BASIC FORMULATION OF FLUIDS

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J. May Equipment/ ATA, Inc.
Arlington, TX
**Fluid Fertilizer Foundation**
Council Bluffs, IA

PRECISION STARTS HERE !!

PRESCRIPTION FORMULATION AND PRODUCTION
The First Step In Precision, Site Specific Application Is To Produce a High Quality Prescription Blend.
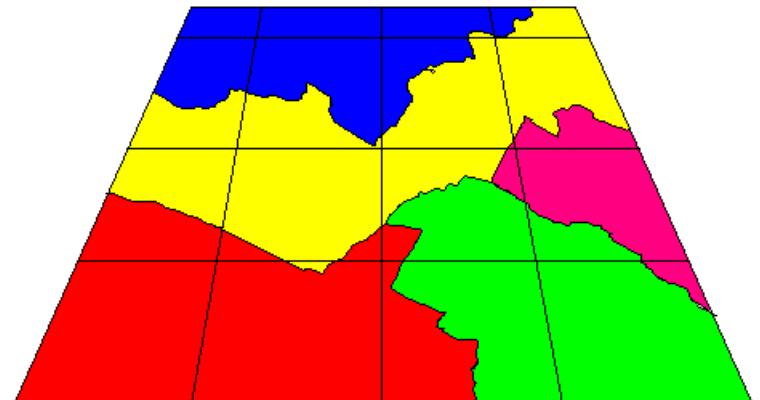
The Correct Analysis and Quality Product

Repeated Stopping To Cleaning Nozzles or Strainers Defeats Precision Application

POOR FORMULATION PRODUCES POOR PRODUCT

ADD, SUBTRACT, MULTIPLY & DIVIDE

GET THINGS IN ORDER
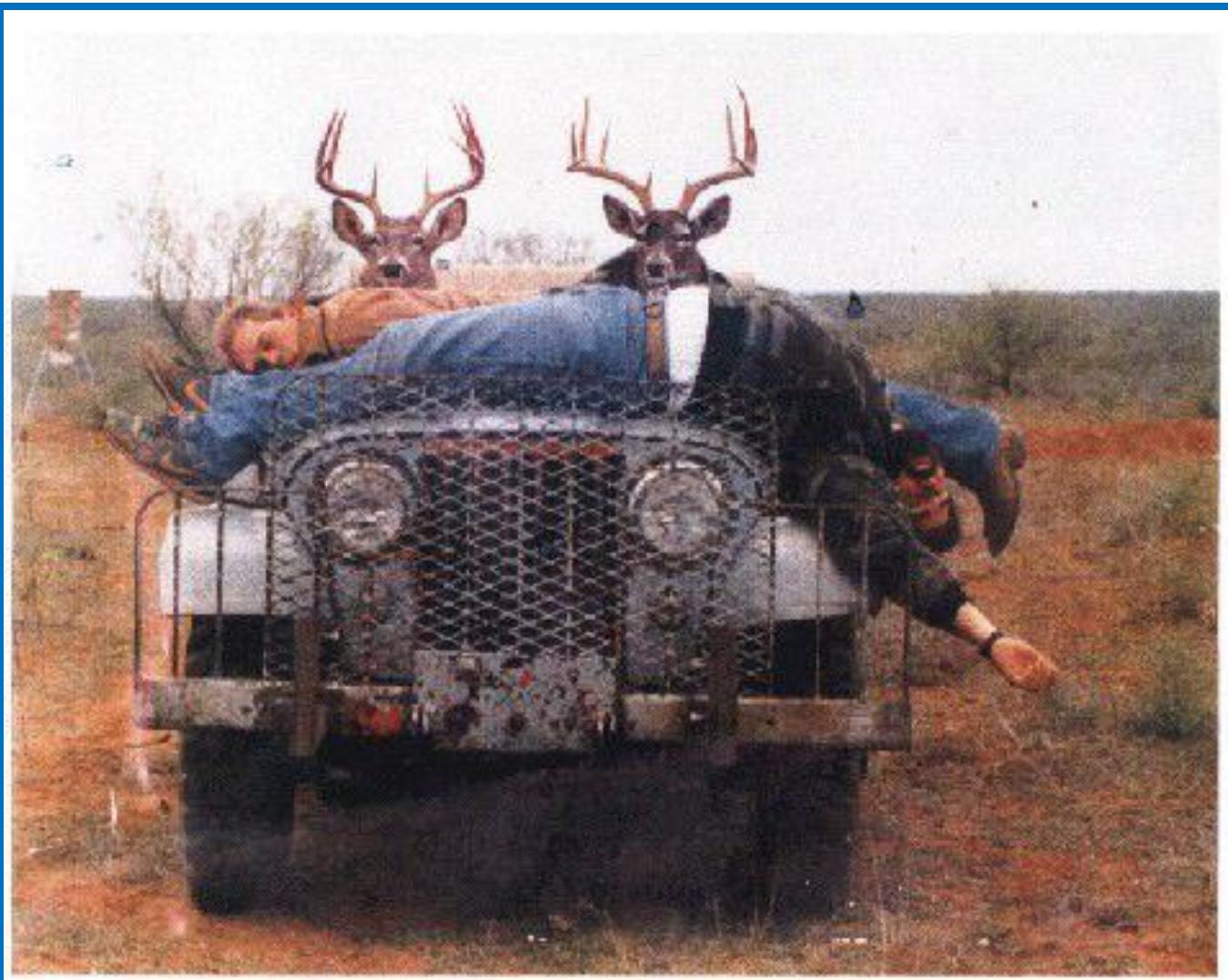
Now That All That Is Out Of the Way,

GET STARTED !

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 !!!

FORMULATION WORKSHEET

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 P2O5 Ratio		
Total Pounds Required		÷ 2,000 = Total Tons÷ Batch Size=	Number Batches	Total P2O5 ÷ 3=		Total Ammonia N

		GRADE						Total % Units	Less MAP/DAP N		

		N	P	K					Total		N from NH3/Aqua
		%	%	%	%	%	%	* Credit Equiv.			

Material	Pounds	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb. H2O	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
	NH3	1750				Urea	< 110	
	Aqua	1400 / Lb. NH3				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!!!
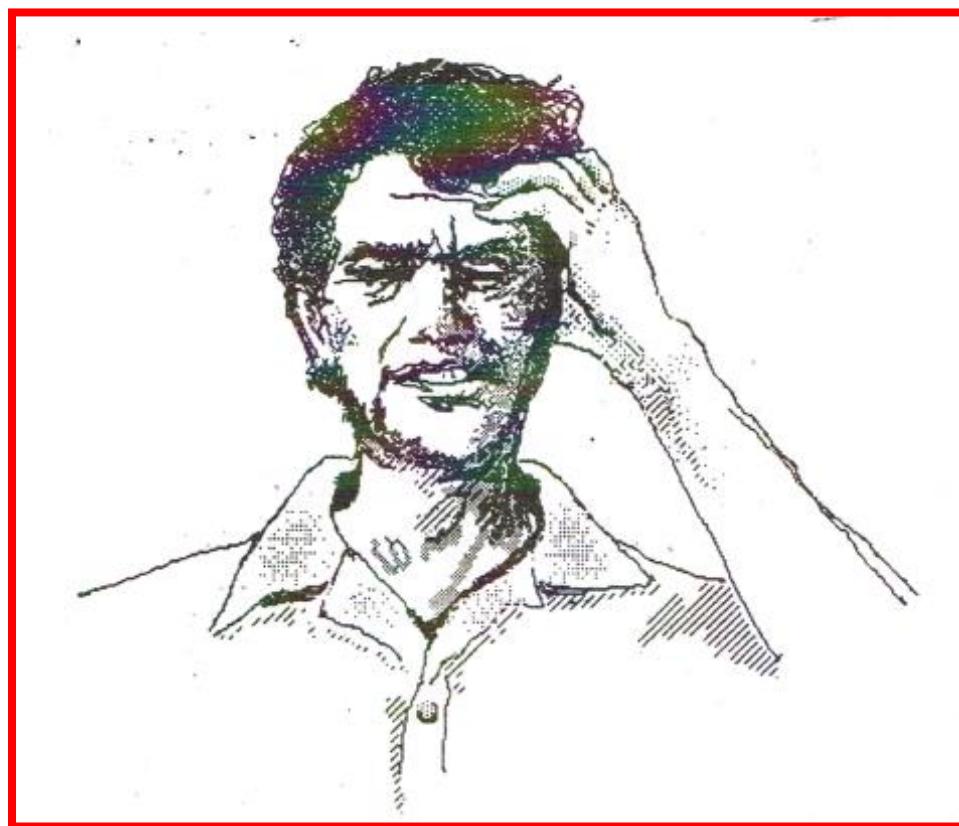
FIGURIN' IT OUT !!

- *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**

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: 7-11-2006

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 P2O5 Ratio

Total P2O5 ÷ 3=		Total Ammonia N
Less MAP/DAP N		
Total		N from NH3/Aqua

		GRADE						Total % Units 25%							
		N	**P**	**K**				* Credit Equiv.							
		% 5	% 10	% 10	%	%	%								
Material	**Pounds**	Lb. 100	Lb. 200	Lb. 200	Lb.	Lb.	Lb.	Lb. H2O	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**	
	NH3	1750				Urea	< 110		
	Aqua	1400 / Lb. NH3				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	1 to 3 Ammonia N to P2O5 Ratio		
Total Pounds Required 24,000 ÷ 2,000 = 12 Total Tons÷ Batch Size= 1 Number Batches		Total P2O5 ÷ 3=		Total Ammonia N

Material	Pounds	N % 10 Lb. 200	P % 8 Lb. 160	K % 18 Lb. 360	% Lb.	% Lb.	% Lb.	Lb. H2O	Lb. Clay	Cost/ Ton	Cost / Lb.	Total Cost	Pounds/ Batch	Scale Stop
								Total % Units 36% Less MAP/DAP N					Total	N from NH3/Aqua
								* Credit Equiv.						
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
	NH3	1750				Urea	< 110	
	Aqua	1400 / Lb. NH3				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: 7-15-06

Customer: INVENTORY　Field #/ Location

Number of Acres	X	Pounds Per Acre =		Total Pounds Required		1 to 3 Ammonia N to P2O5 Ratio		
Total Pounds Required		÷ 2,000 = Total Tons÷ Batch Size=		Number Batches		Total P2O5 ÷ 3=	200	Total Ammonia N

		GRADE						Total % Units	Less MAP/DAP N	126	

		N	P	K				40%	Total	74	N from NH3/Aqua

		% 10	% 30	% 0	%	%	%	* Credit Equiv.			

Material	Pounds	Lb. 200	Lb. 600	Lb. 0	Lb.	Lb.	Lb.	Lb. H2O	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	NH3	1750	157500			Urea	< 110	
	Aqua	1400 / Lb. NH3				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: 4-21-06

Customer: Billy Williams   Field #/ Location #10

Number of Acres	25 X 1000	Pounds Per Acre =		Total Pounds Required	1 to 3 Ammonia N to P2O5 Ratio	
Total Pounds Required	25000 ÷ 2,000 = 12.5	Total Tons÷ Batch Size=	1 Number Batches		Total P2O5 ÷ 3=	Total Ammonia N

Material	Pounds	GRADE						Total % Units 40%		Less MAP/DAP N					
		N	P	K						Total			N from NH3/Aqua		
		% 18	% 9	% 13	%	%	%	* Credit Equiv.							
		Lb. 360	Lb. 180	Lb. 260	Lb.	Lb.	Lb.	Lb. H2O	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
	NH3	1750				Urea	< 110	
	Aqua	1400 / Lb. NH3				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%				

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

Customer: Ted Johnson   Field #/ Location Soybeans

Number of Acres	X	Pounds Per Acre =	Total Pounds Required	1 to 3 Ammonia N to P$_2$O$_5$ Ratio		
Total Pounds Required		÷ 2,000 = Total Tons÷ Batch Size=	Number Batches	Total P$_2$O$_5$ ÷ 3=		Total Ammonia N

		GRADE						Total % Units 40%	Less MAP/DAP N		
		N	**P**	**K**					Total		N from NH$_3$/Aqua
		% 3.5	% 10.6	% 25.9	%	%	%	* Credit Equiv.			
Material	**Pounds**	Lb. 70	Lb. 212	Lb. 518	Lb.	Lb.	Lb.	Lb. H$_2$O	Lb. Clay	Cost/ Ton	Cost / Lb.	Total Cost	Pounds/ Batch	Scale Stop
WATER	438													
10-30-0	707	70.7	212											
CLAY	20							10						
0-0-62	835			518										
TOTALS	2000	70.7	212	518										

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

TEXAS COTTON

Just when you think you will never get it,

It just comes to you!!!!
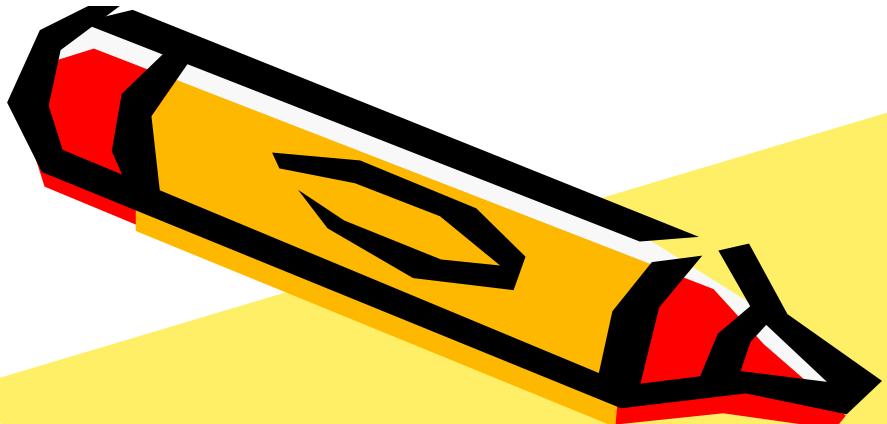
Thanks For Attending !!!

Jim May

J. May Equipment / ATA, Inc.

Arlington, Texas

Fluid Fertilizer Foundation

Council Bluffs, IA

Dec. 11 & 12, 2019