

Pelleting and Distiller's Dried Grains with Solubles

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Practical issues with DDGS Used in Feed Manufacturing

- ❖ Product is Inconsistent – Unpredictable
 - Nutrient content
 - Protein, Fat, Fiber, Moisture, etc.
 - Nutrient digestibility
 - esp. for lysine
 - Physical Characteristics
 - Bulk density, Particle size, Angle of Repose
 - Logistics
 - producers, brokers/consolidators, shippers
 - Handling
 - Flowability
 - Availability
 - Price

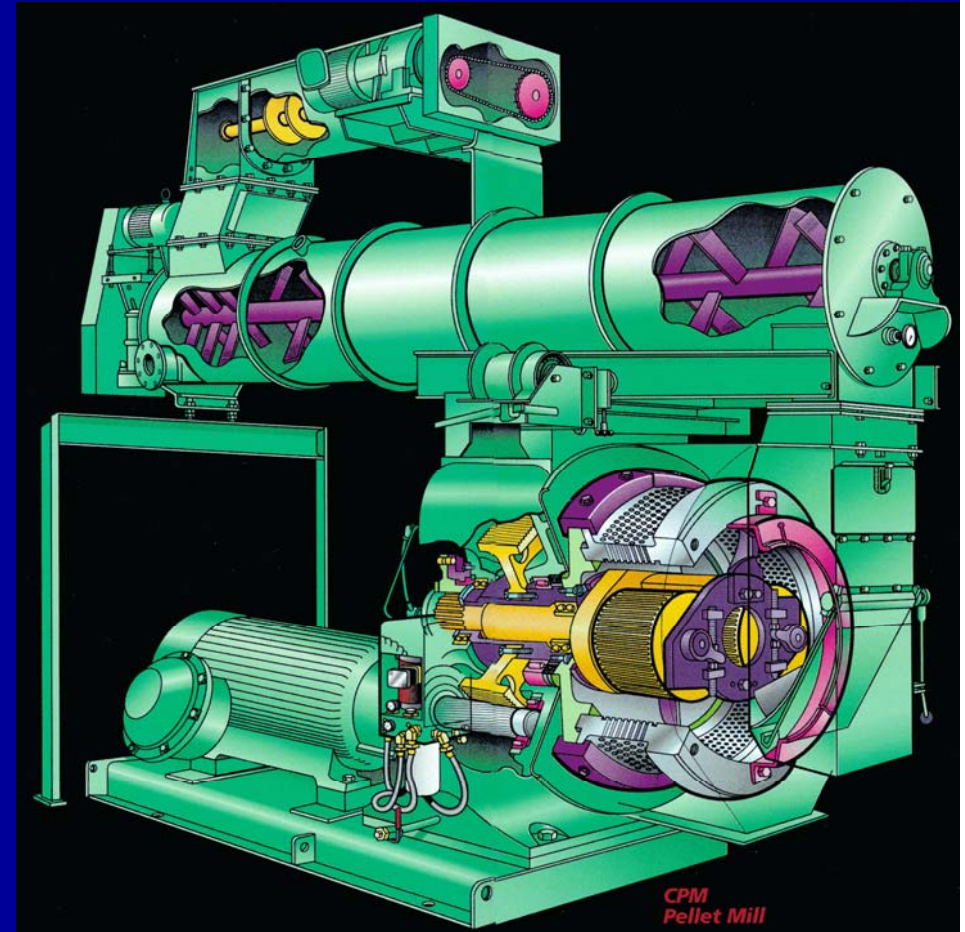
DDGS Characteristics

	Bulk Density, kg/hl	Particle Size, microns	Protein, %	Fat, %	Fiber, %
Knott, Shurson, Goihl	<u>Avg.</u> 45.9	<u>Avg.</u> 1282	<u>Avg.</u> 26.6	<u>Avg.</u> 10.0	<u>Avg.</u> 6.9
	<u>Range</u> 39.6 – 50.6	<u>Range</u> 612 – 2125	<u>Range</u> 24.5 – 28.4	<u>Range</u> 9.2 – 11.6	<u>Range</u> 5.8 – 9.1
Koch	<u>Avg.</u> 48.4	<u>Avg.</u> 588	<u>Avg.</u> 27.6	<u>Avg.</u> 9.2	<u>Avg.</u> 10.0
	<u>Range</u> 45.4 – 51.3	<u>Range</u> 387 – 810	<u>Range</u> 26.3 – 29.9	<u>Range</u> 8.1 – 10.2	<u>Range</u> 5.5 – 16.0

DDGS and Pellet Production

❖ Decreased pellet quality?

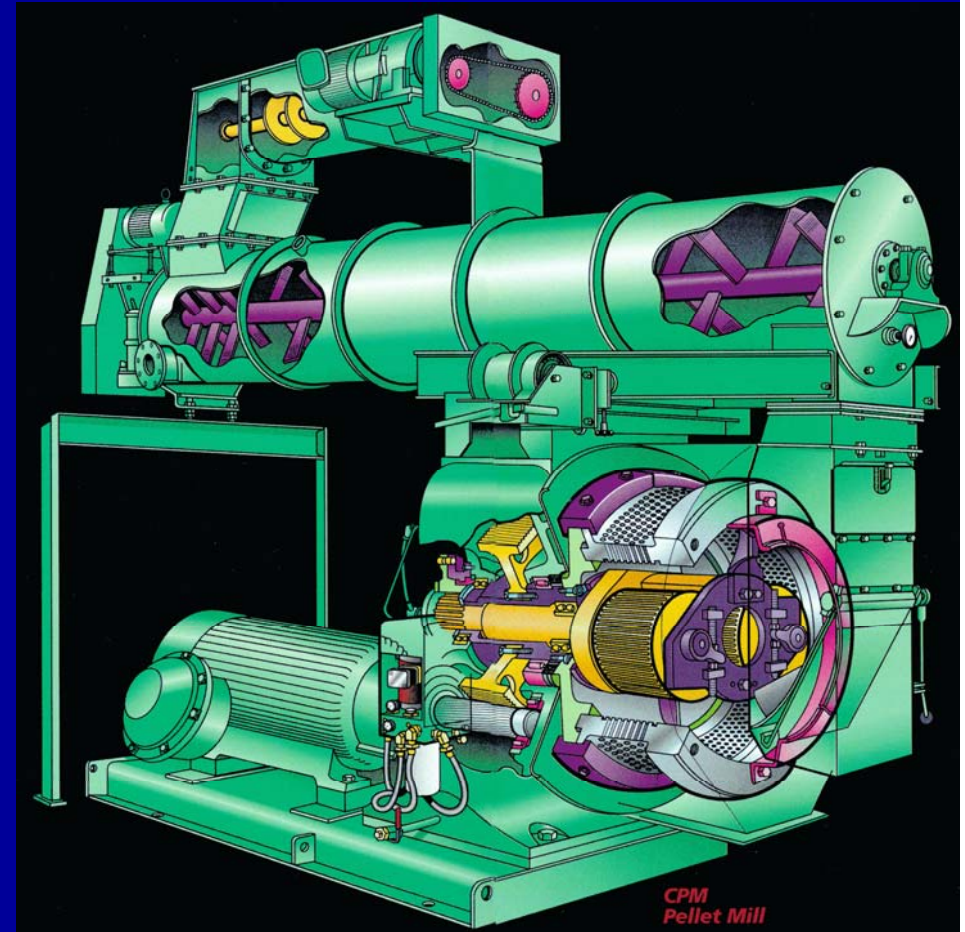
- Depends on physical and nutrient characteristics of DDGS
 - Particle size, density
 - Fat, fiber, protein, moisture
- Depends on ingredients
 - Some are complementary
- Depends on pellet mill operation
 - Die specifications
 - Performance ratio
 - Die speed
 - Conditioning time and temp



DDGS and Pellet Production

❖ Pellet trials

- Pellet die specifications
 - .25 inch hole (6.4 mm)
 - 10:1 performance ratio
- Pellet die peripheral speed
 - 1,200 ft/min. (365.8 m/min.)
- Conditioning chamber
 - 150 rpm
 - Retention time = 30 sec.
- Feed rate
 - Constant
 - Same setting all trials



Pellet Production

Durum wheat midds + DDGS (Koch)

	100%	80/20	70/30/	60/40	50/50
Volts	458.7	456.7	456.0	451.3	452.8
Amps	24.2	28.8	28.5	34.5	32.7
Kw	17.3	21.0	20.6	25.2	24.4
P.F.	0.9	0.9	0.9	0.9	0.9
mt/hr	0.7	0.8	0.8	0.9	0.8
kwh/mt	23.8	26.0	23.9	27.3	27.5
PDI %	96.1	96.3	94.4	95.3	93.3
kg/hl	66.6	63.1	63.3	63.6	60.0
C°	57	72-75	68-70	48-50	53

DDGS and Pellet Production

❖ Koch

- Durum wheat midds and DDGS
 - Increasing DDGS from 0 – 50%
 - A 35% increase in amperage
 - A 41% increase in kilowatts
 - A 15.5% increase in kwh/mt
 - A 3% decrease in pellet quality measured as Pellet Durability Index (PDI)
 - An 11% decrease in pellet bulk density
 - Increased energy use
 - **Added \$0.11/mt** to production costs
 - Decreased pellet quality may cause:
 - reduced feed efficiencies
 - Increased transportation costs

Pellet Production

Durum wheat midds + DDGS + Peas
(Koch)

	100%	60/20/20	60/40	50/30/20	50/50
Volts	458.7	448.1	456	451.3	452.8
Amps	24.2	33.9	28.5	34.5	32.7
Kw	17.3	24.5	20.6	25.2	24.4
P.F.	.9	.92	.92	.92	.93
mt/hr	.7	.9	.8	.9	.8
kwh/mt	23.8	26.9	23.9	27.3	27.5
PDI %	96.1	96.6	94.4	95.3	93.3
kg/hl	66.6	67.6	63.3	63.6	60
C°	57	48 - 50	68-70	48 - 50	53

DDGS and Pellet Production

❖ Koch

- Durum wheat midds, DDGS and dry peas
 - midds at 60%, DDGS at 20%, peas at 20%,
 - Compared to 100% midds
 - » 40% increase in amps
 - » 42% increase in kw
 - » 13% increase in kwh/mt
 - » 0.5% increase in PDI
 - Compared to 60% midds, 40%DDGS
 - » 21% increase in amps
 - » 18% increase in kw
 - » 7.6% increase in kwh/mt
 - » 2% increase in PDI

DDGS and Pellet Production

❖ Koch

- Durum wheat midds, DDGS and dry peas
 - midds at 50%, DDGS at 30%, peas at 20%,
 - Compared to 100% midds
 - » 43% increase in amps
 - » 46% increase in kw
 - » 15% increase in kwh/mt
 - » 0.8% decrease in PDI
 - Compared to 50% midds, 50%DDGS
 - » 6% increase in amps
 - » 3% increase in kw
 - » 2% increase in PDI
 - » 1% decrease in kwh/mt

Pellet Production

Barley malt sprouts and DDGS

(Koch)

	100%	90/10	80/20	70/30
Volts	447.3	451.4	449.6	454.4
Amps	47.2	43	35.2	28.3
Kw	34.8	32.1	26.9	21
P.F.	0.93	0.93	0.95	0.93
mt/hr	0.7	0.7	0.7	0.9
kwh/mt	46.1	41.4	33.4	24.6
PDI %	95.9	97.1	96.1	92.5
kg/hl	63.5	60.2	59.3	57.6
C°	43	48	52	52

DDGS and Pellet Production

❖ Koch

- Barley malt sprouts and DDGS
 - Increasing DDGS from 0 – 30%
 - A 40% decrease in amperage
 - A 40% decrease in kilowatts
 - A 47% decrease in kwh/mt
 - A 3% decrease in pellet quality measured as Pellet Durability Index (PDI)
 - A 10% decrease in pellet bulk density
 - Decreased energy use
 - **saved \$0.65/mt** in production costs
 - Decreased pellet quality may cause
 - reduced feed efficiencies
 - Increased transportation costs

Pellet Production

Typical swine grower diet (Koch)

	Swine grower	substitute 10% DDGS
Volts	467.6	459.1
Amps	42.1	41.6
Kw	31.3	32.1
P.F.	.9	.9
mt/hr	2.9	3.1
kwh/mt	10.2	9.5
PDI %	84.7	70
C°	77	76

DDGS and Pellet Production

❖ Koch

- Comparing a typical swine grower to the same diet with 10% substituted DDGS
 - Substituting 10% DDGS
 - A 1% decrease in amperage
 - A 2% increase in kilowatts
 - A 7% decrease in kwh/mt
 - A 7% increase in production rate (mt/hr)
 - A 17% decrease in pellet quality measured as Pellet Durability Index (PDI)
 - Decreased energy use
 - **saved \$0.02/mt** in production costs
 - Decreased pellet quality may cause
 - **reduced feed efficiencies**