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Title of invention:
MALEIC ANHYDRIDE GRAFTED LLDPE HAVING HIGH MELT INDEX

Patent Proprietor:
Westlake Longview Corporation

Opponent:
The Dow Chemical Company

Relevant legal provisions:
EPC Art. 54
RPBA 2020 Art. 12(6)

Keyword:
Novelty - Main request and auxiliary requests 1-3 (no)
Late-filed requests - Admittance of auxiliary requests 4-7 (no)

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Case Number: T 1579/22 - 3.3.03

D E C I S I O N
of Technical Board of Appeal 3.3.03
of 28 June 2024

Appellant: (Patent Proprietor)	Westlake Longview Corporation 2801 Post Oak Boulevard, Suite 600 Houston, TX 77056 (US)
Representative:	Kraus & Lederer PartGmbB Thomas-Wimmer-Ring 15 80539 München (DE)
Respondent: (Opponent)	The Dow Chemical Company 2030 Dow Center Midland, MI 48674 (US)
Representative:	V.O. P.O. Box 87930 2508 DH Den Haag (NL)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 4 May 2022 revoking European patent No. 3180369 pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chairman	D. Semino
Members:	D. Marquis
	L. Basterreix

Summary of Facts and Submissions

I. The appeal lies against the decision of the opposition division revoking European patent No. 3 180 369.

II. Granted claims 1 and 11 read as follows:

"1. A linear low-density polyethylene (LLDPE) grafted with maleic anhydride (MAH-g-LLDPE), wherein the MAH-g-LLDPE has a melt index (MI) of 250 to 800 g/10 minutes and comprises 0.01 to 3 weight percent of maleic anhydride, based on the total weight of the MAH-g-LLDPE".

"11. A process for preparing the MAH-g-LLDPE according to any one of claims 1 to 4, the process comprising:

(a) melting a LLDPE in an extruder to form a molten LLDPE;
(b) introducing maleic anhydride into the extruder; and
(c) contacting the molten LLDPE with the maleic anhydride in the extruder at conditions effective to increase the melt index (Ml) of the LLDPE and to form the MAH-g-LLDPE."

III. The following documents were *inter alia* submitted during the opposition proceedings:
D1: WO-A-2007/146875
D2: WO-A-2013/187968
D5: Fact sheet AFFINITY™ GA Polyolefin Elastomers, October 2013
D8: Technical information sheet AFFINITY™ GA 1000R Functionalised Polyolefin Elastomer, 2012
D13: Applied Plastics Engineering Handbook, Elsevier,

2011, pages 23-48
D14: Gownder, Mohan, "Branching of LLDPE as Studied by Crystallization-Fractionation and its Effect on Mechanical Properties of Films", Journal of Plastic Film & Sheeting, 2001, volume 17, pages 53-61
D15: Handbook of Plastic Films, E.M. Abdel-Bary, Rapra Technology Limited, 2003, pages 45 and 46
D16: F.M. Mirabella, Jr., E.A. Ford, "Characterization of Linear Low-Density Polyethylene: Cross-Fractionation According to Copolymer Composition and Molecular Weight", J. Polym. Sci. B Polym. Phys., 1987, 25, pages 777-790
D17: TAFMER™ HIGH-PERFORMANCE ELASTOMERS, 3 pages, undated
D18: Performance PE polymers, Exxon Mobil, 4 pages, undated
D19: Polyethylene products, Exxon Mobil, 1 page, undated
D20: Datasheet DOWLEX™ 2032 Polyethylene Resin, dated 2011-10-05
D21: US 7,652,113 B2
D22: Technical Report, by Kyle Anderson, 21 January 2020

IV. In the decision under appeal the opposition division concluded that granted claim 1 and claim 1 of auxiliary requests 1 to 3 lacked novelty in view of each of D1 and D2.

V. The patent proprietor (appellant) lodged an appeal against the decision of the opposition division. The appellant filed seven sets of claims as auxiliary requests 1 to 7 with the statement of grounds of appeal. Document D23 was also submitted:

D23: Handbook of Plastic Films, E.M. Abdel-Bary, Rapra

Technology Limited, 2003, pages 5-12

VI. The opponent (respondent) submitted documents D24 to D28 with their rejoinder to the statement of grounds of appeal:

D24: Handbook of Thermoplastics, Second Edition, Olagoke Olabisi, Kolapo Adewale, CRC Press, 2016, pages 19-26 and 32-44
D25: Handbook of Polyolefins, Second Edition, Cornelia Vasile, 2000, pages 75-79
D26: Encyclopedia of Polymer Science and Technology, Concise Third Edition, 2007, pages 424-427
D27: US 6,433,133 B1
D28: US 3,873,643

VII. Oral proceedings before the Board were held on 28 June 2024.

VIII. The final requests of the parties were as follows:

- The appellant requests that the decision of the opposition division be set aside and that the patent be maintained as granted or on the basis of one of the set of claims of auxiliary requests 1 to 7 filed with the statement of grounds of appeal.

- The respondent requests that the appeal be dismissed.

Claim 1 of auxiliary request 1 corresponded to granted claim 1 with the further limitation of the melt index of the LLDPE to the range of 0.5 to 10 g/10 minutes.

Claim 1 of auxiliary request 2 corresponded to granted claim 1 in which the range of melt index of the MAH-g-

LLDPE is limited to 300 to 800 g/10 minutes.

Claim 1 of auxiliary request 3 corresponded to claim 1 of auxiliary request 1 in which the range of melt index of the MAH-g-LLDPE is further limited to 300 to 800 g/10 minutes.

The auxiliary requests 4 to 7 did not comprise any product claim, but only process claims.

Claim 1 of auxiliary request 4 corresponded to the process of granted claim 11 with the further limitation of the melt index of the LLDPE to the range of 0.5 to 10 g/10 minutes.

Claim 1 of auxiliary request 5 corresponded to claim 1 of auxiliary request 4 further limited in that step (c) "is carried out in the absence of an added free radical initiator".

Claim 1 of auxiliary request 6 corresponded to claim 1 of auxiliary request 4 further limiting the range of melt index of the MAH-g-LLDPE to 300 to 800 g/10 minutes.

Claim 1 of auxiliary request 7 corresponded to claim 1 of auxiliary request 5 further limiting the range of melt index of the MAH-g-LLDPE to 300 to 800 g/10 minutes.

IX. The parties' submissions, in so far as they are pertinent, may be derived from the reasons for the decision below. The disputed points concerned the admittance of documents in the proceedings, the interpretation of the term LLDPE in granted claim 1, the novelty of that claim and of claim 1 of auxiliary

requests 1 to 3 over documents D1 and D2, and the admittance of auxiliary requests 4 to 7 into the proceedings.

Reasons for the Decision

1. Admittance

1.1 The appellant submitted D23 with their statement of grounds of appeal and requested that this document be admitted into the proceedings. D23 was said to be submitted in reaction to the decision under appeal and in particular in reaction to the conclusion of the opposition division that the LLDPE in granted claim 1 could not be distinguished from the polyethylenes of D1 and D2, which conclusion came only at the oral proceedings before the division (statement of grounds of appeal, page 3, first paragraph). The admittance of D23 was not contested by the respondent, nor does the Board see any reason not to admit D23. D23 is therefore admitted into the proceedings (Article 12(4) RPBA).

1.2 The respondent filed D24 to D26 with their rejoinder and requested their admission into the proceedings. It was argued that D24 to D26 were submitted in direct response to the appellant's argumentation in their statement of grounds of appeal based also on D23 that the skilled person would have a precise understanding of the term LLDPE and would be able to clearly delimit such LLDPE from other polyethylenes not falling under the term LLDPE. The admittance of these documents into the proceedings was not contested by the appellant, nor does the Board see any reason not to admit D24 to D26. D24 to D26 are therefore admitted into the proceedings (Article 12(4) RPBA).

1.3 The appellant further requested the admittance of D16 to D20 into the appeal proceedings. D16 to D20 are documents that were filed during the opposition proceedings and for which no decision was taken on admittance (decision under appeal, section 2, page 4). The admittance of D16 to D20 was contested by the respondent (rejoinder, page 2) on the grounds that the decision under appeal was not based on these documents (letter of 17 April 2024, page 2).

1.4 It is apparent from the letter of the patent proprietor of 23 December 2020 (sections 1 and 2.4) that D16 to D20 were filed with that letter in reaction to the filing, after the 9 months opposition period according to Article 99(1) EPC, of D13 to D15 (submitted as D11 to D13) and the arguments filed with them on 16 April 2020 during the opposition proceedings. In particular, D16 to D20 are documents meant to address the definition of linear low density polyethylenes (LLDPE) that was also addressed with the filing of D13 to D15. The Board therefore finds that the request to admit D16 to D20 into the proceedings that can be derived from the letter of 23 December 2020 (page 2, second paragraph) was admissibly raised before the opposition division and it is apparent from the reasoning of the opposition division (decision under appeal, page 4, section 2) that this request was maintained in the proceedings leading to the decision under appeal. Moreover, the filing of these documents was a legitimate and timely reaction to the filing of D13 to D15. In view of this, documents D16 to D20 do not represent an amendment of the appellant's case at the appeal stage and the Board finds it appropriate to admit them into the proceedings.

1.5 In their letter of 29 August 2023 (point 1.4, page 2) the appellant originally requested that D21 submitted by the respondent before the opposition division with their letter of 22 January 2021 (page 5, last paragraph) be not admitted into the proceedings, but that request was withdrawn at the oral proceedings before the Board. D21 was argued to have been filed in response to a point raised in the second summons of the opposition division on 8 October 2020 regarding the definition of the term linear to interpret granted claim 1. In view of this, the Board found it appropriate to admit D21 into the appeal proceedings.

1.6 The Board did not need to address admittance of documents D22 and D27-D29, as these documents are not relevant to the present decision, in spite of having been cited during the appeal proceedings.

Main request

2. Novelty

2.1 Granted claim 1 concerns a linear low-density polyethylene (LLDPE) grafted with maleic anhydride (MAH-g-LLDPE), wherein the MAH-g-LLDPE has a melt index (MI) of 250 to 800 g/10 minutes and comprises 0.01 to 3 weight percent of maleic anhydride, based on the total weight of the MAH-g-LLDPE.

2.2 The opposition division concluded that claim 1 of the main request lacked novelty in view of samples EO1 and EO2 of D1 and sample EO 07 of D2 (decision under appeal, section 3). The opposition division in particular considered that the polyethylenes referred to as linear in granted claim 1 were not distinguishable from the polyethylenes disclosed in D1

and D2 (decision under appeal, page 5, second paragraph).

2.3 Document D1

2.3.1 D1 discloses in the experimental part on pages 59 to 62 the grafting of random ethylene/octene copolymers EO1 and EO2 with maleic anhydride to produce grafted copolymers whose properties are reported in tables 2 and 3 of D1.

2.3.2 The compositions of the copolymers EO1 and EO2 are disclosed on page 59 of D1. EO1 and EO2 are defined as being random ethylene/octene copolymers having a density of 0.87 g/cm^3 (EO1) and 0.874 g/cm^3 (EO2) respectively. It is apparent from this passage of D1 that EO1 and EO2 are polyethylenes of low density but the experimental part of D1 does not disclose whether these copolymers are linear and it does not provide their preparation processes.

2.3.3 D1 discloses on page 59 also the grafting of the copolymers EO1 and EO2 with maleic anhydride. The contents of maleic anhydride in the samples #1-#4 of the grafted copolymers are disclosed in Table 2 and are 0.81 wt.-% (sample #1), 0.65 wt.-% (sample #2), 0.55 wt.-% (sample #3) and 0.68 wt.-% (sample #4). The melt indexes at 190°C/2.16 kg of the grafted copolymers are disclosed in Table 3 of D1 and are 672 g/10 min (sample #1), 539 g/10 min (sample #2), 410 g/10 min (sample #3) and 375 g/10 min (sample #4). It was not disputed that these contents and melt indexes are in the ranges defined for the maleated LLDPE (MAH-g-LLDPE) of granted claim 1.

2.3.4 Granted claim 1 requires additionally that the polyethylene is a linear low-density polyethylene (LLDPE). The question of novelty therefore hinged on the question of whether the copolymers EO1 and EO2 are linear low-density polyethylenes (LLDPEs) according to granted claim 1.

2.3.5 As anticipated above (point 2.2), the opposition division considered that the term linear in claim 1 was ambiguous and as a result an LLDPE did not have an accepted definition in the prior art that would constitute a valid difference with the copolymers EO1 and EO2 (page 5 of the decision under appeal, second paragraph).

2.3.6 Both parties submitted documents pertaining to the definition of a linear low-density polyethylene (LLDPE) that were seen to represent the common general knowledge relevant to the characterization of the copolymers of D1, namely D5, D8, D13, D14, D15, D16-D21, D23, D24, D25 and D26. These documents include excerpts of textbooks (D13, D15, D23 to D26), scientific articles (D14 and D16), datasheets of commercial products (D5, D8, D17-D20) and a patent document (D21).

2.3.7 According to established case law, the common general knowledge is to be found in basic handbooks, monographs, encyclopaedias, textbooks and reference books (Case Law of the Boards of Appeal, 10th Edition 2022, I.C.2.8.1-2.8.4). It is knowledge that an experienced person in the field in question is expected to have, or at least to be aware of, to the extent that he/she knows he could look it up in a book if he/she needs it. Common general knowledge does not normally

include patent literature and scientific articles.

2.3.8 In accordance with this, documents D13, D15 and D23 to D26 are found to represent the common general knowledge as they are taken from textbooks and handbooks in the field of polymer technology. D14 and D16 are research publications that are less relevant to the definition of the common general knowledge (Case Law of the Boards of Appeal, 10th Edition 2022, I.C.2.8.1).

The following information can be taken from D13, D15 and D23 to D26:

(a) D13 (page 28, section 3.2.3) teaches that LLDPEs are made by copolymerization of ethylene and a comonomer (typically butene, hexene and octene) and consist of long linear molecules with short side chain branches (SCB), little long chain branching (LCB) and a density in the range of 0.92 to 0.94 g/cm^3 (Table 3.2, page 29).

(b) D15 contains information on chain branching of polyethylenes but does not define LLDPEs.

(c) D23 (page 8, section 1.2.3) essentially provides a definition of LLDPEs as copolymers of ethylene with 1-butene, 1-hexene and 1-octene obtained by polymerization with multisites catalysts such as Ziegler-Natta catalysts having a range of densities of 0.915-0.93 g/cm^3 (0.91-0.93 g/cm^3 in table 1.1 on page 6) and containing short chain branching but no long chain branching. D23 also discloses that following the development of a new metallocene catalyst technology other types of polyethylenes have also been recently commercialised. These polyethylenes are very low density polyethylenes

(VLDPEs) with a density range of 0.89-0.915 g/cm^3 and ultra low density polyethylenes (ULDPEs) with a density of <0.89 g/cm^3 (section 1.2.4).

(d) D24 (pages 23 and 24, section 1.4.1.2) also contains a similar definition of LLDPEs as linear polyethylene copolymers with a density range of 0.900-0.945 g/cm^3 with short chain branching and no long chain branching. VLDPEs are also mentioned in D24 as being structurally similar to LLDPEs and having a density of 0.89-0.915 g/cm^3 (page 24, first paragraph and Table 1.4, page 20). As in D23, D24 also provides a historical perspective of the production of polyethylenes and teaches (section 1.4, page 20, first paragraph) that from the free radical initiated non-catalyzed polymerization technology of the 1930s, to Ziegler-Natta and chromium catalyst technologies of the 1950s, to the single site metallocene catalyst (SSC) technologies of the 1990s, and the post-metallocene SSC catalyst technologies of the present, polyolefins continue to evolve capturing significant market share in applications that were not previously accessible. Against this general background, section 1.4.1.2 on linear LDPEs (LLDPEs) introduces the term "conventional linear LDPE" to refer to polyethylenes obtained with conventional catalyst technology with density ranges between 0.900 and 0.945 g/cm3 and mentions, as LLDPE, also the structurally close VLDPEs obtained with SSC metallocene technology with densities between 0.890 and 0.915 g/cm3 developed in the early 1990s (section 1.4.7).

(e) D25 (page 75, section A) discloses that there are essentially three groups of polyethylenes (PE), low

density PE (LDPE), high density PE (HDPE) and linear low density PE (LLDPE). It further recounts that "recently, very low density PE (VLDPE) and ultra low density PE (ULDPE) have joined the LLDPE family". The passage on page 77 (section 1) also describes LLDPEs as products of the polymerization of ethylene with a comonomer, i.e., 1-butene, 1-hexene, 1-octene that can be obtained from multi site catalysts (Ziegler-Natta catalysts) as well as from single site catalysts (metallocene catalysts).

(f) D26 (pages 424 to 427) teaches that LLDPE was first made in the late 1970s and that in the early 1990s, the LLDPE industry was "revitalized with the introduction of single site catalyzed very low density polyethylenes (VLDPE) [...] and metallocene-catalyzed LLDPE (mLLDPE)" (page 424, first column, last paragraph). According to table 1 on page 425 LLDPEs have a density in the range of 0.915-0.925 g/cm^3 and VLDPEs/ULDPEs have densities below 0.915 g/cm^3.

2.3.9 The common general knowledge cited by the parties in appeal shows that LLDPEs are historically understood to be polyethylenes produced by copolymerization of ethylene with α-olefins such as 1-butene, 1-hexene and 1-octene using Ziegler-Natta catalysts, these copolymers having short chain branching and low amounts of long chain branching, resulting in a density typically in the range of about 0.915-0.925 g/cm^3 (D26, page 425, table 1). It is, however, also apparent from the same documents that the development of these polymers led over time to also consider LLDPEs as a class of polyethylenes on their own alongside low density polyethylens (LDPEs) and high density polyethylnes (HDPEs) (D13 Figure 3.3, D25, page 75,

second column, penultimate paragraph). D23, D24, D25 and D26 confirm that the term LLDPE eventually took a more generic meaning especially in view of the more recent advances in polyethylene synthesis and the use of new catalysts (single-site catalysts or metallocene catalysts) leading to new types of polyethylene copolymers, such as VLDPEs and ULDPEs, of densities (less than about 0.915 g/cm^3) that are below the known range of "conventional LLDPEs" (0.915-0.925 g/cm^3 in D26, page 424, left column, last paragraph and page 425, left column, first paragraph in combination with table 1).

2.3.10 The appellant acknowledged that the prior art sometimes referred to the LLDPE family or LLDPE class as containing in addition to the conventional LLDPEs also the single site catalyzed LLDPE (also designated as very low-density polyethylene (VLDPE)) and ultra low-density polyethylene (ULDPE), letter of 29 August 2023, section 2.1.1.5). The appellant, however, argued that LLDPE without any further specification would always be understood as referring to the conventional LLDPE with a structure shown in document D26 (figure 1), which was different from the structure of e.g. the single-site catalyzed LLDPE (designated mLLDPE in figure 1). In their opinion those single-site catalyzed LLDPEs, which were not prepared by Ziegler-Natter catalysts but by metallocene technology, led to polymers which also had a low density and were considered linear but were nevertheless structurally different from LLDPEs.

2.3.11 The Board finds that the documents representing the common general knowledge do not show that the skilled person would understand LLDPEs with no further qualification as indicating only conventional LLDPEs as opposed to single-site catalysed LLDPEs. While the

chapter structure of D23 seems to imply that LLDPEs and VLDPEs/ULDPEs are separate classes of polyethylenes (1.2.3 referring to LLDPE and 1.2.4 to VLDPE/ULDPE), D24 discloses the preparation of VLDPE in the chapter concerning LLDPEs (page 24, first paragraph) and chapter 1.4.7.1 dealing with single-site polyethylenes implies that metallocene catalysts are used in the production of LLDPE. D25 also discloses the single-site catalyzed LLDPEs (Figure 11) in the chapter titled LLDPE and a similar disclosure is present in D13 under item 3.2.3.2 belonging to chapter 3.2.3 titled Linear Low-Density Polyethylene.

2.3.12 The other documents cited in appeal do not change that conclusion. The scientific articles D14 and D16 attempt to assemble a broad set of data on LLDPE resins containing 1-octene (D14) and 1-butene (D16) which have densities of 0.919-0.922 g/cm^3 (D14) or 0.918 g/cm^3 (D16) and have no measurable long chain branching. Beyond this D14 and D16 do not address the definition of LLDPEs in general and do not concern advances in the production of the recent polyethylenes of very low densities. D21 is a US patent document disclosing polyethylene copolymers and their preparation but it does not address the definition of LLDPEs. D5, D8 and D17-D20 are datasheets of commercially available polyethylenes, some of which being classified as LLDPE but none of these datasheets provides general information that could be seen as representing the common general knowledge on LLDPEs.

2.3.13 It is not disputed that conventional LLDPEs and VLDPEs/ULDPEs can have different properties and show differences of structures, but the cited common general knowledge confirms that the term LLDPE, without any further mention, may not only refer to conventional

LLDPE, but also to the broader class of polyethylenes including single-site catalysed polyethylenes such as VLDPEs or ULDPEs.

2.3.14 Thus, the common general knowledge submitted by the parties shows that the term LLDPE already had, at the priority date of the patent in suit, a more generic meaning than when the first LLDPEs were produced and that for the skilled reader the term LLDPE as it is used in granted claim 1 may refer both to the conventional LLDPE produced with a Ziegler-Natta catalyst and to the broader class which includes LLDPEs produced with single-site catalysts. The linear low-density polyethylene (LLDPE) in granted claim 1 is also not defined by a specific density range so that the density of the polyethylenes of granted claim 1 cannot constitute a distinguishing feature over the copolymers of D1.

2.3.15 According to the established case law, a non-specific definition in a claim should be given its broadest technically sensible meaning as understood by the skilled person (Case Law of the Boards of Appeal, 10th Edition 2022, II.A.6.1). On that basis, the term LLDPE in granted claim 1 should be given its broadest meaning as established by the common general knowledge cited in appeal.

2.3.16 Since the broadest technically sensible meaning of the term LLDPE encompasses ethylene copolymers with densities below 0.915 /cm^3, the densities of the copolymers EO1 and EO2 (0.87 g/cm^3 and 0.874 g/cm^3) are not seen as a feature distinguishing these copolymers from the LLDPE of granted claim 1. Besides, the values of the densities given for EO1 and EO2 indicate that these copolymers are according to the definition of

VLDPEs or ULDPEs provided in table 1, page 425 of D26 which is also supported by their values of crystallinity (around 16% for EO1 and around 18% for EO2; below 30% for VLDPEs/ULDPEs in table 1 of D26). Also, since it was not shown that the copolymers EO1 and EO2 contained long chain branching that would distinguish them from LLDPEs (D1 confirms that the copolymers dealt with therein are either linear or substantially linear, see page 51, last full paragraph to paragraph bridging pages 52 and 53), the Board does not find that that characteristic can constitute a distinguishing feature over granted claim 1. It follows that the random ethylene 1-octene copolymers EO1 and EO2 of D1 are polyethylenes of very low densities (0.87 and 0.874 g/cm^3) that can be seen as being LLDPEs in the broad sense of the term used in the common general knowledge. In this respect, since the grafted maleic anhydride copolymers of samples 1-4 based on EO1 and EO2 in D1 fulfil the other conditions laid out in granted claim 1, the Board concludes that the grafted LLDPE of granted claim 1 lacks novelty over D1.

2.4 Document D2

2.4.1 While the Board considers that the grafted LLDPE of granted claim 1 also lacks novelty over the disclosure of D2 for reasons similar to the ones outlined for D1, there is no need in view of the conclusion reached for D1 to give any further detail on that issue.

Auxiliary requests 1-3

3. Novelty over D1

3.1 Claim 1 of auxiliary request 1 corresponds to granted claim 1 with the further limitation of the melt index of the LLDPE before grafting to the range of 0.5 to 10 g/10 minutes while the melt index of the claimed product remains the same.

3.2 The opposition division considered in the decision under appeal that claim 1 of auxiliary request 1 lacked novelty over D1. In particular, it was concluded that the patent proprietor had not shown how the characterization of the LLDPE before grafting by its melt index constituted a distinguishing feature over D1 (page 6, third paragraph).

3.3 The appellant argued in appeal that the melt index of the ethylene/α-olefin interpolymers of D1 before grafting was considerably higher than 10 g/min and that these high melt indexes showed that there was a structural difference in the starting polymer that was also present in the grafted product of operative claim 1.

3.4 The objection of lack of novelty of claim 1 of auxiliary request 1 relied on the same examples (samples #1-4) that were produced from the ethylene copolymers EO1 and EO2 of D1. Table 3 of D1 shows that the melt indexes of the copolymers EO1 and EO2 before grafting were 1037 g/10 min and 558 g/10 min respectively (1000 g/10 min and 500 g/10 min on page 59 respectively). The melt indexes of the LLDPE polymer of EO1 and EO2 are therefore outside the range defined in claim 1 of auxiliary request 1 (0.5 to 10 g/10 minutes)

which was not in dispute between the parties in appeal.

3.5 The question that had to be answered was whether the melt index of the LLDPE used as starting material for the grafting reaction leading to the product MAH-g-LLDPE according to operative claim 1 implied a structural characteristic on the LLDPE that could also differentiate a maleated product according to operative claim 1 from those of D1.

3.6 The appellant accepted in section 6.1.2.2 of their statement of grounds of appeal that the melt index of the starting LLDPE was a product-by-process feature of the maleated product (MAH-g-LLDPE). The appellant, however, argued that the increase in melt index from the LLDPE (0.5 to 10 g/10 minutes) to the grafted maleated product (250 to 800 g/10 minutes) meant that cross-linking of the copolymer chains did not occur under the reacting conditions of the patent in suit. On the contrary, in samples 1-4 of D1 the melt index of the LLDPE copolymers EO1 and EO2 (1037 g/10 min and 558 g/10 min respectively) decreased substantially after maleation (672 g/10 min (sample #1), 539 g/10 min (sample #2), 410 g/10 min (sample #3) and 375 g/10 min (sample #4)) which could only be explained by the occurrence of cross-linking. Since the presence of cross-linking could be ascertained by known measurement methods on the copolymers (which was not disputed in appeal), the products according to claim 1 of auxiliary request 1 could be differentiated from those of D1.

3.7 According to established case law, when a chemical product cannot be defined by structural characteristics but only by its method of manufacture, novelty can be established only if evidence is provided that modification of the process parameters results in

products that can be differentiated from those known in the prior art (Case Law of the Boards of Appeal, 10th Edition 2022, II.A.7.2). It is sufficient for this purpose to show that distinct differences exist in the properties of the products.

3.8 This condition is, however, not met in the present case since no factual evidence was submitted as explained in the decision under appeal (page 6, third paragraph).

3.9 The Board finds that the argumentation provided by the appellant in their statement of grounds of appeal (section 6.1.2) and subsequently in their letter of 29 August 2023 (section 2.2) relied on qualitative considerations based on comparisons of the product as defined in operative claim 1 with the products of samples #1-4 of D1 which ultimately are not sufficient to establish reliably that maleation processes based on LLDPEs of different structural melt indexes (according to operative claim 1 and D1) lead to structurally different products, such as through the necessary occurrence of cross-linking in the products of the prior art (for which no evidence is available). The addition in operative claim 1 of a range defining the melt index of the LLDPE was thus not shown to distinguish the product of claim 1 of auxiliary request 1 with respect to D1. The Board therefore concludes that claim 1 of auxiliary request 1 lacks novelty over D1.

3.10 Claim 1 of auxiliary request 2 corresponds to granted claim 1 in which the range of melt index of the MAH-g-LLDPE is limited to 300 to 800 g/10 minutes. The appellant relied for claim 1 of that request on their arguments provided for the novelty of granted claim 1. It was also acknowledged by the appellant at the oral

proceedings before the Board that the limitation performed in claim 1 of auxiliary request 2 did not constitute a distinguishing feature over samples #1 to #4 of D1. The Board therefore finds that for the same reasons as for granted claim 1, claim 1 of auxiliary request 2 lacks novelty over D1.

3.11 Claim 1 of auxiliary request 3 corresponds to claim 1 of auxiliary request 1 in which the range of melt index of the MAH-g-LLDPE is further limited to 300 to 800 g/ 10 minutes. The appellant relied for claim 1 of that request on their arguments provided for the novelty of claim 1 of auxiliary request 1. Since the further limitation of the range defined for the melt index of the maleated product in claim 1 of auxiliary request 3 does not constitute a further difference over samples #1 to #4 of D1, the conclusion reached by the Board on the lack of novelty of claim 1 of auxiliary request 1 over D1 applies equally to claim 1 of auxiliary request 3.

4. Admittance of auxiliary requests 4-7

4.1 Auxiliary requests 4-7 were filed by the appellant with their statement of grounds of appeal. It is undisputed that corresponding requests were not present in the proceedings before the opposition division.

4.2 Claim 1 of auxiliary request 4 corresponds to the process of granted claim 11 with the further limitation of the melt index of the LLDPE to the range of 0.5 to 10 g/10 minutes.

4.3 Claim 1 of auxiliary request 5 corresponds to claim 1 of auxiliary request 4 further limited in that step (c) "is carried out in the absence of an added free radical

initiator".

4.4 Claim 1 of auxiliary request 6 corresponds to claim 1 of auxiliary request 4 further limiting the range of melt index of the MAH-g-LLDPE to 300 to 800 g/10 minutes.

4.5 Claim 1 of auxiliary request 7 corresponded to claim 1 of auxiliary request 5 further limiting the range of melt index of the MAH-g-LLDPE to 300 to 800 g/10 minutes.

4.6 The admittance of these requests into the proceedings was contested by the respondent on the grounds that these requests only pertained to a process which was not the object of the decision under appeal (rejoinder, page 2, last paragraph) and therefore were late filed in appeal.

4.7 The appellant submitted that auxiliary requests 4 to 7 were filed in direct response to the decision of the opposition division on lack of novelty in view of D1 and D2 of the main request and auxiliary request 1 filed during the opposition proceedings. The appellant considered that given that the opposition division in the two preliminary opinions had acknowledged novelty, there was no reason to file these auxiliary requests in the first instance proceedings.

4.8 It is, however, apparent that the notice of opposition already contained objections of lack of novelty in view of D1 (samples EO1 and EO2) and D2 (sample EO 07) and that the question of novelty of granted claim 1 hinged on the meaning of the term linear in linear low density polyethylene (LLDPE). The reasons for which granted claim 1 was found to lack novelty over D1 and D2 in the

decision under appeal had therefore already been raised by the opponent in their notice of opposition and, contrary to the view held by the appellant, the opposition division in the summons to attend oral proceedings dated 5 June 2020 (page 2, last paragraph) had not acknowledged novelty, but it had made it clear that the "*discussion on the disputed meaning of the term "linear" during the oral proceedings and its influence on the issue of novelty will be a crucial one for the final decision on novelty of the disputed subject-matter*". The Board thus finds that the appellant had been made aware in these summons at the latest that a negative conclusion on novelty of granted claim 1 and claim 1 of auxiliary request 1 over D1 and D2 was possible. It is, however, only with their statement of grounds of appeal that the appellant chose to file new auxiliary requests based on the process for preparing the MAH-g-LLDPE defined in granted claim 11 and further amended that had never been part of the proceedings before and for which no separate line of defence had been submitted up to that point. In view of the course of the proceedings, the Board finds that these auxiliary requests could and should have been submitted earlier during the opposition proceedings. No special circumstances in appeal appear to be present to justify their filing and the introduction of a fresh case only at the appeal stage.

4.9 The Board therefore on application of Article 12(6) RPBA, second sentence, does not admit auxiliary requests 4 to 7 into the appeal proceedings.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

D. Hampe D. Semino

Decision electronically authenticated