EVERYTHING IS STILL %
- SIMPLE STEPS
- #1 ADD UP THE PLANT FOOD (N+P+K)
- #2 PICK A CONCENTRATION
- #3 TOTAL PLANT FOOD ÷ CONCENTRATION = RATE PER ACRE
- #4 EACH NUTRIENT (N-P-K) ÷ RATE PER ACRE= ANALYSIS
- #5 FORMULATE TO THE ANALYSIS, 1 TON

FORMULATION FOR SUCCESSFUL CROPS

FORMULA FOR SUCCESS

- CAN YOU GIVE 100%
- HOW ABOUT THOSE THAT SAY ”110%”
- HERE IS SOMETHING TO THINK ABOUT!!
- The Formula: If each letter of the alphabet is represented by a number
- ABCDEFGHIJKLMNOPQRSTUVWXYZ
- 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

BY THE NUMBERS

- HARD WORK 8 1 18 4 23 15 18 11 = 98%
- KNOWLEDGE 11 14 15 23 12 5 4 7 5 = 96%
- BUT,
- ATTITUDE 1 20 20 9 20 21 4 5 = 100%
- AND,
- BULLS_ _ _ 2 21 12 12 19 8 9 20 = 103%
- So, it stands to reason that Hard Work and Knowledge will only get you close. Attitude will get you there, but Bulls_ _ _ will get you over the top !!!!

KEY FORMULA TO SUCCESS

LOOK HOW FAR...

A_ _ KISSING

1 19 19 11 9 19 19 9 14 7 = **118%**

WILL TAKE YOU !!!!!

Just when you think you will never get it,

It just comes to you!!!!

Fluid Fertilizer Foundation

Louisville, KY Dec 8-9, 2015

Thank You!!

Back to Main Menu

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