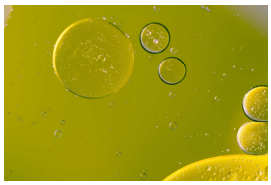


Summary

1 | Fat in dry pet food, What, Where and Why
2 | Adding fat in inclusion
3 | Adding fat in coating
4 | Conclusions



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Fats in dry pet food
2 types of fat origin

ENDOGENOUS FATS

> Coming from ingredients : meat and fish meals, vegetable meals, cereals…

> Between 4 to 9% fat on dry matter

EXOGENOUS FATS

> Purified forms added to reach targeted fat content

Vegetable oils | Poultry fat | Beef tallow | Pork fat | Fish oil

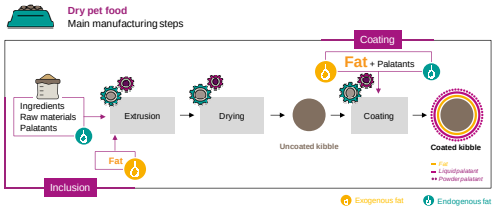


Fat content on dry matter
8% to 25%
according to the range

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Fats in dry pet food
Coating or inclusion, 2 ways to add fat

Dry pet food
Main manufacturing steps



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Fats in dry pet food
Numerous functions

Fats main functions in pet food

Nutrition



> Macronutrient
> Energy source
> Bring essential fatty acids (Omega 6, Omega 3 - EPA & DHA)
> Carrier for fat soluble vitamins

Technological aid



> Change kibble texture and density

Palatability



> Contribute to kibble smell, taste, texture…

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Adding fat in inclusion
Dealing with fat lubrication effect

Problematic:
Fat lubrication effect

Fat inclusion

Significantly:

- **reduces** the mechanical energy

and

- **increases** the kibble density

Solutions

> Increase screw(s) speed

> Increase barrel temperature

> Increase the specific mechanical energy by modifying the screw profile

> Modulate pressure in the barrel by using restriction options:

- Reduce opened surface at the die exit: decrease number of holes / decrease diameter of holes
- Use equalizer plate

Source: CLEXTRAL

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Adding fat in coating
Coating ingredients, what and why

Fat - 1 to 15 %

> To meet lipids nutritional requirements
> To improve palatability
> To stick dry palatability enhancer
> To protect the kibble from abrasion and improve its appearance

Liquid palatants - 1 to 4 %
To improve palatability

Powder palatants - 0.5 to 3 %
To improve palatability,

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Adding fat in coating
Why coating step is critical for palatability

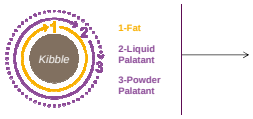
PALATANTS ACCESSIBILITY (+) COATING HOMOGENEITY (=) PERFORMANCE

Each step of the coating procedure should be conducted in a way to maximize the homogeneity and accessibility of the palatants.

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Adding fat in coating
The importance of sequences

Respect the sequences



1-Fat
2-Liquid Palatant
3-Powder Palatant

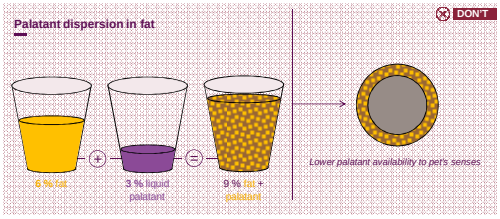
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Adding fat in coating
The importance of sequences

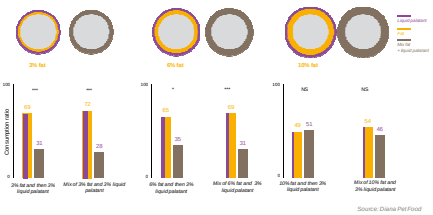
Palatant dispersion in fat

DON'T



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Adding fat in coating
The importance of sequences





> Cats prefer kibbles coated in sequences to kibbles coated with a blend of fat and liquid palatant.

> High amount of fat may encapsulate palatant and request adapted coating procedures.

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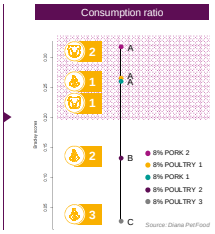
Adding fat in coating
The importance of fat origin



> Dog Super premium kibbles
> Poultry fat x 3 suppliers
> Pork fat x 2 suppliers

> Sequential coating :
8% fat
5% dog liquid palatant
1% dog powder palatant

> All kibbles tested
> Bradley analysis



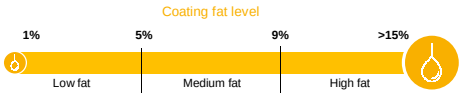
> *Both fat nature and quality impact dogs kibble palatability*

> *Fat supplier should be carefully chosen*

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Adding fat in coating
The importance of fat dosage

Different levels of fat are used in coating according to the diet range



Does fat dosage impact coating quality ?
How to coat different amounts of fat?

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Adding fat in coating
The importance of fat dosage

> Super premium cat kibbles

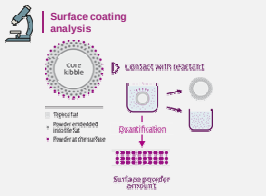
> Sequential coating:

- fat
@ 2%, 3%, 4 %

- powder palatant
@ 0.5%, 1%, 1.5%, 2%, 2.5%

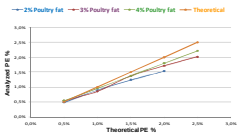


Surface coating analysis



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Adding fat in coating
The importance of fat dosage



> Loss of powder is observed with low fat coating rates and dry palatant rate > 0.5%

> Increasing low fat dosages improves dry palatant binding

Source: Diana Pet Food

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Adding fat in coating
Impact of kibble temperature

Try to adapt the cooling process before coating to the kibble to be produced

> Cool down kibbles prior to coating for **low-fat rate**

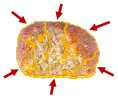
Kibble at **20 – 40 °C**
Coating effect



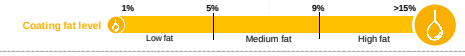
Low penetration of liquids (fat + PE)

> Coat on warm kibbles for **high fat rate**

Kibble at **45 – 70 °C**
Sucking effect



Good penetration of liquids (fat + PE)



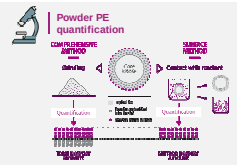
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How to coat high amounts of fat
Comparing fat coating procedures

- > Super premium cat kibbles
- > Topical poultry fat : **8%, 11% or 14%**
- > 2% Super Premium Cat powder palatant
- > Batch coating: **4 fat coating procedures**

Coating procedure	Code	Fat Coating	Powder coating
Atmospheric	ATM	Atmospheric	just after fat
Medium vacuum	MVAC	Vacuum 600 mbar	just after fat
High vacuum	HVAC	Vacuum 300 mbar	just after fat
Differential coating	DIFF	Atmospheric	24h after fat





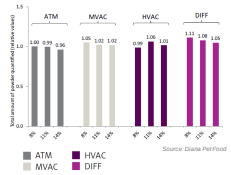
Source: Diana Pet Food

How to coat high amounts of fat
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Differential coating	DIFF	Atmospheric	24h after fat

Total amount of powder quantified
Relative value



Source: Diana Pet Food

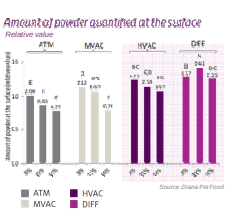
> **Total amount of powder coated is similar whatever the fat coating procedure**

How to coat high amounts of fat
Comparing fat coating procedures

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Amount of powder quantified at the surface
Relative value

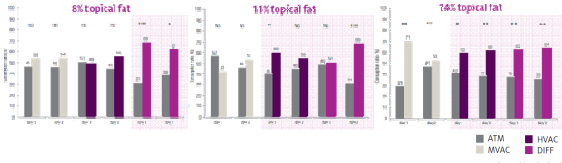


Source: Diana Pet Food

> **Powder availability decreases with high fat levels**

> **Powder is more available with vacuum or differential cooling procedures than with atmospheric coating**

How to coat high amounts of fat
Comparing fat coating procedures

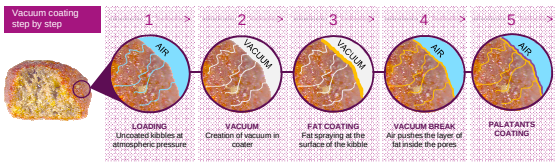


Source: Diana Pet Food

> **Palatability is improved with vacuum or differential coating, especially with higher fat levels**

> **Powder PE remained at the surface of the kibble, being more available to the cat's tongue thus increasing palatability performance.**

How to coat high amounts of fat
Vacuum batch coating





Fat coating and kibble resistance
The durabilimeter method

The durabilimeter measures kibble potential to break and create fines

Principle

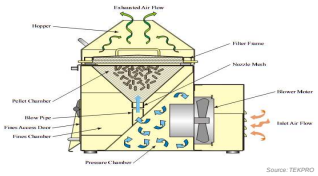
- 100g samples x 4 repetitions
- Durabilimeter for 60s
- Kibbles weighing

Pellets Durability Index (PDI)

PDI = Weight of kibbles after testing / Weight of kibbles before testing

- PDI = 100 : perfect
- 92 < PDI< 99 : acceptable
- PDI <90 : not acceptable

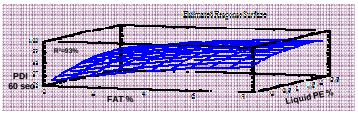
Durabilimeter



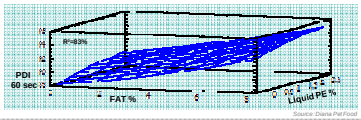
Source: TEKPRO

Fat coating and kibble resistance
Impact of fat dosage

Kibble 1



Kibble 2



Source: Diana Pet Food

> Durability is improved with fat in both kibbles types

> Durability is even higher with fat + liquid palatant

Conclusion



> Fat is first used in pet food for nutrition

> Fat is also essential for palatability, especially when applied in top coating

> Fat origin and quality directly impact palatability

> Fat inclusion affects extrusion process

> Fat application method affects palatant availability thus palatability

> Coating procedure sequences are key and must be adapted to fat dosage :

- high kibbles temperature, vacuum coating or differential cooling are adapted to coat high amounts of fat
- atmospheric coating with low temperature kibbles are adapted to coat low amounts of fat