

## Environmental Aspects of Clarifoil Cellulose Diacetate Film

Clarifoil is the trade name for a range of films based on cellulose diacetate. From very glossy, highly transparent films to semi-matt and matt films, covering a thickness range from 14 $\mu$  - 500 $\mu$ . The properties of these films reflect their cellulosic origins and thus offer an attractive combination of environmental features. Their cellulosic nature also makes Clarifoil films ideally suited to be used in contact with paper and board in packaging applications such as window cartons and film-laminated printed material.

### Clarifoil Manufacture

The diacetate raw material is produced by treating cellulose from wood pulp or cotton linters with acetic anhydride. The resulting flake is mixed with a small proportion of plasticiser and traces of anti-block compound and is cast onto a continuous band to produce a non-oriented film with exceptional optical properties.

The major raw material, cellulose, comes from PEFC (Program for the Endorsement of Forest Certification™) managed forestry. The PEFC program is an international non-profit, non-governmental organization dedicated to promoting Sustainable Forest Management (SFM) through independent third-party certification.

PEFC works throughout the entire forest supply chain to promote good practice in the forest and to ensure that timber and non-timber forest products are produced with respect for the highest ecological, social and ethical standards. The trees that are harvested are naturally grown and are certified as 100% GMO free.

For more information please visit <http://www.pefc.org>

Clarifoil is distinguished from most other thermoplastic films in that it comes from a sustainable resource and its main component is not derived from fossil fuels. The secondary raw material is acetic anhydride, a simple derivative of the everyday tabletop chemical, acetic acid.

A range of different plasticisers are used in Clarifoil films, depending on the end use. These include glycerol triacetate (triacetin), which is itself a direct food additive and can be naturally derived.

### EN 13432 / ASTM D 6400 / Vincotte OK Compost Home

The EN 13432 and ASTM D 6400 are the European and American industry standards for industrial **biodegradability** and **compostability** respectively. There are four requirements necessary to gain accreditation to these standards:

- 1) Heavy metal content – The films heavy metal content should fall within a pre-defined level described by the standards.
- 2) Disintegration – The film should disintegrate into pieces <2mm within a 12 week period when subjected to composting conditions.
- 3) Biodegradation – The film must biodegrade within a six month period to at least 90% of a reference cellulose sample.
- 4) Plant eco-toxicity – The resulting compost produced from part 3 is used to grow a selection of plants to ensure any bi-products of degradation are not harmful to plant life.

Clarifoil have attained both the EN 13432 and ASTM D 6400 standards for both our clear standard grades T17 (up to 95µm) and T24 (up to 116µm), please see certificates attached. In addition, Clarifoil cellulose acetate films have accreditation to the Vincotte OK Compost Home program which requires biopolymers to be compostable at significantly lower temperatures when compared to industrial conditions. With the increase in popularity of home composting and increasing pressure on efficient waste management on both industry and the public, the OK Compost Home certification is extremely important to the environmental credentials of Clarifoil films.

It should be noted that despite its inherent biodegradability, Clarifoil is very stable and does not break down in normal end-use conditions.

## Environmental Legislation

The last few years has seen national and inter-national legislation being introduced worldwide to minimise the environmental burden of packaging materials. In Europe, for instance, legislation is designed to reduce packaging levels wherever possible and to encourage re-use or re-cycling of materials, or alternatively composting or incineration with energy recovery. Targets have been set for recycling and recovery of packaging across the various material types - glass, metals, paper and board, plastics and others.

European legislation also calls for very low heavy metal content in packaging materials, in line with the US Coneg limits. Clarifoil has, for many years, complied with these levels.

## Influence of Clarifoil cellulose diacetate film on the paper waste stream.

Pira International has conducted independent investigations on the influence of our cellulose diacetate film on the paper waste stream. Using both FINAT and INGEDE methods of dispersion and fragmentation they demonstrated that our 50µm film passed 5.8% (FINAT) and 2.0% (INGEDE) through the screen, and would not be anticipated to cause difficulties in recycling.

In other re-pulping tests, it has been demonstrated that printed media laminated with Clarifoil cellulose acetate films produce a cleaner, brighter and higher quality re-pulped material when compared to printed media laminated with, for example, OPP films. This is believed to be due to the fact that on re-pulping, the adhesive and ink preferentially adhere to the acetate film leaving behind a much cleaner paper/pulp material.

Nevertheless we cannot guarantee that our film will have no influence on the paper waste stream as each individual recycling centre uses their own unique conditions and therefore the results cannot be reliably used with confidence across the entire industry.

Compostable plastics are designed for organic recycling. They are clearly marked for this purpose with logos such as the Seedling logo. The main raw material in cellulose diacetate film is cellulose, a natural resource from sustainably sourced PEFC-certified wood pulp, which is free of genetically-modified-organisms. The film is compostable where facilities exist – see above.

As we develop new film formulations for new applications we carry out a range of assessments on the suitability of the chemicals used, including their REACH status. We will continue to ensure that our films meet legislative requirements and that they are safe and fit for purpose in their intended end uses.

## Recycling with Clarifoil

In principle Clarifoil film is readily recyclable. It is easily re-dissolved and filtered for casting, to yield a first quality recycled film. Since the Clarifoil manufacturing process is relatively low temperature, no thermal degradation of the polymer occurs, as can happen with melt processed polymers. Thus virtually all in-house waste and worthwhile quantities of redundant film from customers is currently re-processed in our plant to produce first quality film.

In practice Clarifoil is usually used in combination with paper or board in packaging applications, either bonded around the edge of a window in a folding carton, or laminated to the surface of printed board, thus other possibilities arise:

## Incineration with Energy Recovery

Where mixed waste arises, in many cases the most sensible disposal option is to incinerate at high temperature with energy recovery, rather than to attempt to separate materials and process them down different waste streams. Fully combusted Clarifoil produces only carbon dioxide, water and a little non-toxic inorganic ash. It has a calorific value around 20MJ/kg, making it worthwhile to recover the energy for heating purposes.

## Summary

Clarifoil is derived mainly from sustainable non-fossil fuel resources. Its cellulosic origin provides a number of attractive environmental options and gives it a unique versatility for packaging waste recovery.

For additional guidance or technical information contact Clarifoil Technical Support:

Telephone: 00 44 1332 68 1307 or 00 44 1332 68 1210

Fax: 00 44 1332 66 0178

e-mail: [kevin.g.parker@celanese.com](mailto:kevin.g.parker@celanese.com)



Gesellschaft für Konformitätsbewertung mbH



# NOTIFICATION OF REGISTRATION

The company

**Clarifoil**  
1 Holme Lane, Spondon  
DERBY DE21 7BS  
GREAT BRITAIN

hereby receives the confirmation that the product/s

**Compostable intermediates**

of the type

**Clarifoil T17 Cellulose Acetate Film**

conforms to

**DIN EN 13432:2000-12**

**Certification scheme products made of compostable materials (Edition: 2006-08)**

**Registration No.: 7H0054**

This Notification of Registration is valid in connection with above stated Registration No.  
for an unlimited period and becomes ineffective only upon termination.

See annex for further information.

DIN CERTCO Gesellschaft für  
Konformitätsbewertung mbH  
Alboinstraße 56, 12103 Berlin



2010-11-02

  
Dipl.-Ing. (FH) Dipl.-Wi.-Ing. Sören Scholz  
- Head of Certification Body -

Every effort has been made to ensure that this information  
is correct and in accordance with current knowledge.  
While information given describes known applications for  
the product, no warranty of fitness for purpose is intended.

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# NOTIFICATION OF REGISTRATION

The company

**Clarifoil**  
1 Holme Lane, Spondon  
DERBY DE21 7BS  
GREAT BRITAIN

hereby receives the confirmation that the product/s

**Compostable intermediates**

of the type

**Clarifoil T24 Cellulose Acetate Film**

conforms to

**DIN EN 13432:2000-12**

**Certification scheme products made of compostable materials (Edition: 2006-08)**

**Registration No.: 7H0055**

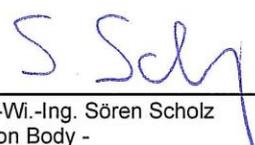
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- Head of Certification Body -



**AIB-VINÇOTTE International s.a. / n.v.**  
SAFETY, QUALITY, ENVIRONMENT  
Member of the Group AIB-VINÇOTTE  
Head office : Boulevard A, Reyers 80 - B-1030 Brussels / Belgium

**VINÇOTTE - CERTEST PRODUCTS**  
Everest - Leuvensesteenweg 248 / B-1800 Vilvoorde / Belgium  
Tel. : +32(0)2 674.57.50 - Fax : +32(0)2 674.57.85  
E-Mail : okcompost@vincotte.be



## CERTIFICATE FOR AWARDING AND USE OF THE 'OK COMPOST HOME' CONFORMITY MARK

No. O 15-1642-A

( Prolongs the certificate N° O 10-485-A )

**Issued by AIB-VINÇOTTE International**

**For the product(s) described hereafter :**

Product Domain :	Home Compostable Products
Product Group :	Raw materials
Product Family :	Bio material
Product Type :	In form of Film
Trade mark :	Clarifoil Cellulose Acetate T17 film
Product description / Particularities :	Thickness : maximum 95 µm Colour : Transparent

**Conformity examination applied for by :**

Vinçotte

CLARIFOIL  
1 Holme Lane,  
Spondon, Derby  
DE21 7BS  
UK

**© Criteria for certification :**

- AVI Test Program with reference OK 2 edition D "Home compostability of products"

**Validity of the certificate :**

From 12 August 2015 till 12 August 2020

**Conclusions of the examination :**

The products comply with the above mentioned certification criteria, as confirmed by the test report of AVI no 09 / 60211890 / 507355p.

**Applicable certification system :**

Type examination followed by supervision through verification tests on samples from the distributor's stocks or of the market.  
The conformity of the product is guaranteed by the procedures for awarding and use of the 'OK compost HOME' conformity mark. This only applies for specimen bearing the 'OK compost HOME' mark.

*This certificate is issued in English.*

Brussels, 30 July 2015

  
For the Certification Committee  
Ph. DEWOLFS  
President of the Committee

P. MICHIELS  
Contract Manager

D-056-00-01

Annex : /

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E-Mail : okcompost@vincotte.be



## CERTIFICATE FOR AWARDING AND USE OF THE 'OK COMPOST HOME' CONFORMITY MARK

**No. O 15-1643-A**  
( Prolongs the certificate N° O 10-486-A )  
**Issued by AIB-VINÇOTTE International**

**For the product(s) described hereafter :**

Product Domain :	Home Compostable Products
Product Group :	Raw materials
Product Family :	Bio material
Product Type :	In form of Film
Trade mark :	Clarifoil Cellulose Acetate T24 film
Product description / Particularities :	Thickness : maximum 116 µm Colour : Transparent

**Conformity examination applied for by :**

Vinçotte

**CLARIFOIL**  
1 Holme lane,  
Spondon, Derby  
DE21 7BS  
UK

**Criteria for certification :**

- AVI Test Program with reference OK 2 edition D "Home compostability of products"

**Validity of the certificate :**

From 12 August 2015 till 12 August 2020

**Conclusions of the examination :**

The products comply with the above mentioned certification criteria, as confirmed by the test report of AVI no 09 / 60211690 / 507355p.

**Applicable certification system :**

Type examination followed by supervision through verification tests on samples from the distributor's stocks or of the market.  
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This certificate is issued in English.

Brussels, 30 July 2015

P. MICHIELS  
Contract Manager

Ph. DEWOLFS  
President of the Committee

D 056 00 01

Annex : /

08-CERTOKH-e

## ***CERTIFICATE*** ***for Products***

THIS IS TO CERTIFY that the following PRODUCTS have been found to comply with the specifications established in the American Society for Testing and Materials standards ASTM D6400 and/or D6868 in accordance with the terms and conditions of "Biodegradable Products Institute - Certification Program for Products Made Compostable Plastics - Program Rules":

- Cellulose acetate based plasticized films manufactured by Clarifoil with maximum thickness of 95 microns (3.74 mils) and sold as Clarifoil T17 films. 00251836]

as further described in the application and related information submitted to Biodegradable Products Institute by Celanese Acetate Ltd (Clarifoil) Corporation, "Licensee") a corporation of United Kingdom.

Specific products associated with these certifications can be found on the BPI Product Catalog: <http://products.bpiworld.org/companies/celanese-acetate-ltd-clarifoil>

This Certificate authorizes the Licensee to use the Certification Program Logo depicted below in relation to such Product, subject to all conditions and terms of the Program Rules and the License Agreement between the Biodegradable Products Institute and Licensee.



**COMPOSTABLE**  
IN INDUSTRIAL FACILITIES

Check locally, as these do not exist in many communities. **Not suitable for backyard composting.** CERT # 891032

By:   
BPI Executive Director

Valid until: April 30, 2020  
Certificate #: 891032-2