EI 1535 *Minimum criteria to determine acceptability of additives for use in multi-product pipelines co-transporting jet fuel* – Additive Listing

EI 1535 describes the minimum information required from suppliers and shippers of additive-containing products in multi-product pipeline systems that co-transport jet fuel to demonstrate to pipeline operators and other interested parties that these products will not subsequently adversely affect jet fuel or have an adverse effect on pipeline operations.

Several multi-product pipeline operators have previously made available in the public domain lists of those additives that they have assessed and have found to be satisfactory in their pipeline operations (in most cases this will have involved reference to 'IP *Multi-product pipelines: Minimum criteria to determine additive acceptability*'). Table 1 is a composite of the former lists from pipeline operators that since 2016 has been updated by the EI as an informative reference for any fuel suppliers/shippers and pipeline operators worldwide. It shall not be regarded as an approval list of universal pipeline adoption. An additive shall not be considered as being suitable for use in all configurations of pipeline on the sole basis of its inclusion in Table 1.

Multi-product pipeline operators are invited to provide further information to update Table 1 by submitting to EI details of any other additives that they have assessed in accordance with IP *Multi-product pipelines: Minimum criteria to determine additive acceptability* (1st or 2nd editions), or if evaluated since October 2016, EI 1535 3rd edition[1], AND with which they have auditable experience of satisfactory use in their pipeline operations.

Note: Other lists of additives in the public domain provided by pipeline operators, may also be of interest. The EI has not verified whether additive approval was based on EI 1535.

For EI to add an additive to Table 1, the following information is required to be submitted to technical@energyinst.org by a multi-product pipeline operator:

- The name of the additive manufacturer;
- The name of the additive;
- The maximum treat rate evaluated;
- A statement confirming that the additive was evaluated in accordance with IP *Multi-product pipelines: Minimum criteria to determine additive acceptability* (1st or 2nd editions), or if evaluated since October 2016, EI 1535 3rd edition, and met fully the requirements;
- A statement that the pipeline operator has auditable evidence of its successful use in that pipeline operator's pipeline system.

The multi-product pipeline operator is also invited to provide optional information regarding the pipeline system in which the additive has been successfully used (length, diameter, lined/unlined, product flow rate, use of buffers without additives etc.)

Table 2 provides details of additives that have been evaluated in accordance with EI 1535 3rd edition, that are awaiting use in a multi-product pipeline.

For EI to add an additive to Table 2, the following information is required to be submitted to technical@energyinst.org by a multi-product pipeline operator or fuel supplier:

- The name of the additive manufacturer;
- The name of the additive;
- The maximum treat rate evaluated;
- A statement confirming that the additive was evaluated in accordance with EI 1535 3rd edition and met fully the requirements.

[1] IP *Multi-product pipelines: Minimum criteria to determine additive acceptability* was renamed as EI 1535 *Minimum criteria to determine acceptability of additives for use in multi-product pipelines co-transporting jet fuel* upon publication of the 3rd edition.

For EI to move an additive from Table 2 to Table 1, the following information is required to be submitted to technical@energyinst.org by a multi-product pipeline operator:

- A statement that the pipeline operator has auditable evidence of the successful use of the additive at the treat rate shown, in that pipeline operator's pipeline system.

Note that additives nominated solely by additive manufacturers/suppliers for inclusion in Tables 1 or 2 will not be included.

The inclusion of an additive in Table 1 or Table 2 shall in no way be inferred or interpreted as implying any form of endorsement by the EI or its members that developed the technical content of EI 1535. The EI has not undertaken any technical review/assessment/validation of the potential impact of these additives on jet fuel, and neither the EI nor its members that developed the technical content of EI 1535 shall be held liable for their use in multi-product pipeline systems. The additives are listed by manufacturer alphabetically. The lists shall not be interpreted as implying any order of preference.

Tables 1 or 2 do not include details of any additives that are approved by specification authorities for use in jet fuel. See for instance, Def Stan 91-091 or ASTM D1655 for further details of approved jet fuel additives.

Table 1 Additives that have been assessed by a pipeline operator in accordance with EI 1535 and found to be satisfactory in their pipeline operation

Manufacturer	Additive	Additive purpose	Maximum treat rate evaluated	Pipeline operator that undertook assessment and has successfully used the additive	Optional pipeline information (length, diameter, lining, product flow rate, use of buffers without additives etc.)
AFTON	HITEC 4140A	Lubricity improver additive	290 ppm (m/m)	CEPMA/UFIP-TRAPIL	
AFTON	HITEC 4141	Lubricity improver additive	370 ppm (diluted version of HITEC 4140A) (m/m)	CEPMA/UFIP-TRAPIL	
Baker Hughes	TOLAD 3514	Static dissipater additive	15 ppm	UFIP-TRAPIL	
BASF	KEROKORR LA 99	Lubricity improver additive	200 ppm (v/v)	CEPMA/UFIP-TRAPIL	
BASF	KEROKORR LA 99 C	Lubricity improver additive	140 ppm (m/m)	Hellenic Petroleum	10 km, 300 mm diameter
CESTOIL	COLI9500	Lubricity improver additive	200 ppm (m/m)	Yanchang Petroleum Group Pipeline Company	
CESTOIL	COLI9500E	Lubricity improver additive	200 ppm (m/m)	Yanchang Petroleum Group Pipeline Company	
CESTOIL	COLI9500ES	Lubricity improver additive	200 ppm (m/m)	Yanchang Petroleum Group Pipeline Company	
CESTOIL	ST 3425	Static dissipater additive	10 ppm (m/m)	Yanchang Petroleum Group Pipeline Company	
CHIMEC S.p.A.	CHIMEC 9730	Lubricity improver additive	263 ppm (v/v) (diluted version of CHIMEC 9740)	See NOTE A	
CHIMEC S.p.A.	CHIMEC 9740	Lubricity improver additive	250 ppm (v/v)	Hellenic Petroleum	11 km, 300 mm diameter, 270-325 m^3/h
DORF KETAL	SR 2008	Lubricity improver additive	300 ppm (m/m)	BP	30 km, 150 mm diameter, unlined pipeline trial

May not be suitable for use in all pipelines

Manufacturer	Additive	Additive purpose	Maximum treat rate evaluated	Pipeline operator that undertook assessment and has successfully used the additive	Optional pipeline information (length, diameter, lining, product flow rate, use of buffers without additives etc.)
DORF KETAL	SR 2010	Lubricity improver additive	300 ppm (m/m)	BP	30 km, 150 mm diameter, unlined pipeline trial
Infineum	R602	Lubricity improver additive	600 ppm (diluted version of R655) (m/m)	CEPMA/UFIP-TRAPIL	
Infineum	R640	Lubricity improver additive	300 ppm (m/m)	Viva Energy Australia	55 km, 200 mm diameter, unlined, 300m^3/hr
Infineum	R646	Lubricity improver additive	300 ppm (v/v)	BP Kwinana Refinery	39 km, 200 mm diameter, unlined
Infineum	R649	Lubricity improver additive	600 ppm (v/v)	See NOTE A	
Infineum	R650	Lubricity improver additive	290 ppm (v/v)	CEPMA/UFIP-TRAPIL	
Infineum	R650D	Lubricity improver additive	305 ppm (v/v) (diluted version of R650)	See NOTE A	
Infineum	R654	Lubricity improver additive	300 ppm (m/m)	Yanchang Petroleum Group Yanan Refinery	
Infineum	R651	Lubricity improver additive	580 ppm (v/v) (diluted version of R650)	See NOTE A	
Infineum	R655	Lubricity improver additive	200 ppm (m/m)	CEPMA/UFIP-TRAPIL	
Infineum	R671	Lubricity improver additive	400 ppm (m/m) (diluted version of R655	CEPMA/UFIP-TRAPIL	
Infineum	R673A	Lubricity improver additive	286 ppm (m/m) (diluted version of R655)	CEPS	

May not be suitable for use in all pipelines

Manufacturer	Additive	Additive purpose	Maximum treat rate evaluated	Pipeline operator that undertook assessment and has successfully used the additive	Optional pipeline information (length, diameter, lining, product flow rate, use of buffers without additives etc.)
Innospec	Octamar LI-5	Lubricity improver additive	227 ppm (m/m)	See NOTE B	
Innospec	OLI 8000	Lubricity improver additive	200 ppm (m/m)	Hellenic Petroleum	10 km, 300 mm diameter
Innospec	OLI 8010	Lubricity improver additive	220 ppm (m/m) (diluted version of OLI 8000)	See NOTE A	
Innospec	OLI 9900	Lubricity improver additive	100 ppm (m/v)	CEPMA/UFIP-TRAPIL	
Innospec	OLI 9950	Lubricity improver additive	155 ppm (diluted version of OLI 9900) (v/v)	CEPMA/UFIP-TRAPIL	
Innospec	OLI 9980	Lubricity improver additive	300 ppm (m/m)	Viva Energy Australia	
NALCO Water	EC5583A	Static dissipater additive	10 ppm (m/m)	Yanchang Petroleum Group Pipeline Company	
NALCO Water	EC5719A	Lubricity improver additive	300 ppm (m/m)	Mainline Pipelines Limited	
NALCO Water	EC5719W	Lubricity improver additive	600 ppm (m/m)	Rhein-Main-Rohrleitungstransportgesellschaft mbH (RMR)	
NALCO Water	EC5720A	Lubricity improver additive	400 ppm (m/m)	Viva Energy Australia	
NALCO Water	EC5720G	Lubricity improver additive	400 ppm (m/m)	Astron Energy	12 km, 300 mm diameter, unlined pipeline trial
NALCO Water	EC5725A	Lubricity improver additive	250 ppm (m/m)	Astron Energy	12 km, 300 mm diameter, unlined pipeline trial
NALCO Water	EC5726A	Lubricity improver additive	200 ppm (m/m)	Yanchang Petroleum Group Pipeline Company	

May not be suitable for use in all pipelines

Manufacturer	Additive	Additive purpose	Maximum treat rate evaluated	Pipeline operator that undertook assessment and has successfully used the additive	Optional pipeline information (length, diameter, lining, product flow rate, use of buffers without additives etc.)
NALCO Water	EC5727A	Lubricity improver additive	250 ppm (m/m)	Viva Energy Australia	
Nippon Yushi	LE772W	Lubricity improver additive	87 ppm	BP	30 km, 150 mm diameter, unlined pipeline trial
Sanyo	Sanfric FM6C	Lubricity improver additive	200 ppm	BP	30 km, 150 mm diameter, unlined pipeline trial
Total ACS	PC 12/ PLI 800	Lubricity improver additive	300 ppm (m/m)	TRAPIL	66 km, 508 mm diameter and 87 km, 813 mm diameter pipeline trial
Total ACS	PC 30	Lubricity improver additive	600 ppm (v/v)	CEPMA/UFIP-TRAPIL	
Total ACS	PC 31	Lubricity improver additive	375 ppm (diluted version of PC 32) (m/m)	CEPMA/UFIP-TRAPIL	
Total ACS	PC 32	Lubricity improver additive	300 ppm (m/m)	CEPMA/UFIP-TRAPIL	
TOTAL ACS	PC 60	Lubricity improver additive	272 ppm (m/m)	TRAPIL	66 km, 508 mm diameter and 87 km, 813 mm diameter pipeline trials

May not be suitable for use in all pipelines

Manufacturer	Additive	Additive purpose	Maximum treat rate evaluated	Pipeline operator that undertook assessment and has successfully used the additive	Optional pipeline information (length, diameter, lining, product flow rate, use of buffers without additives etc.)
Notes: – NOTE A: The Energy Institute has confirmed with the additive manufacturer that the diluent used is a hydrocarbon-derived solvent that does not affect the surfactancy of the additive package. – NOTE B: The Energy Institute has confirmed with the additive manufacturer that Octamar LI-5 contains only a lubricity improver additive that is included in Table 1, in combination with an aviation fuel approved additive that is listed in international jet fuel specifications. – CEPMA became Central Europe Pipeline System Programme Office (CEPS PO) of the NATO Support Agency (NSPA) in 2012. – A former public-domain list provided by a pipeline operator included a drag reducer additive. Such additives are excluded from the scope of EI 1535. ASTM D7872 *Standard test method for determining the concentration of pipeline drag reducer additive in aviation turbine fuels* should be used to verify that DRA injection controls are adequate. – Additive manufacturers shall alert all parties to changes in additive formulation/manufacturing processes or raw material sources. Changes shall be assessed on a case-by-case basis and the need for re-evaluation of the additive (in accordance with EI 1535) determined. The changes shall be reported to all customers.					

Table 2 Additives that have been assessed by a pipeline operator or fuel supplier in accordance with EI 1535, awaiting use in pipeline operation

Manufacturer	Additive	Additive purpose	Maximum treat rate evaluated	Pipeline operator or fuel supplier that undertook assessment
EMAX Solutions	ESDA 1513	Lubricity improver additive	50 mg/L	BP
Innospec	OLI 5500	Lubricity improver additive	50 mg/L	BP
NALCO Water	EC 5713A	Lubricity improver additive	(300 mg/l in diesel) added to jet fuel (15 mg/L))	BP
Sanyo Chemical Industries	SANFRIC FM6	Lubricity improver additive	50 mg/L	BP