



AddiFlex[®]

Oxo - Biodegradability

Nature's choice for plastic waste

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Add-X Biotech

Oxo - Biodegradability

We mimic nature by using the environmental forces of heat, oxygen and sunlight to cause degradation leading to biodegradation

AddiFlex® *Nature's choice for plastic waste*

The difference from Oxo - Biodegradability: Instead of plastic waste fertile earth



fertile earth

What is Biodegradability?

A technology for degrading plastics

- **Biodegradable technologies** depend on plastics in a biologically active environment (e.g. compost). The destruction of the material happens directly through the **consumption by microbes**.
- Biodegradable technologies are different from **oxo-biodegradable technologies**.
Here the primary degradation starts with any combination of light, heat, stress and air.
And then the **consumption by microbes**.

The features of the **AddiFlex®** system

- The most cost effective additive – less material for the same result.
- The most effective additive on the market – initiation time could be controlled.
- The highest quality and durability – high process ability in the manufacturing process.
- The only oxo-biodegradable technique on the market suitable for basically all plastic processes.

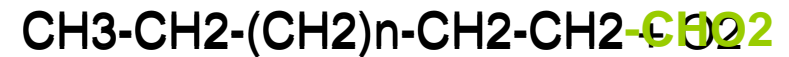
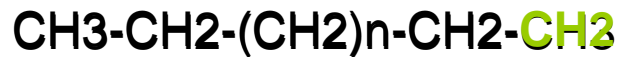
Overview on the benefits of **AddiFlex**®

- Complete bio-degradation
- 80%-90% waste reduction (in weight, not volume)
- Conventional raw materials and natural modifiers
- No toxic by-products (e.g., methane)
- Less energy input vs. competitive products

What happens when you add **AddiFlex®** to your plastics (=polyolefins)?

Microbes digest the biodegradable components and provide a greater surface

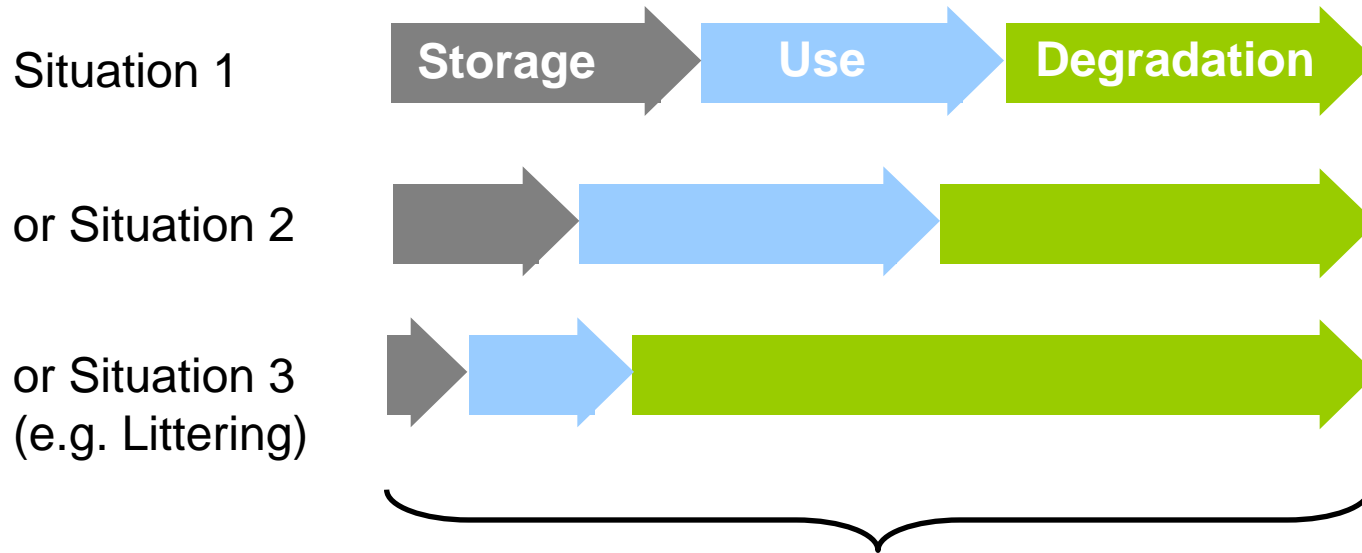
Temperature and oxygen will initiate the molecular breakdown of the polymer chains of the polyolefins:



- ➔ Reducing the molecular weight
- ➔ Weakening the structure
- ➔ The surface becomes hydrophilic and assists the third process:

Microbes digest the polymer fragments. Result: H₂O, CO₂ and biomass (no toxic breakdown components).

Why is the **AddiFlex®** system unique? It allows to control the time for...



Controlled Service Life and tailored Degradation

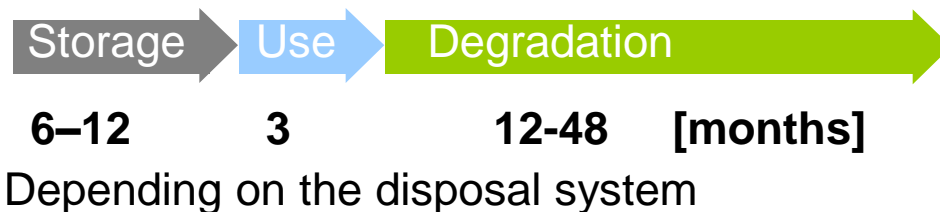
AddiFlex[®] in Action: **Examples of Applications**

AddiFlex[®] *Nature's choice for plastic waste*

AddiFlex® - applied in a carrier bag



- HDPE
- + **1 % AddiFlex® HES**
- + 10 % CaCO₃ masterbatch containing Calcium carbonate at 18μ - 25μ film thickness
- = **Oxo - Biodegradable** Carrier bag



AddiFlex® - applied in a carrier bag



- HDPE
- + **3% AddiFlex® HES**
- + 30 % CaCO₃
- up to 54% CaCO₃ masterbatch containing Calcium carbonate
- at 25µ film thickness

- = **Oxo - Biodegradable** Carrier bag



AddiFlex® - applied in another carrier bag



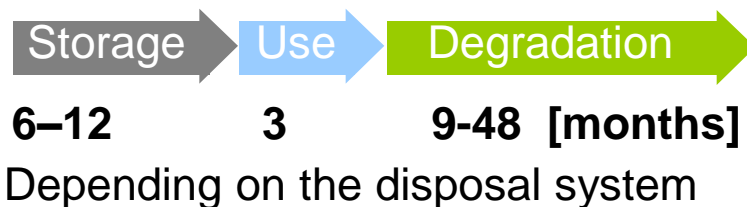
HDPE

+ **1% AddiFlex® HE**

+ 10% CaCO₃

masterbatch containing
Calcium carbonate

= **Oxo - Biodegradable**
Carrier Bag



AddiFlex® - applied in a bread pack



LDPE

+ **3 % AddiFlex® HES**

= **Oxo - Biodegradable**
Bread pack



Depending on the disposal system

AddiFlex® - applied in a outer milk pack



LDPE

+ 3 % AddiFlex® HES

= Oxo - Biodegradable outer milk pack



3-6 1 12-48 [months]

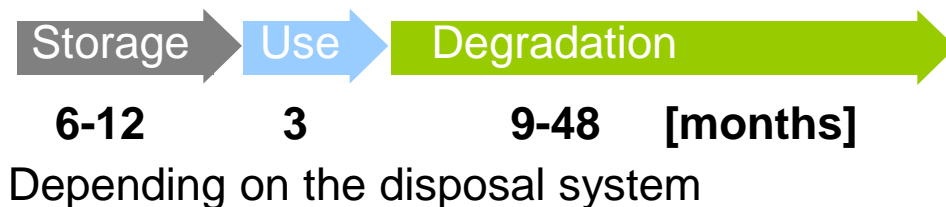
Depending on the disposal system

AddiFlex® - applied in refuse sacks



- Recycled PE
- + **5% AddiFlex® HES**
- + up to 20% CaCO₃
e.g. 27% CaCO₃
masterbatch containing
Calcium carbonate

- = **Oxo - Biodegradable**
Refuse sacks

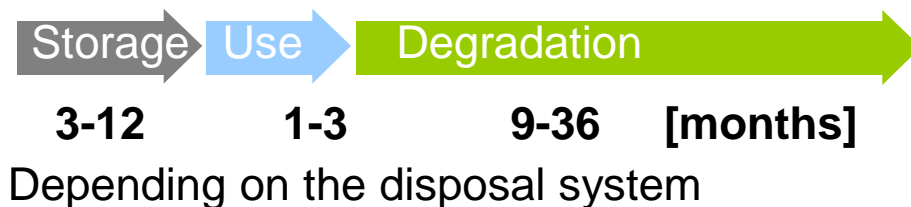


AddiFlex® applied in food trays



- PP
- + **5% AddiFlex® HES**
- + 20% CaCO₃
- up to 50 % CaCO₃

- = **Oxo - Biodegradable**
Food trays



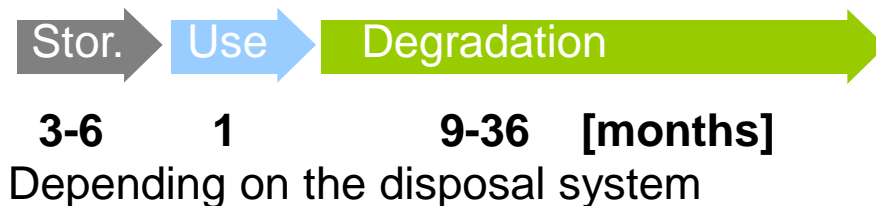
AddiFlex[®] applied in a mushroom punnet

after ca. 8 -10 weeks outdoor weathering



- PP
- + **5 % AddiFlex[®] HES**
- + 20 % CaCO₃
up to 50 % CaCO₃

- = **Oxo - Biodegradable**
mushroom punnet



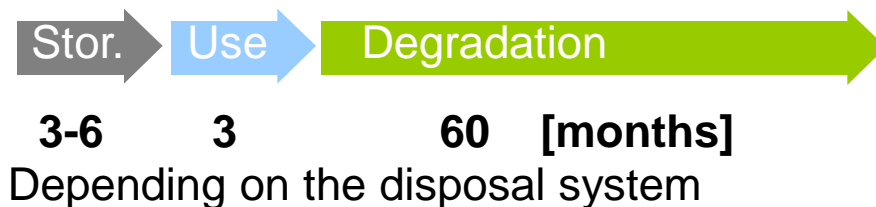
AddiFlex® applied in a vending cup



- PP
- + **5% AddiFlex® HES**
- + 50% CaCO₃

masterbatch containing
calcium carbonate
multilayer

- = **Oxo - Biodegradable**
vending cup
at 300μ thickness



AddiFlex® applied in a duster cloth



PP / PE
+ **6% AddiFlex® A**

= **Oxo - Biodegradable**
duster cloth



6 3 - 12 3 [months]

Depending on the cultivation system and species

AddiFlex[®] System: Independent Performance Tests

AddiFlex[®] *Nature's choice for plastic waste*

Research and Performance Tests: **AddiFlex®** has proven to be effective

- We actively invest in research. Therefore we also collaborate with industry partners and universities
- Much supporting scientific data on **AddiFlex®** has been provided by well recognized independent testing laboratories, such as:

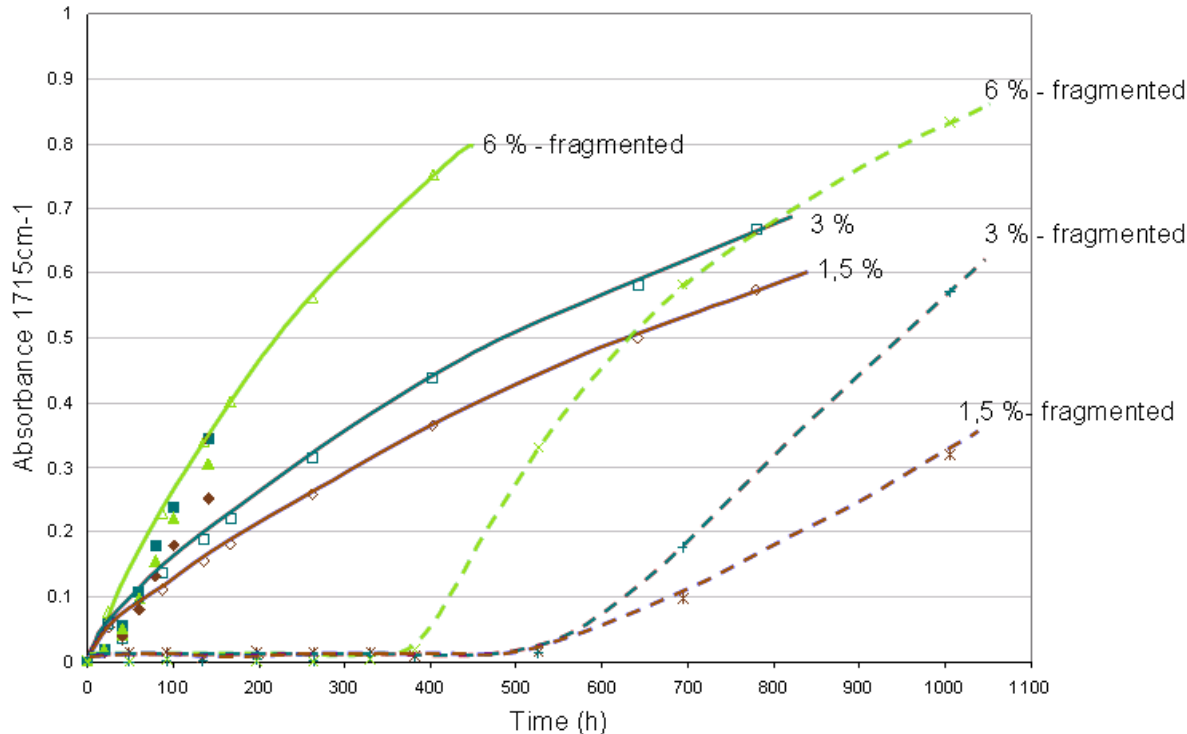


SP
Swedish National
Testing and Research Institute

CNEP
Centre National d'Evaluation
de Photoprotection

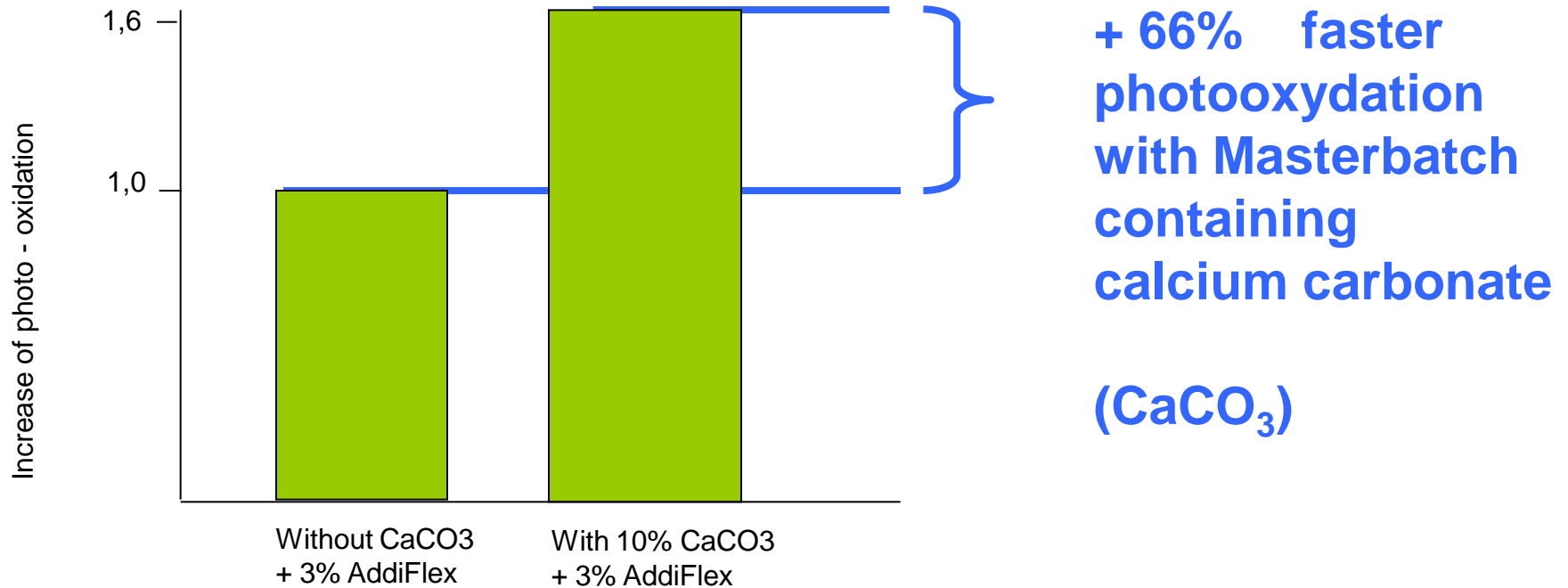
Bodenlabor
Dr. Galli

AddiFlex® Performance Test: Storage, Use and Degradation behaviour



AddiFlex - 40h SEPAP + Oven à 60° C IRTF and transmission of films

Increase of 66% of photo-oxydation with addition of CaCO₃



This is an essential property in case the application is littered.

AddiFlex[®] System Performance

Application	Let down	Thickness	% AddiFlex [®]
Fruit & Vegetable T-shirt bags	HDPE	9 μ	1 % HES
Carrier bags	LD / HD	18 μ -25 μ	1 - 2 % HE / HES
Food trays	PP	ca. 300 μ	5 % HES
Injection moulded parts	PP	ca. 500 μ	6 % HES

All applications are subject to customer/enduser specification and will be tailored to have optimised properties in storage, use, degradation and economics.

AddiFlex® Products standard

Product	AddiFlex A	AddiFlex HES	AddiFlex HEV
Typical Letdown	10% - 20%	1% - 5%	1% - 4%
Letdown polymers	LLDPE, LDPE, HDPE	LLDPE, LDPE, HDPE	LLDPE, LDPE, HDPE
Typical applications	Compost bags, mulch film	Carrier- and waste- disposal bags, mulch film	Carrier- and waste- disposal bags, mulch film
	Food grade Slight odour	Non-odor food grade Combined Photo- and Oxobio-degradation	Non-odor food grade Accelerated Photo- and Oxobio-degradation

AddiFlex® Products advanced

Product	AddiFlex HEV-HD	AddiFlex HES-BOPP	AddiFlex HES-PVC
Typical Letdown	1% - 4%	1% - 3%	1% - 3%
Letdown polymers	LLDPE, LDPE, HDPE/LLDPE	PP grades	PVC
Typical applications	Carrier bags	Food packaging Produce bags	Textile packaging Secondary packaging Food packaging
	Non-odor food grade high temperature high speed product	Non-odor food grade Combined Photo- and Oxobio-degradation BOPP and double bubble	Non-odor food grade Combined Photo- and Oxobio-degradation PVC grade

Let's invest in a fertile future: Oxo - Biodegradability



Interested?

- Do you have a question?
- Would you like to do a **AddiFlex[®]**-test with your product?
- We are here to help you:



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