CHARACTERISTICS of UAN SOURCES

Michael Orr

Specialty Process Consulting

Kansas


VINCITA
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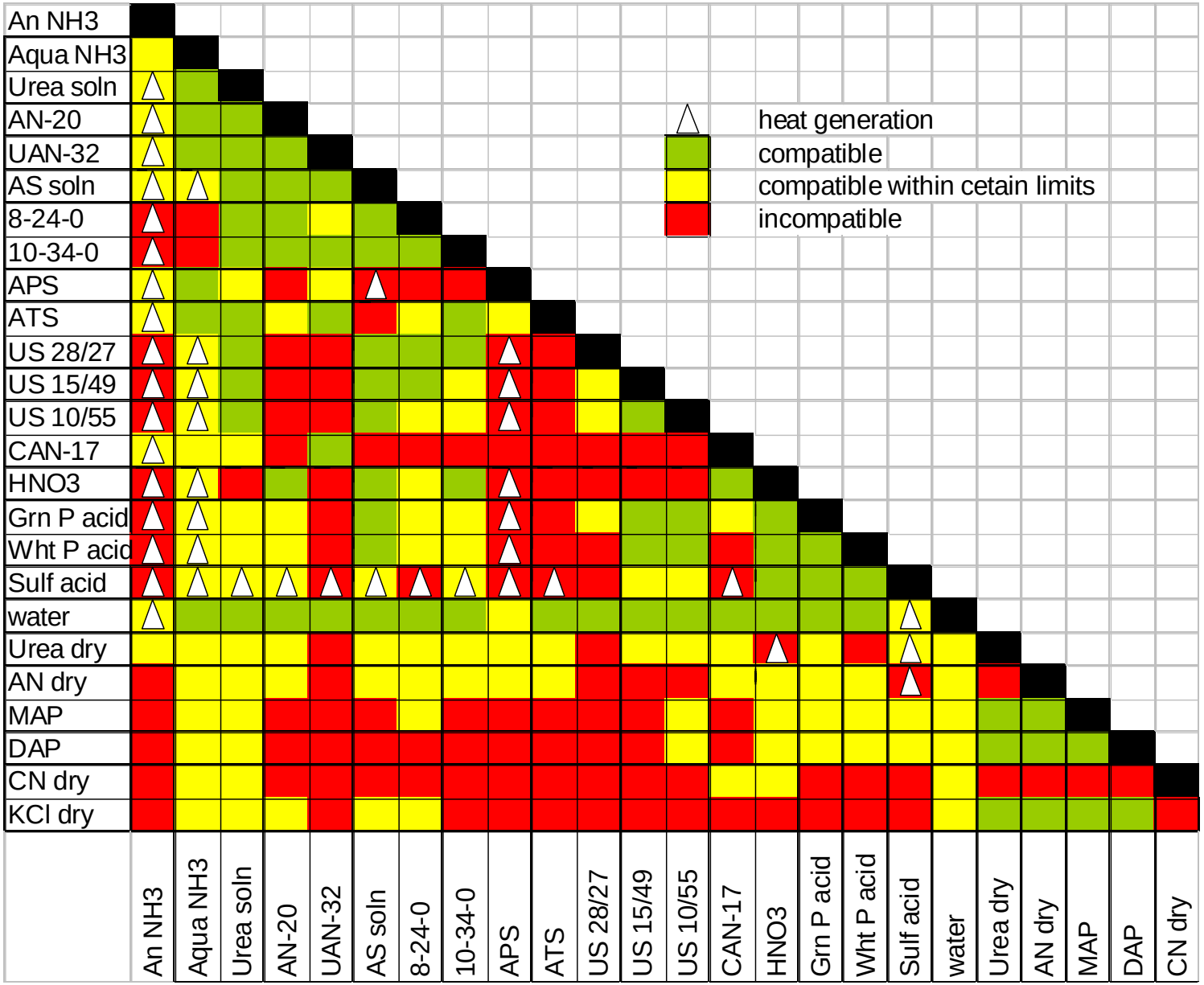
Unocal Compatibility Chart



UAN PRODUCTION

- AN Liquor + Urea Liquor
- Nitric acid + Ammonia + Urea Liquor
- Melt
- Adjust concentration

% N salts at Temps

Temp	urea	NH_4NO_3	UAN	NH_4SO_4		NH_4Cl	
32	18.7	19.0	32.6	8.8	10	5.9	15
35	19.2	19.4	33.6				
40	19.9	20.2	34.8				
45	20.6	20.8	35.7				
50	21.3	21.4	36.3	8.8	10.2	6.5	16.6
55	22.1	22.0	36.8				
60	22.8	22.4	37.2				
65	23.5	22.9	37.6				
70	24.2	23.4	37.9	9.1	10.4	7.2	18.2
75	25.0	23.8	38.1				
80	25.8	24.3	38.3				
85	26.5	24.7	38.5	9.3	10.6	7.6	19.3

CHANGING NITROGEN SUPPLY

- Ammonium nitrate
- Increased importation of UAN
- pH variation in UAN
- AN/Urea ratio
- Supply
- Discoloration

UAN 28-32%

- RATIOS VARY-INFLUENCE BLENDS
- pH CHANGES DUE TO UREA/NH_3/NO_3
- ADDITION OF OILS/INHIBITORS
- CROSS CONTAMINATION
- WINTER STORAGE INFLUENCE
- BLENDING

ADJUST UAN

- Addition of Urea-summer, winter blend
- Addition of Ammonia to adjust pH
- Addition of one or the other also impacts saltout temperature
- Addition of water to cut concentration impacts saltout
- Inhibitor addition impacts saltout temperatue

NITRATE/ NO_X

NO WITH ACIDS
SIGNS REDDISH/BROWN GAS
NERVE GAS/DEADLY
NITRATE NOT HIGHLY SOLUBLE WITH POTASSIUM
WILL COMPETE WITH OTHER ANIONS IN SOLUTIONS
KEEP IN MIND WITH UAN SOLUTION MIXING

pH	Free NH_3
0 - 6.30	0.00
6.31 - 6.85	0.01
6.86 - 7.10	0.02
7.11 - 7.25	0.03
7.26 - 7.35	0.04
7.36 - 7.45	0.05
7.46 - 7.52	0.06
7.53 - 7.57	0.07
7.58 - 7.61	0.08
7.62 - 7.67	0.09
7.68 - 7.72	0.10
7.73 - 7.75	0.11
7.76 - 7.80	0.12
7.81 - 7.83	0.13
7.84 - 7.86	0.14
7.87 - 7.88	0.15
OVER 7.88	TITRATE

Sample Name: UAN 32

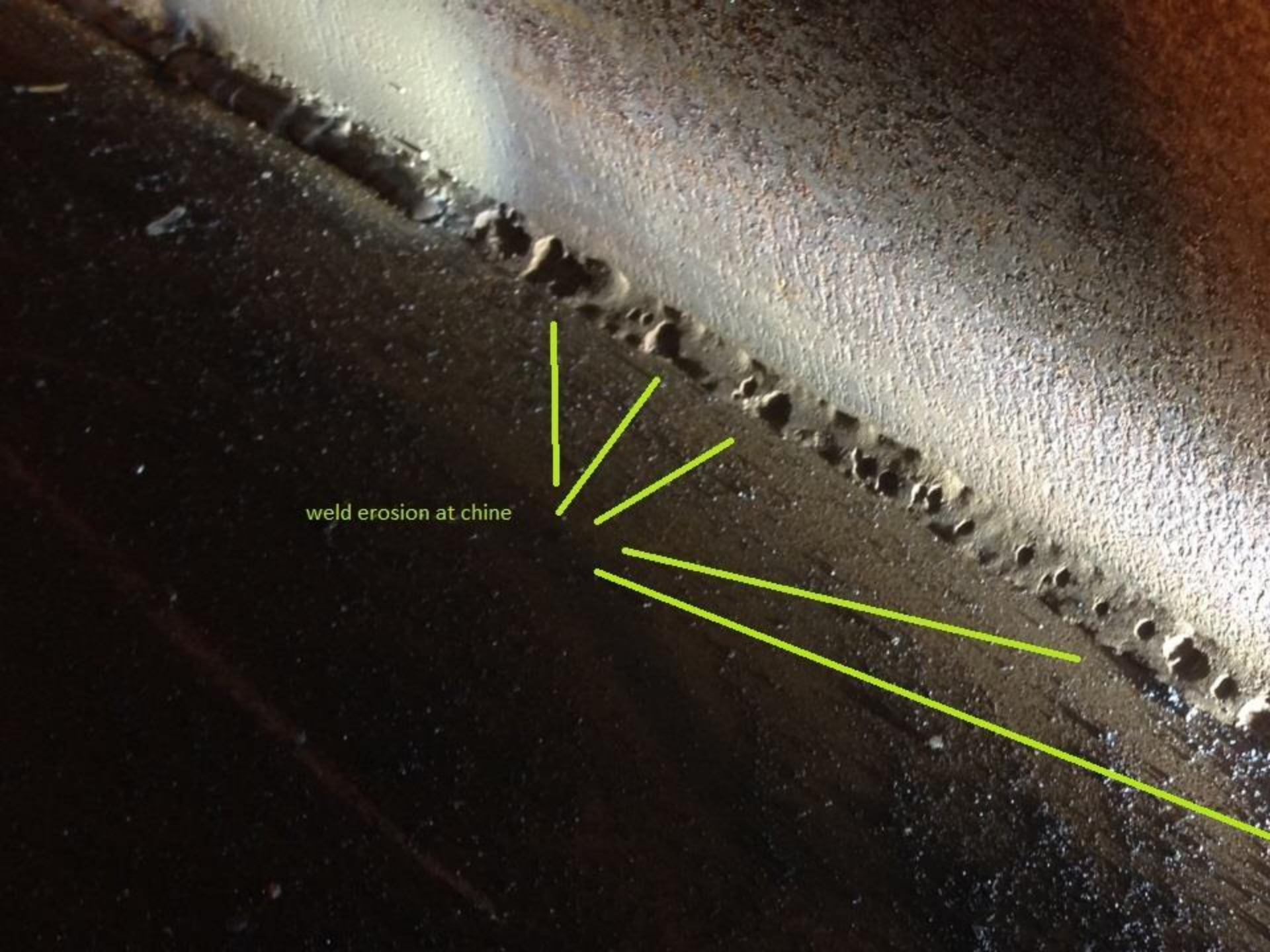
Analysis Name	Analysis	Units
Free Ammonia	0.03	%
Ammonium Nitrate	46.52	%
Ammonium Nitrate (N)	16.28	%
Urea	34.32	%
Urea Nitrogen (N)	15.99	%
Total Nitrogen (N)	32.29	%
Biuret	1.0	%
pH	7.53	
Specific Gravity @ Ambient/ 60 deg F	1.3319	

Sample Name: UAN 32

Analysis Name	Analysis	Units
Free Ammonia	0.03	%
Ammonium Nitrate	45.79	%
Ammonium Nitrate (N)	16.03	%
Urea	35.19	%
Urea Nitrogen (N)	16.40	%
Total Nitrogen (N)	32.44	%
pH	7.57	
Specific Gravity @ Ambient/ 60 deg F	1.3308	

NITROGEN,% COMPREHENSIVE		NITROGEN,% R.I. / S.G.		REF. INDEX 86 DEGREES F		SP. GR. 60 DEGREES F		AN / UREA RATIO		NITROGEN,% COMBUSTION	
		32.20	32.23	1.4581	1.4582	1.3385	1.3385	1.51	1.51		
32.21								1.47			
		32.10		1.4582		1.3394		1.54			
										32.08	32.03
										32.43	32.15
		32.29		1.4584		1.3355		1.45			
										32.00	31.94
		32.27		1.4621		1.3384		1.49			
		32.24	32.24			1.3382	1.3380	1.52	1.51		
										32.57	32.54
										32.60	31.90
		32.37		1.4592		1.3385		1.45			
		31.89	31.91	1.4568	1.4569	1.3380	1.3383	1.60	1.60		
										32.36	32.48
		32.62		1.3380				1.39			
31.37	31.95									32.57	32.51
										32.48	32.72
	31.84		32.21		1.4451		1.3381		1.50		32.34

UAN/10-34-0 blend


weld erosion at chine

Clear Liquid Formulations

Some Keys to Avoiding Salt-out Problems

Salt-out information

- Salt-out results from the formation of insoluble material in a mixed, liquid fertilizer
- It usually occurs between the time the mixture was produced and the time it is actually applied to the field
- In most cased, this decrease in solubility is due to a drop in temperature
- The material which “salts out” may or may not be one of the original ingredients

Key Factors That Influence Salt-out Temperatures

- Raw Material selection

  (e.g. UAN vs. Urea)

- Polyphosphate content

  0% (Ortho) – 45% - 70%

- Grade targeted

  for a given grade radio, generally, the higher the concentration the higher the salt-out temperature we be

SOLUBILITIES OF SALTS IN POUNDS PER 1000 POUNDS OF WATER AT DIFFERENT TEMPERATURES

TEMPERATURE	AMMONIUM	UREA	NITROGEN	POTASSIUM
FO	NITRATE		SOLUTION 32-0-0	CHLORIDE
32	1180	670	3900	280
35	1246	698	4552	285
40	1357	745	5639	293
45	1479	793	6725	302
50	1580	840	7812	310
55	1683	898	8900	318
60	1786	956	9987	327

Where to start?

- Salt-out tables (the no brainer approach)
  - Exist for both 32°F and 50°F Salt-out T's
  - Choose UAN or Urea
  - Choose 0%, 45% or 70% Poly

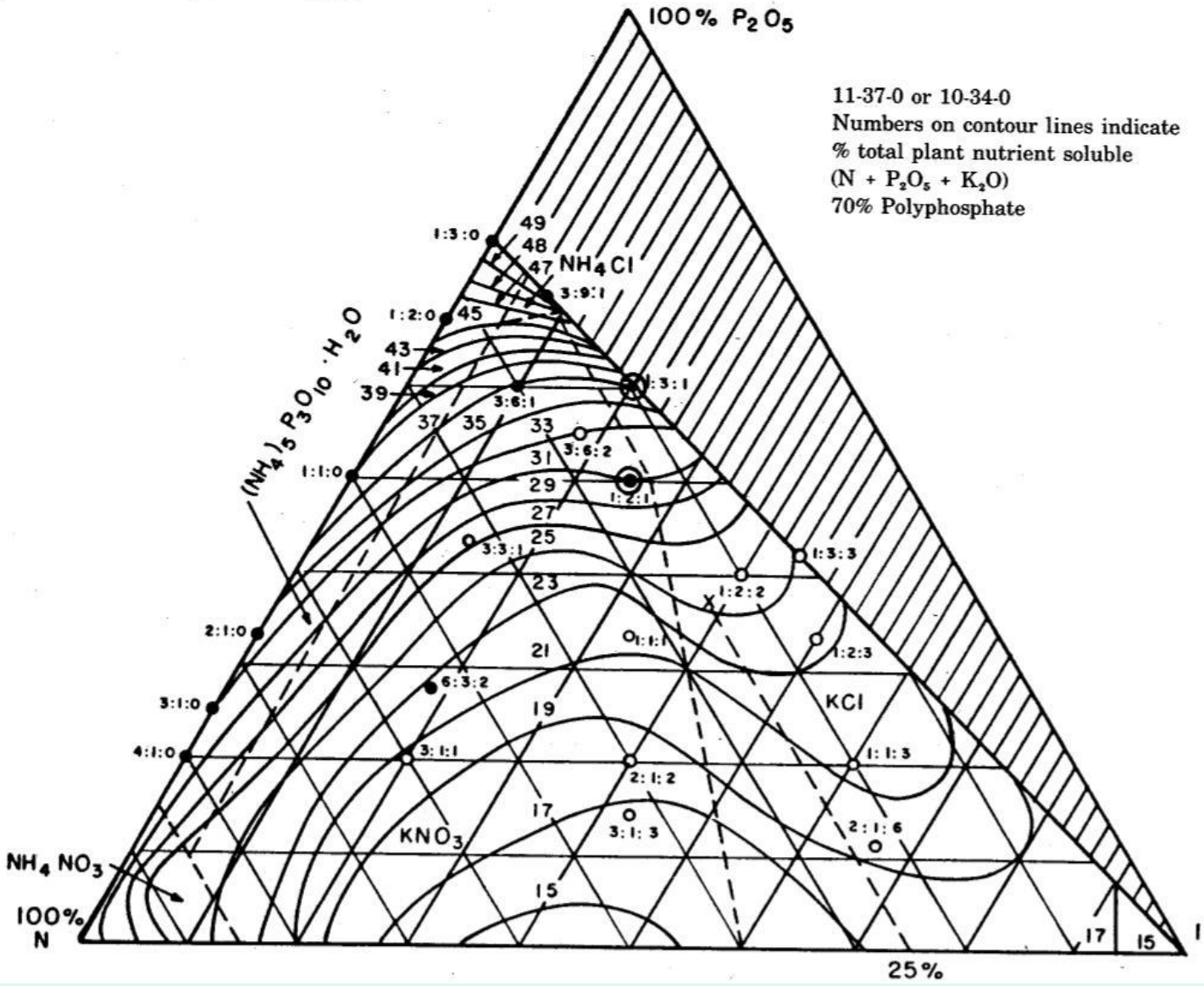
- Triangular diagrams
  - Each set of raw materials has its own chart
  - Most charts are for 32°F salt-out
  - Most are for either 0% or 70% Poly

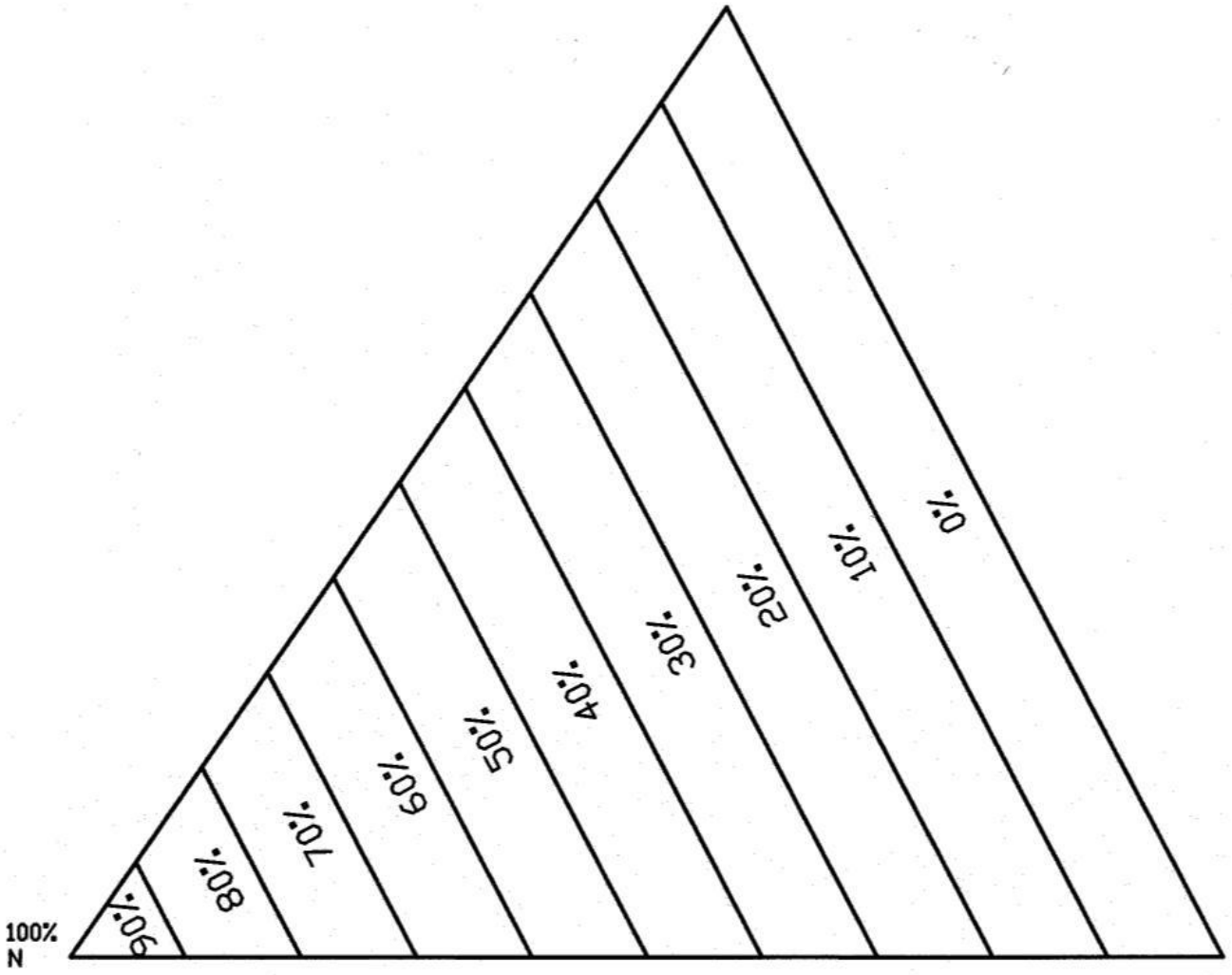
Triangular Charts (Cont'd)

- Advantages over tables
  - Show total plant food units possible for a given grade ratio
  - Indicate what material will salt-out first (KCl, NH_4, NO_3, etc.)
- Drawbacks
  - Most are for 32°F only
  - A little harder to read (but not much)

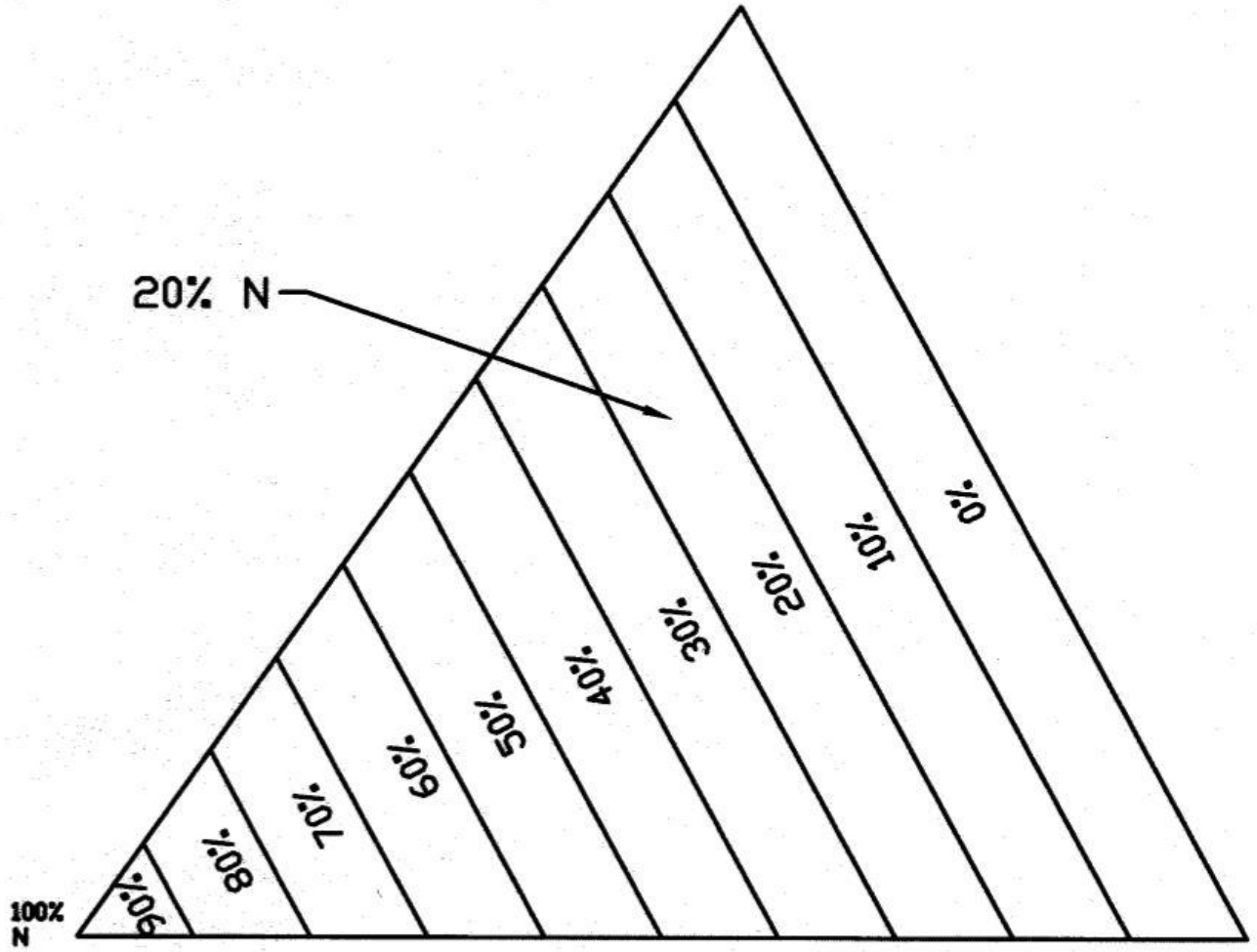
Reading Salt-Out Diagrams

Figure 3.7: System 11-37-0, UAN solution, potassium chloride, water at 32°F.





Triangle 1 - percent N



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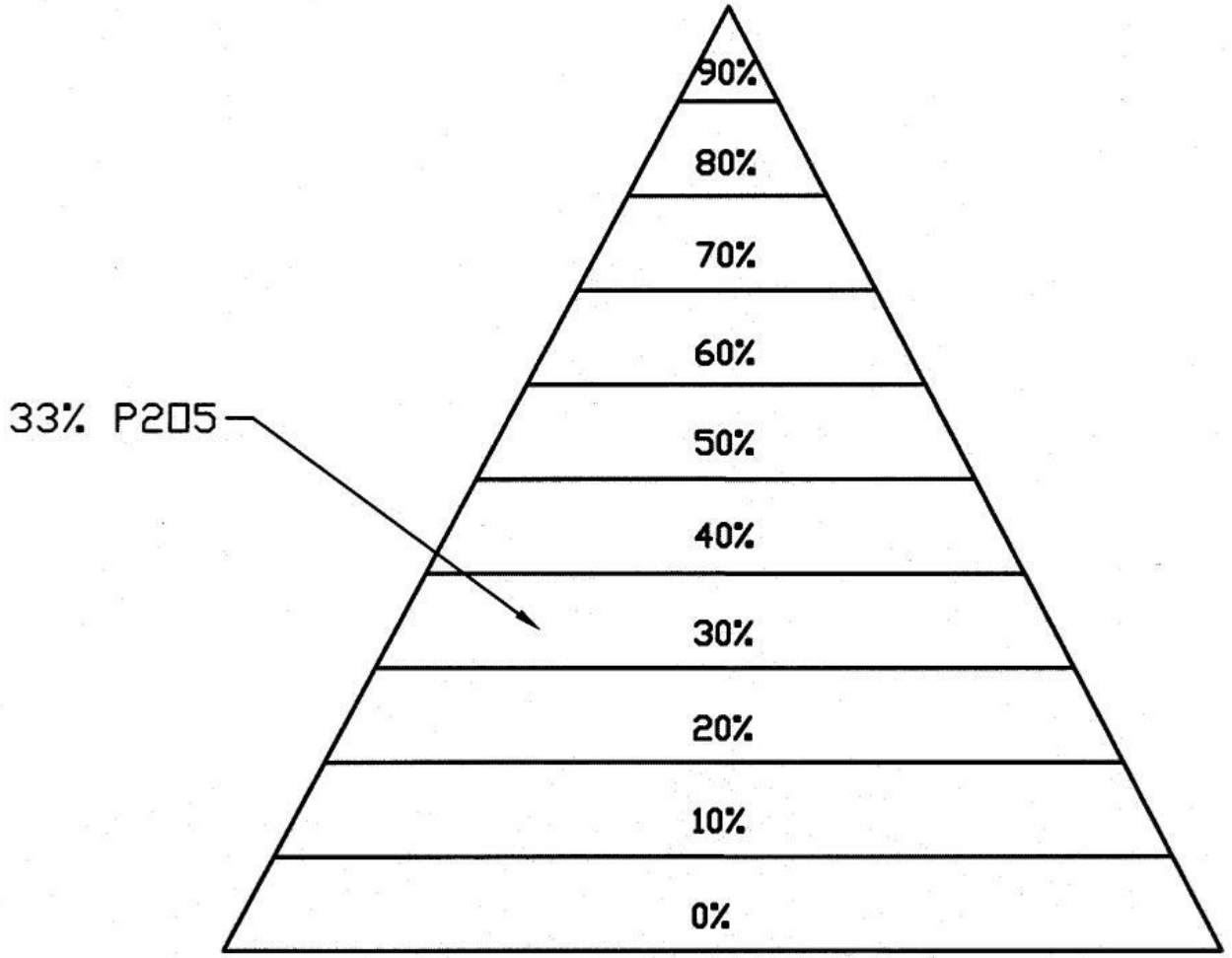
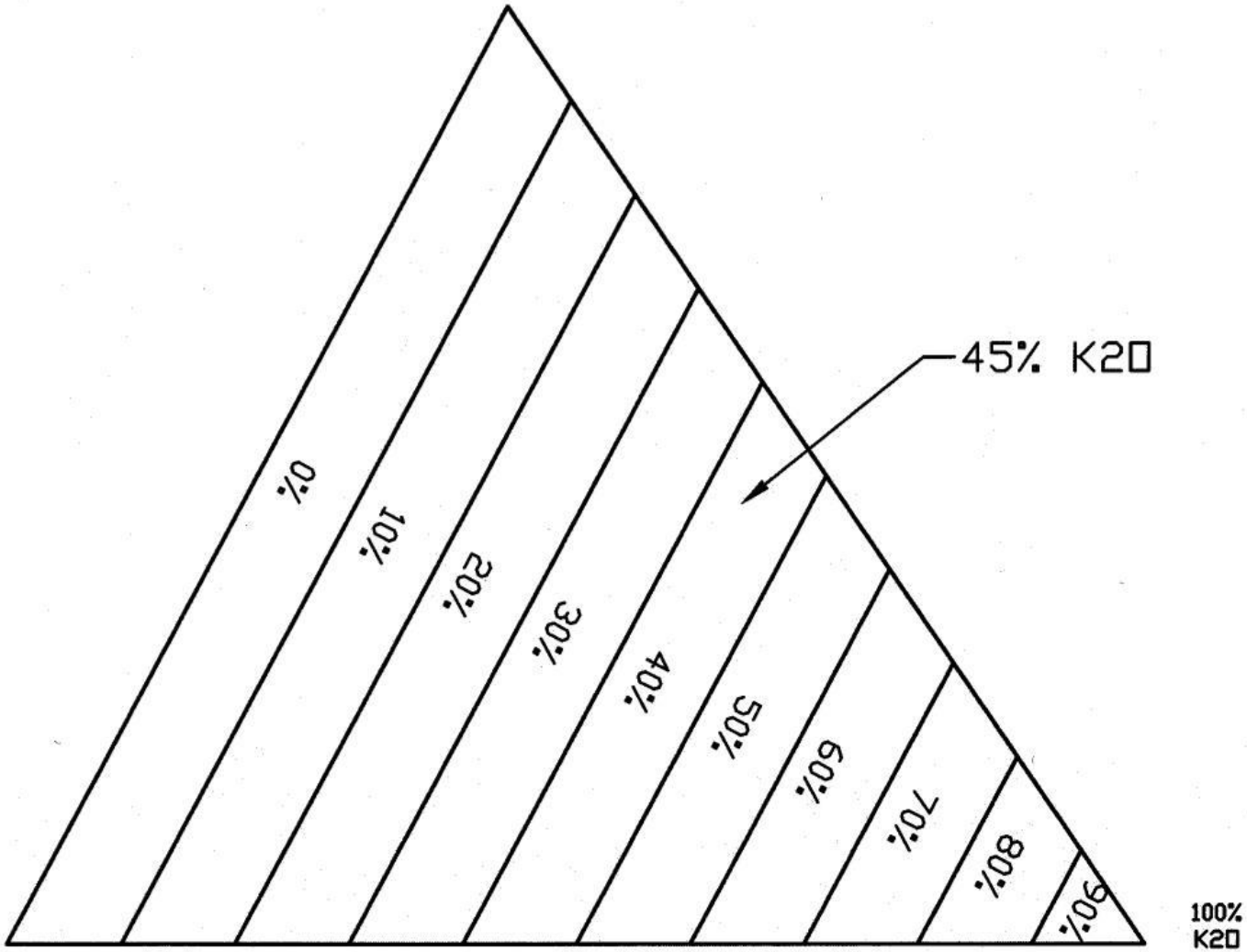
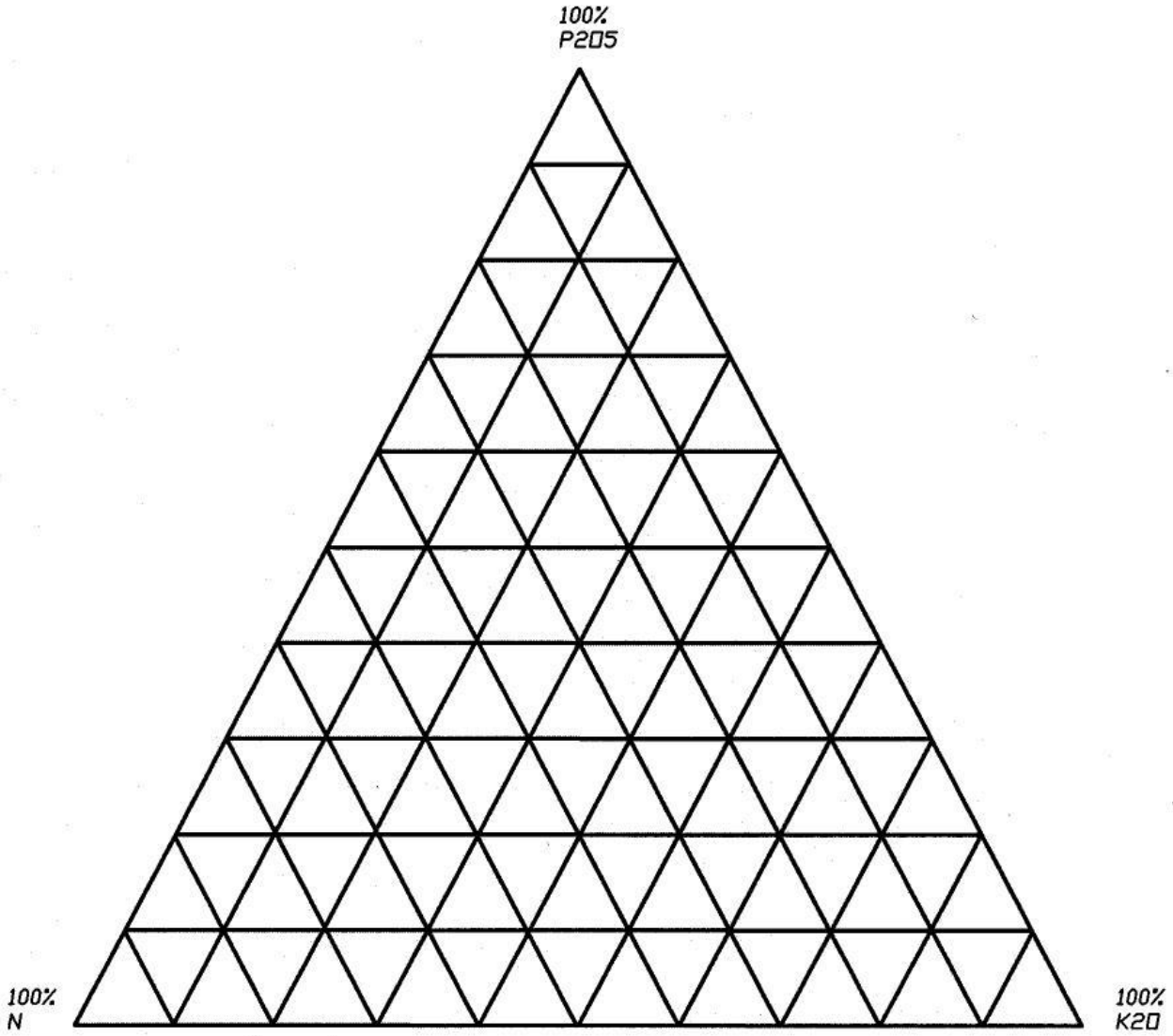


Triangle No.2-Percent P205



Triangle No.3-Percent K2O


100%
P205
100%
N
100%
K20

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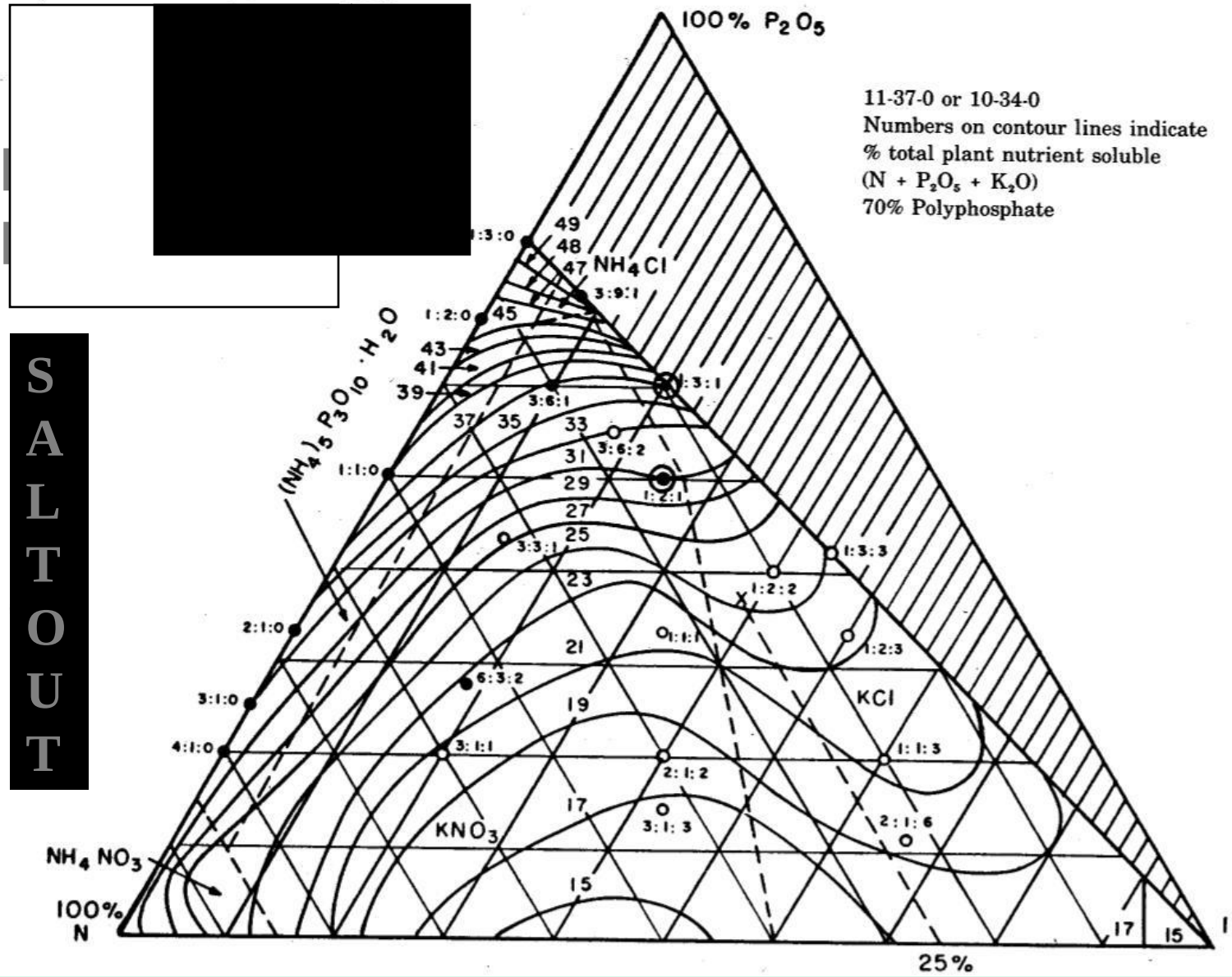


SALTOUT

Mathematics

- Percent N is the Percent of Total $N+P_2O_5+K_2O$
- 18-18-0 is 50% N and 50% P_2O_5
- 8-8-8 is 33% N, 33% P_2O_5, and 33% K_2O
- What are the Percentages for 6-18-12?

Mathematics Cont'd

- Total Nutrients

  $N + P_2O_5 + K_2O = 6 + 18 + 12 = 36$

- Percents

  $N = 6/36 = 16.6\%$

  $P_2O_5 = 18/36 = 50\%$

  $K_2O = 12/36 = 33.3\%$

As a check – percentages should total to 100%

Mathematics Cont'd

- Method B (Uses Grade Ratios)

- Example 1:3:1

  - Total units = 5

    %N = 1/5 = 20%

    $\%P_2O_5$ = 3/5 = 60%

    $\%K_2O$ = 1/5 = 20%

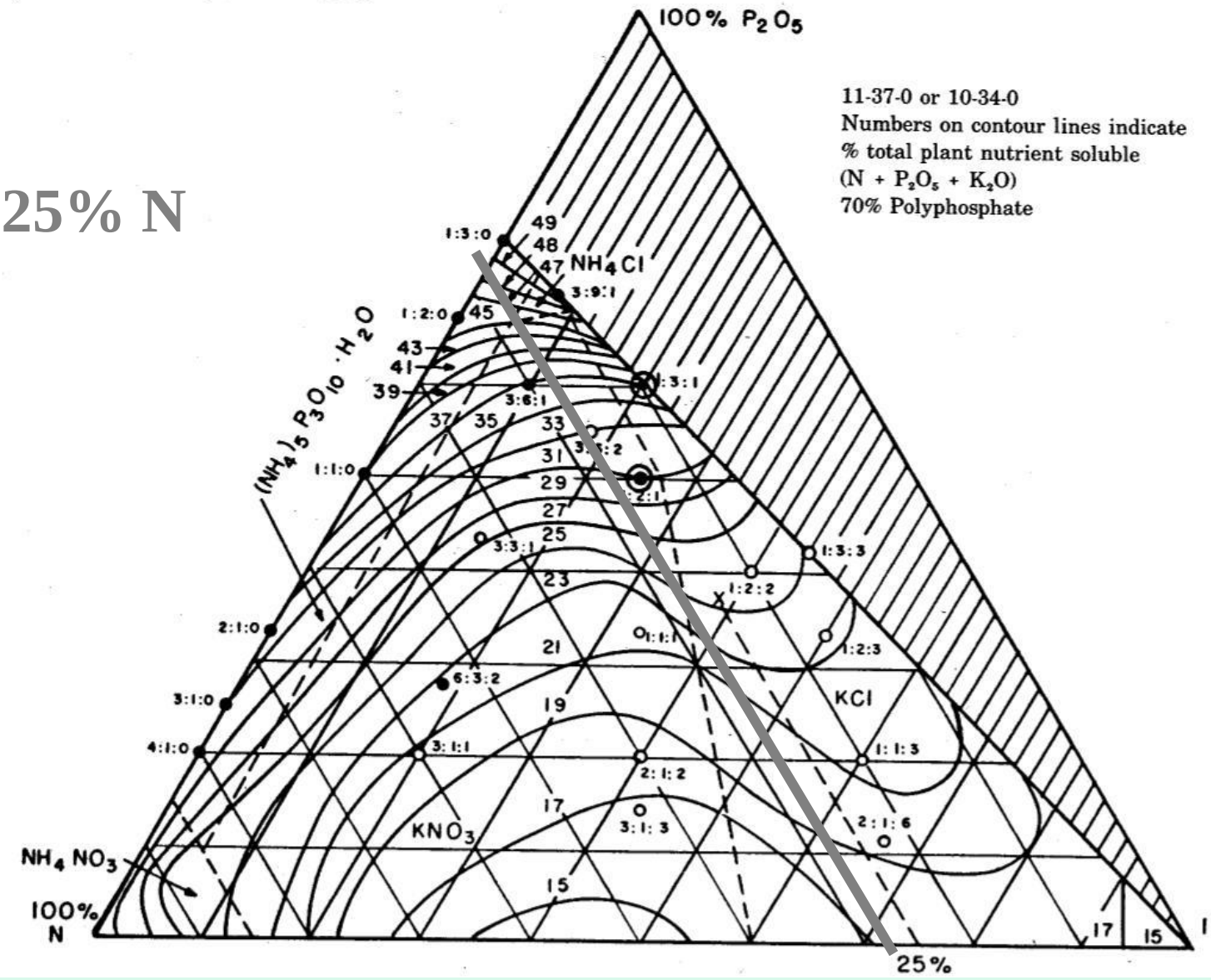
Lets work through an example

- What is the highest concentration possible for a 1:2:1 grade?

  - Total grade = 1+2+1 = 4
  - % N = ¼ = 25%
  - % P_2O_5 = $^2/_4$ = 50%
  - % K_2O = ¼ = 25%

- Now find where these lines intersect in the diagram

Figure 3.7: System 11-37-0, UAN solution, potassium chloride, water at 32°F.



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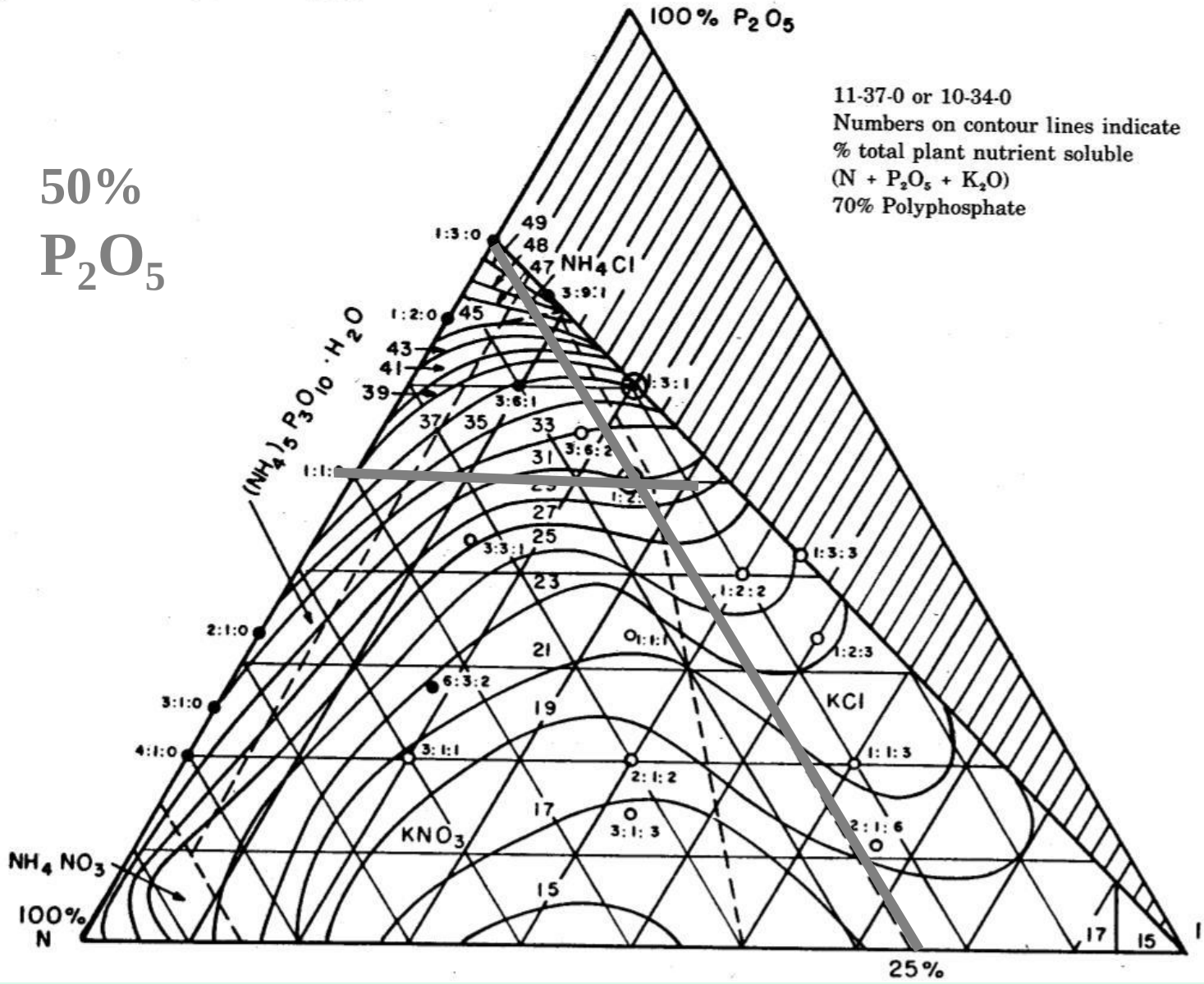

Notes:

- The intersection of any two lines will define the point on the chart for the user to read

- Drawing the line for the percent of the third component will also intersect at this same point –a good way to check yourself!!

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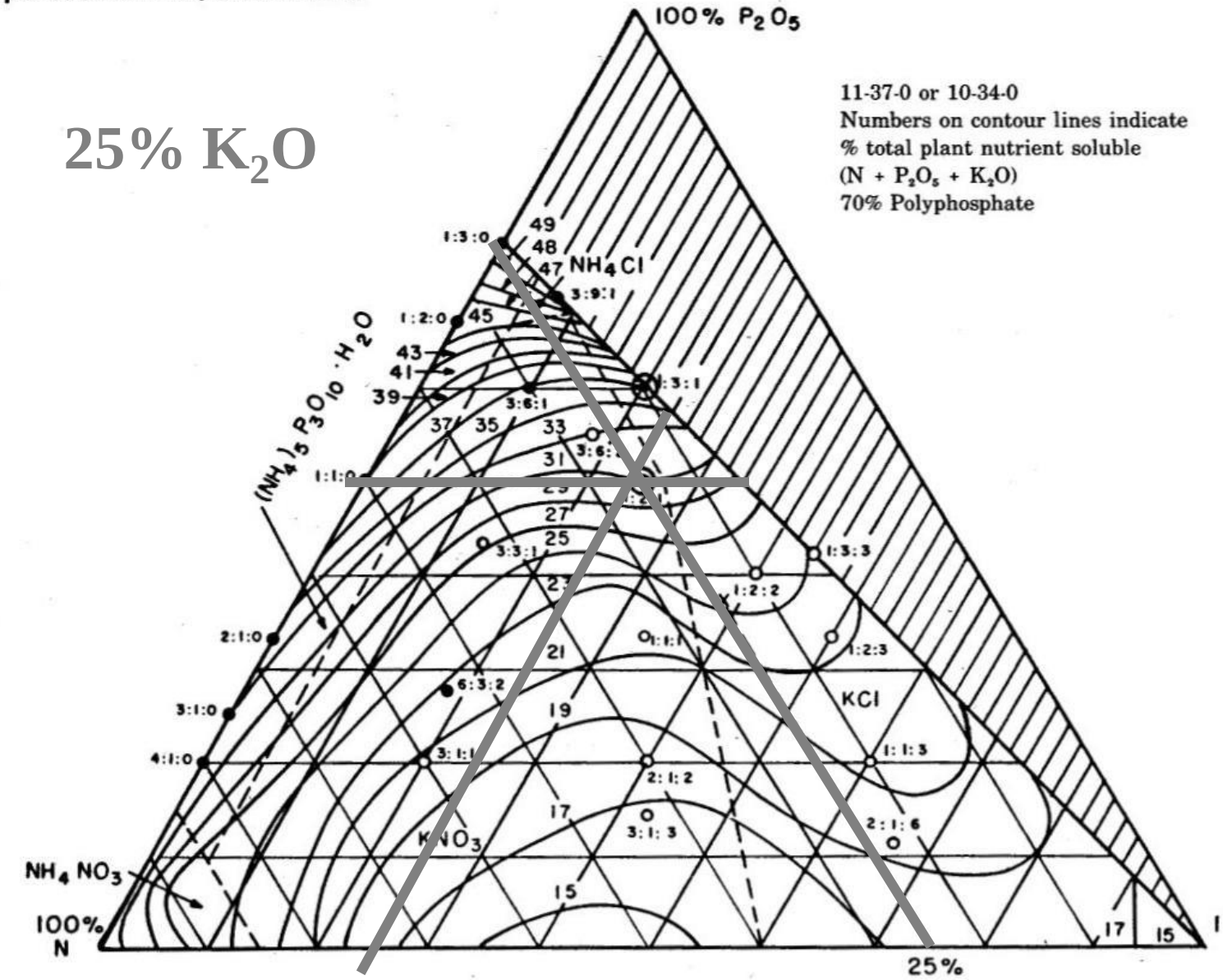

- **The contour (wavy) lines on the chart indicate the maximum number of total plant food units the grade may contain without salting out above 32°F.**
- **Four our example the point of intersection is on the contour line of 30 – this says the 1:2:1 grade cannot hold more than 30 units.**
- **%N = 0.25 X 30 = 7.5**
- **%P_2O_5 = 0.5 X 30 = 15; %K_2O = 0.25 X 30 = 7.5**
- **Maximum grade then becomes 7-14-7**

  (a total of 28 units)

Question – if the temperature falls below 32°F, what material will precipitate?

- Answer – KNO_3

  Note the dashed lines in the triangle. The area inside the dashed lines defines what material will precipitate

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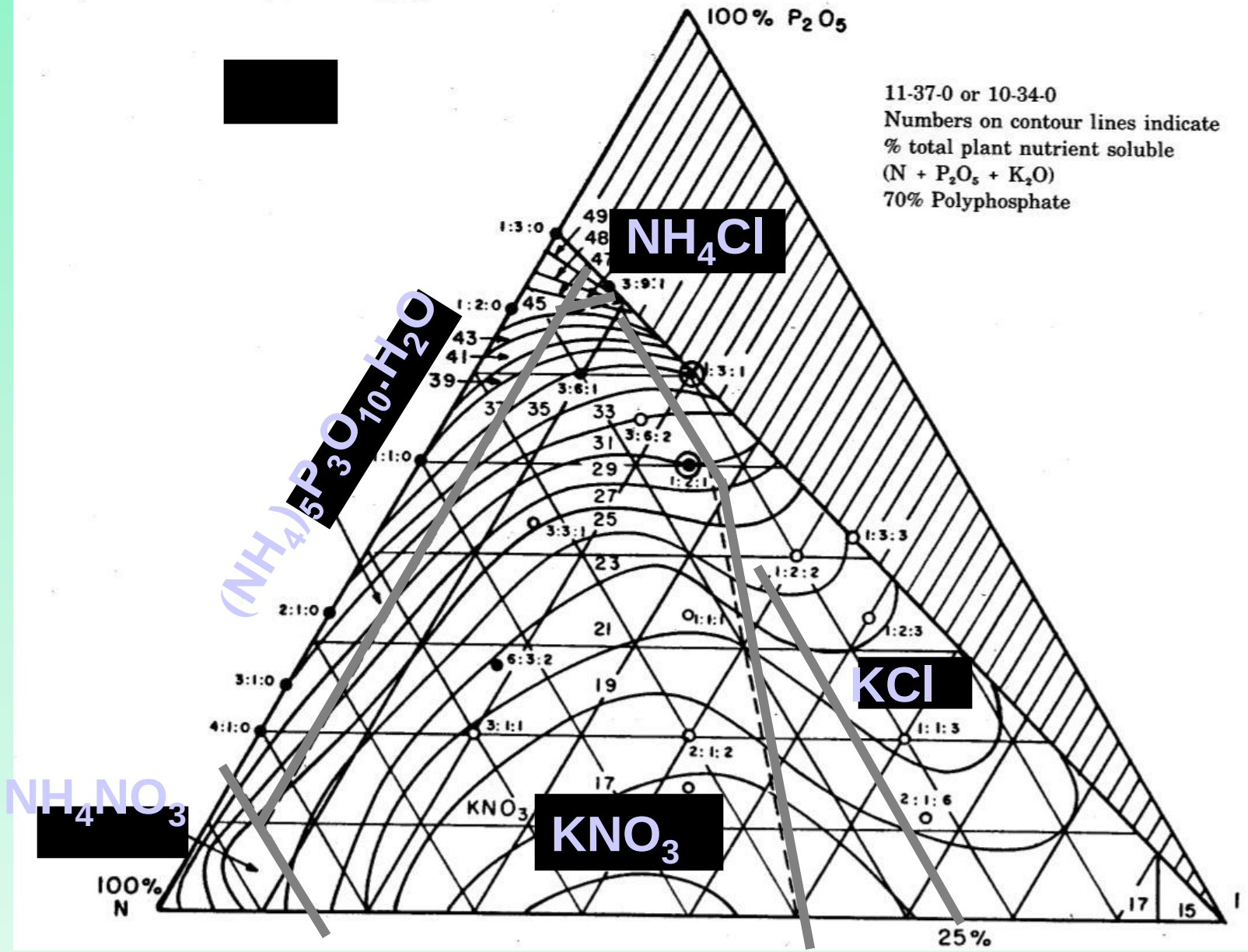

Now to test your skills

- What is the maximum 3:1:1 grade that can be made with UAN, 11-37-0 and KCl that will exhibit a salt out temperature of 32°F ??
- Step 1 – Calculate the percentage of each component
- Step 2 – Find the point on the diagram where the percentage lines intersect
- Step 3 – Check to make sure the third component line also intersects at the same point

THE FUTURE

- Know what the AN/UREA ratio
- Consider pH (ammonia) above pH 7
- Know total Nitrogen
- A Crystal Ball would be nice