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NUPIGECO SpA

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O/ref: A20140311-1159778-BEV-01EN WOM: 137304-1 / Boss: 1159778

Antwerp, 17-03-2014

**Certification of SMARTFLEX piping NUPIGECO
 for petrolstations**

In accordance with the Flemish law VLAREM II art. 5.17.1.4 §2
 TSMA, TSMAD, TSMAH, TSMAH-H, TSMAH-Z, TSMAMD, TSMAMD-H, TSMAMD-Z, TSMADU and accessories

2012/HBenEvensSGS-SSB-2014

<u>Place of inspection:</u>	SGS Belgium NUPIGECO ITALY (Imola, Castel Guelfo, Busto Arsizio)	<u>Inspection date:</u>	11-03-2014 – 14-03-2014
Environmental expert	Ben Evens 654 2012/HBenEvens	Period of validity:	5 years

1. Description of the system to be certified:

First inspection date/visit: May-August 2007

Second inspection date/visit: May 2012

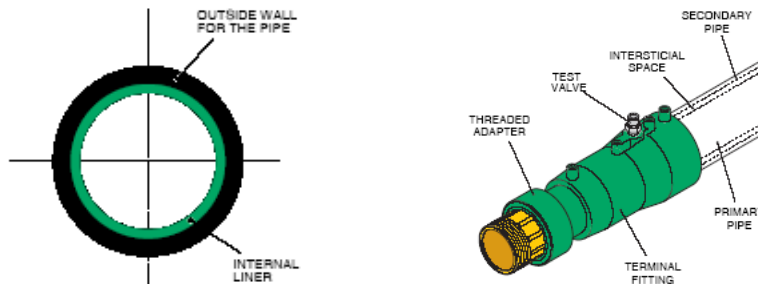
This report is based on our previous reports (REP 07000001 and A2100001) and the observations made during inspections.

In the new revision of the standard EN14125, two additional test fuels were introduced for the fuel tests.

In addition to already certified SMARTFLEX products some new pipes were introduced to the range. TSMAH-H, TSMAH-Z, TSMAMD-H and TSMAMD-Z. These pipes are basically the same as the existing TSMAH pipe except the liner of the new pipes is 0,5 mm thick instead of 1 mm

The SMARTFLEX installation technology is based on one of the most widely used processes in the polyethylene industry: electro-fusion.

It has been optimized for use in buried applications and for the transportation of fuels such as Gasoline, Unleaded Gasoline, Diesel, Biodiesel and E85.



Used types: TSMA, TSMAD, TSMAH, TSMAH-H, TSMAH-Z, TSMAMD, TSMAMD-H and TSMAMD-Z TSMADU

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TSMAD: Double wall piping consisting of a fuel flow primary pipe (TSMA – see further on) and a secondary pipe for leak detection (TSMAS – black pipe on the in- and outside)

TSMA: Pipe for fuel flow. This pipe is black on the outside while the inside (liner) is colored green. The outside features two green lines (180° running parallel). These green lines are dotted to allow marking.

T SMAH (including T SMAH-H and T SMAH-Z): Pipe for fuel flow. This pipe is black on the outside with a different liner inside then the TSMA. The inside (liner) is colored green. The outside features two red lines (180° running parallel). These red lines are dotted to allow marking.

T SMAHD: Double wall piping consisting of primary T SMAH and secondary pipe for leak detection (T SMAHS)

T SMAU: Pipes for vapory recovery. This pipe is black on the outside while the inside (liner) is colored yellow. Even here, the outside features two yellow, parallel running and dotted lines.

[Remark: It's allowed to use TSMA or T SMAH pipes for vapory recovery but not otherwise]



Accessories: 45 and 90 degree elbows, end caps, tees, adapter fittings, straight connectors,...

Used materials:

Outer pipe: An extruded black polyethylene.

Liner: Extruded into the pipe (Modified Polyamide with glue for TSMA and EVOH for T SMAH).

Other Secondary Containment: The outer pipe is an extruded black polyethylene.

Plastic Electrofusion Fittings or welding sockets: are green (80% polyethylene) or black molded polyethylene. They come in sleeves, 90° elbows, 45° blends,...

Smartflex design is based on ASTM D2837 (ISO9080)

2. Used code for the construction of the pipes :

EN 14125 (T SMAH - T SMAU)

Institute of Petroleum Performance Specification for Underground Pipework Systems at Petrol Filling Stations. (TSMA - TSMAD)

KIWA BRL-K552/03: Evaluation guideline for the KIWA technical approval with product certificate for underground thermoplastics piping systems for the transport of liquid oil products and their vapours. (TSMA – TSMAD – T SMAU)

3. Verification of the prototype execution file:

Following the Flemish legislation Vlareem article 5.17.1.4 §2, the non-accessible pipes must be installed in a trench filled with a fine-grained inert material. This trench must be impervious to liquids and installed at a slope towards a liquid-tight sump.

This system may be substituted by an alternative system which offers the same guarantees regarding prevention of soil and/or groundwater pollution. The alternative system must be approved by an environmental expert accredited for the inspection and approval of gasholders or hazardous substance tanks. A certificate of this acceptance will subsequently be drawn up and signed by the aforementioned environmental expert. This certificate is kept available for perusal by the supervisory official. A copy of this certificate shall be sent to the Flemish environmental department.

The customer execution file contains at least the following parts:

3.1. Name and address workshop:

NUPIGECO SpA
Via Colombarotto 58
40026 Imola
Italy
(Production pipes)

NUPIGECO SpA
Via Dell' Artigianato 13
40023 Castel Guelfo di Bologna
Italy
(Storage pipes and fittings)

NUPIGECO SpA
Via Stefano Ferrario Z.I. sud ovest
21052 Busto Arsizio
Italy
(Production fittings and QA/QC)

Contact persons:

Roberta Brusi, Product Manager Smartflex

Erica Alberoni, Quality Manager of Imola and Castel Guelfo NUPIGECO plants

Rosario Barbera, Quality Manager of Busto Arsizio NUPIGECO plant

Roberto Tosi, Director TTR (laboratory, see 4.2)

3.2. Validity area for the pipes (see technical catalogue)

3.3. Proposed construction code: see 2.

3.4. A detailed design plan:

NUPIGECO SpA – STAB.TI 2-3, Istruzioni di lavoro (ISTR043: Piano della qualita' Smartflex)
Data 2/04/2013, 1 ED V (is being revised)

3.5. List with the used safety equipment: not applicable

3.6. A described document mentioning:

- Used materials;
- The designing technics;
- The structure of the construction including the description of the inner and outdoor layer.

3.7. The designer's quality system

- ISO 9001:2008 dd 26/07/2011 – expiring date 25/07/2014 – Registration number IT-3440 (certificate n°004 by CISQ, an Italian Certification Company)
- The revised SMARTFLEX quality plan edition “ 1 ED V” was submitted (only available in the Italian language)

3.8. Third party inspections during construction: not applicable (self certification)
(Quality check is done by an external laboratory, TTR-institute)

3.9. A Dutch manual mentioning:

- Name of the manufacturer;
- Type of the pipe
- Necessary maintenance and installation prescriptions.
See Welding Unit User's handbook (translated by TSE Netherlands (not Belgium) and SMARTFLEX Installation training guide (translated by Petroltech and TSE)
 - Handling pipes and fittings: transport, storing, stacking,...
 - Electro-Welding
 - Trenching and Backfilling
 - Piping Layout
 - Cutting and scrapping
 - Assembly
 - Testing procedures
 - Checklist
 - ...

4. Prototype inspections:

During our stay in Italy, we visited the following plants: Imola (production Smartflex pipes), Castel Guelfo di Bologna (Storage Smartflex pipes and fittings), Busto Arsizio (production Smartflex fittings) and the TTR-institute (Quality lab).

4.1. Additional fuel tests for the pipes in the existing certification:

T SMAH:

- Fuel 3 according pr- EN14125:2013: TTR test report 1101401-001
- Fuel 4 according pr- EN14125:2013: TTR test report 1101401-002

T SMAU:

- Fuel 3 according pr- EN14125:2013: TTR test report 1101406-001
- Fuel 4 according pr- EN14125:2013: TTR test report 1101406-002

4.2. Initial type testing of the new pipes:

The initial type tests for T SMAH-H and T SMAH-Z were reviewed. It was not necessary to redo all the tests because of the similarity of the T SMAH pipes and the T SMAH-(H/Z). The only difference is the thickness of the liner. This does not influence properties of the pipe like conductivity (static electricity), puncture resistance, pull-out strength and weathering. The test reports of the applicable test were reviewed and accepted without remarks. Summary of the tests:

- Hydrostatic pressure test at 23°C
- Hydrostatic pressure test at 50°C
- Leakage testing under Vacuum
- Fuel permeability and swelling
- Fuel compatibility
- Impact testing

On request of SGS some additional tests were performed on the new pipes at TTR-lab (see point 5.3)

4.3 Review of quality plan of the new pipes:

In the new revision of the NUPIGECO quality plan T SMAH-H and T SMAH-Z was added. The same test summary (type test and batch release) is applicable for T SMAH (old pipe) as for T SMAH-H and T SMAH-Z. The test summary in the NUPIGECO quality plan prescribes a peel test for according ISO 8510-2. This standard gives no acceptance criteria and the quality plan of NUPIGECO also doesn't mention an acceptance criteria, this is necessary. The internal procedure of TTR refers to *EN14125 5.5 fuel tests* and gives a limit of 15 N/cm peel strength. But TTR-institute needs to follow the NUPIGECO quality plan and not the other way around.

4.4. Test mentioned in the standards/ Received certificates/checks/inspections done by (other) notified bodies:

The pipeline systems were already tested with positive result by the following bodies:

4.4.1. Underwriters Laboratories Inc. (USA – 333 Pfingsten Road, Northbrook, Illinois 60062-2096)

- File MH25887, Project 04NK26954 (May 05, 2006): Report on piping, flammable liquid, underground
With test such as permeability, fluid (fuel) compatibility, leakage, hydrostatic strength, burst, pull, resistance to crushing test, sustained pressure, low temperature, bending, drop, ball impact, pressure and vacuum, aging,...

4.4.2. ERA Technology Ltd (UK, Cleeve Road, Leatherhead Surrey KT22 7SA)

Letter of approval (will be transformed in a certificate of compliance):

“NUPIGECO TMAH/D(H) and (Z) pipe work EN14125:2013 approval”

ERA Technology granted NUPIGECO approval for the following range of pipe work for size 50 mm, 63 mm , 90 mm and 110 mm: TMAH, TMAHD, TMAH-H, TMAH-Z, TMAHD-H and TMAHD-Z for positive pressure, vacuum, vapor recovery, fill and secondary containment applications to EN14125:2013

Certificate of Compliance:

Number BC63/0041/98/002 (dated 19/01/1998) for underground petroleum pipework for secondary containment only
(Full details in ERA report 98-0041)

Number BC63/1111/97/002A (dated 16/01/1997) for underground petroleum pipework for positive pressure and suction delivery lines
(Full details in ERA report 97-1111)

Number BC62/0206/2001/001 (dated 20/04/2001) for Smartflex TSMA50, TSMA63, TSMA90 and TSMA110 with 'H' barrier layer
(Full details in ERA report 2001-0206)

Number BC62/0469/2002/001 (dated 11/12/2002) for Smartflex, Smart X2 & Smartcontainment range of pipes and connectors
(Full details in ERA report 2002-0469)

Number BC66/2006-0091/001 (dated 28/02/2006) for Smartflex product range
(Full details in ERA report 2006-0091)

Number BC66/2006-0091/002 (dated 21/11/2006) for Smartflex product range
(Full details in ERA report 2006-0091 Issue 2)

Fuelstar Surveillance Scheme: 2010 Report for EN 14125 (dated October 2010) – report number 2010-0578

Number BC66/2006-0091/006 (dated 03/05/2012) for Smartflex product range
(Full details in ERA report 2006-0091 Issue 2 and ERA Test Certificates 4613-4615)

4.4.3. Wolfson Electrostatics (UK, University of Southampton SO17 1BJ):

- Report 257/GLH (13 November 2000): An audit of Electrostatic Safety for the SMARTFLEX Plastic Piping System

4.3.4. Physikalisch-Technische Bundesanstalt

- An audit of Electrostatic Safety for the Smartflex Plastic Piping system D.63 mm (18/09/2001)

4.4.5. Approval in countries;

Smartflex was already approved in the following countries:

Belgium:

Flemish Region (past):

Ando Consult:

- Report 2002.2111.1242.P.919 (21/11/2002): Vlare certification for TSMA and TSMAU

- Report 2003.2404.1306.P.002 (24/04/2003): Vlare certification for TSMAD

SGS:

- Report 07000001 (723082) (May-August 2007): Vlare certification for Smartflex

- Report A2100001 (May 2012): Vlare certification for Smartflex

Walloon Region: DPA/DCPP/HYDROCARBU/DF/AGW 4-3-1999/art.681bis-29/04/09.10.03/117473 dd. 19/11/2003

The Netherlands, Kiwa (15/04/2012 – BRL-K552/03 – Product certificate K26785/05)

Germany, Deutsches Institut für Bautechnik (26/04/2012)

Italy, Ministero dell'interno (10/10/1997) and TESI (07/04/2003 - equipment)

Spain, ENAC (12/03/1997) and ATISAE (01/09/1999)

Portugal, Ministério da economia (04/03/2004)

Others: Poland, Croatia, Hungary, Yugoslavia, Bulgaria, Ukraine, Russia, Romania, Denmark, China, Argentina, India, New Zealand, USA (several states), Singapore, Thailand, Brazil.

SGS has a copy of all these certificates in a file.

4.5. The manipulation of the finished pipes (including the instructions for transport):

See Technical Catalogue

For the Belgium market, the pipes will be marked with the number mentioned in this certificate:

2012/HBenEvensSGS-SSB-2014

2012/HBenEvens : Recognition number of the environmental expert (Flemish)

SGS SSB : Inspection Company

2014: Year of the certificate

4.6. The certificate of conformity proposed by the designer:

The designer gives (at request) a warranty form for 30 years

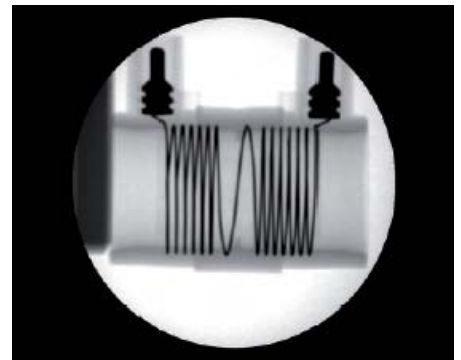
4.7. Quality requirements for the installers and welders of the pipes:

See Smartflex Installation Training Guide

The training of the installers shall be conducted by a Certified SMARTFLEX Instructor. After a successful completion of the training, the installer will receive an application form (Smartcard Application Form) valid for a period of 3 years.

Following SMARTFLEX product/technical literature shall be given to each installer:

- SMARTFLEX Product Catalog, most recent revision
- SMARTFLEX Technical, most recent revision
- User Manual – Welding Unit,



5. Inspections performed/witnessed by environmental expert:

5.1 Check calibrations

In Imola, Castel Guelfo di Bologna and TTR-institute the calibrations of the measuring equipment, sensors (on the extrusion machines) were checked. A general database is used for all the production locations and the TTR institute. No remarks.

5.2 Welding training

A short introduction of the welding training was given. As well theoretical as practical.

5.3 Testing at TTR-institute

On request of the environmental expert same additional tests were performed at the TTR-institute:

- Raw materials:
 - o Melt flow rate (MFR): no remarks
 - o Carbon black content : no remarks
 - o Density test: no remarks
- New type of pipes:
 - o Pressure test TSMAH-H Ø63 mm at 80°C for 165h: waiting for result
 - o Burst test of TSMAH-H Ø63 mm: burst pressure 56,2 bar, no remarks
 - o Crush test of TSMAH-H Ø63 mm: no remarks
 - o Bend test of TSMAH-Z Ø63 mm: no remarks
 - o Peel test of TSMAH-Z Ø63 mm: test ok, see remark 4.3

6. System requirements to take the pipes in service:

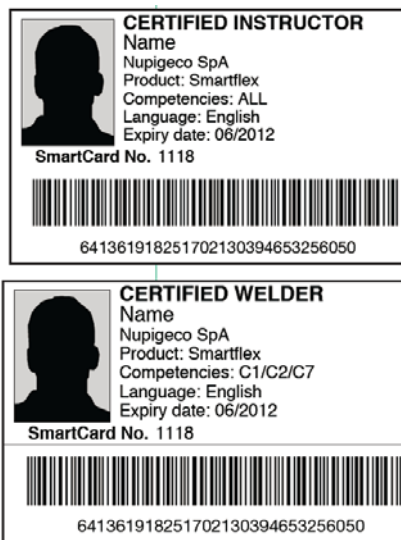
All the requirements mentioned in the under-mentioned manuals are applicable:

See manual: Welding Unit User's handbook

See manual: SMARTFLEX Technical Catalogue

See manual: SMARTFLEX Installation training guide

SMARTFLEX can be installed only by SMARTFLEX certified Installers. A Certified Installer shall complete a SMARTFLEX Certified Installer training course prior to obtaining his/her Certified Installer credentials. Certified Installer training is valid for a period of 3 years.



The Check List for Smartflex Installations has to be filled in and provided for the inspector when asked.

The SMARTFLEX piping system comes with a 30y raw materials and workmanship warranty. **In order for the product warranty to be valid, SMARTFLEX must be installed by factory certified installers in accordance with the latest technical instructions.**

The warranty is validated only by providing NUPIGECO with the warranty certification form, the welding report and the pressure test report.

We received a copy from the actual certified installers in Belgium.

6.1. Enumeration of the most important requirements:

- Only suitable for the installation of fuel conveyance and distribution systems for motor vehicles (Gasoline and Diesel Fuels);
- Only suitable for underground pipeline systems;
- The pipe lining must be protected from exposure to UV rays;
- The soil surrounding the pipe may not contain any aggressive agent or inadequate backfill material which could affect and/or damage the materials used;
- The outer pipe is not resisted to a prolonged time in fuels;
- The only system allowed for filling the tanks is a system based on gravitation;
- All pipes must be placed at a sufficient gradient to the storage tank(s);
- Generally pipe and fittings should be installed at a minimum depth of 45cm;
- Piping should be separated by a distance of at least one pipe diameter from each other as well as from the trench wall (with 15cm of backfill placed under the pipe as bedding material);
- Crossing pipes must be separated by a minimum of 5cm of compacted backfill material to prevent point loading condition.
- In case of pipelines for service stations, they may not be used in a condition of overpressure (only during the test procedure (see further on));
- All metal components of the piping system must be earthed, since they are a suitable source of electrostatic ignition. Components which cannot be earthed – such as weld-on sockets placed in the visit chamber (not underground in the earth) – must be provided with a permanent brush discharge insulation, e.g. leak-proof caps, filling material with satisfactory brush discharge insulation properties or a connection (cable) from the earthing with the pin.
- No metal objects or components may be placed or fitted inside the primary pipe, as these elements can act as an electrode and may generate an electrical discharge.
- Smartflex has no impact on cathodic protection systems. It's not necessary to use insulating sleeves.
- The fuel flow rate may not exceed 3.5 m/s.
- No filters may be fitted before or inside the plastic pipes (in the direction of the fuel flow).
- Flammable discharges must be avoided in all sections of the piping system.
- All the prescriptions and the procedures of the manufacturer and the owner of the station(s) are applied to the yard.
- Insulated metal parts must always be earthed.
- All the legislations regarding the installation of pipes and other equipment are applicable.
- If the proprietor should find any defects or flaws in the installation or pipes, he has to inform immediately the manufacturer/importer and SGS Industrial Services Belgium.

6.2. Test to be carried out by the environmental expert:

The environmental expert is to carry out the following inspections, after the complete installation of the pipeline system, but prior to backfilling:

- Visual inspection of the welding indicators on the fittings to ensure:
 - that misalignment between two pipes does not exceed 10°
 - that the correct insertion depth of the pipes in the fitting has been observed
 - that there is no escape of molten material, and that the area from which the oxidation has been scraped off is visible
 - that no parts of the resistor inserted in the fitting protrude
- All Smartflex installations must be pressure tested prior to being placed into service. Testing procedure:

85 $\pm_{-0.7}^0$ psi/20 min	Gaseous Fluids		Liquid Fluids		
	Pre-conditioning ⁽¹⁾	Test Pressure	Test Duration	Test Pressure	Test Duration
Primary pipe	7 $\pm_{-0.5}^0$ bar/20 min	87 psi (6 bars)	2 hours	174 psi (12 bars)	2 hours
Secondary pipe	6 $\pm_{-0.5}^0$ bar/20 min	58 psi (4 bars)	2 hours	87 psi (6 bars)	2 hours
Rubber entry boots		5 psi (0.3 bar)	2 hours	5 psi (0.3 bar)	2 hours

1) The pre-conditioning phase is not included in the barcode of the PRESSURE TEST CARD and shall be carried out with pressure feed not regulated by the pressure test unit. The pressure test unit shall be connected at the end of the pre-conditioning phase.

WARNING: When testing the primary pipe make sure that the test ports on the double wall fittings are open and the hollow space properly vented.

WARNING: As in any system where pressure is employed, adequate safety precautions must be exercised.

The fluids recommended for the tests are: compressed air, nitrogen, helium or water. In most cases compressed air will be used.

Test procedure in this case is:

- Primary pipe: 6 bar during 2 hours minimum
- Secondary pipe: 4 bar during 2 hours minimum
- Complete installation with fittings and tanks: 0,3 bar during 2 hours minimum

Inspect all welding fittings and connections.

Record the ambient temperature at the beginning and the end of testing, as temperature variations will affect gas pressure inside the pipe.

Primary pipe and secondary pipe (where applicable) shall be tested separately

(leaking connections are likely to be due to an interrupted electro-welding cycle, a not properly scraped end of the pipe, a dirty pipe,...)

Only in case of an interruption of the electro-welding cycle, it's possible to re-weld the pipe (only once!)

- Check for possible deformations;
- Check whether the gradient of the pipes towards the tank(s) is sufficient;
- Second leakage test after backfilling at 300 mbar. Checking all joints for leaks by means of soapy water;
- Check the certification of the qualified fitter and welding operator, the calibration certificate of the welding appliance;
- Check the Smartflex checklist
- Leakage test performed on the pipes during each obligatory periodic inspection (general inspection).

7. Conditions

- The observation made in point 4.3 of this report should be improved and resolved
- The ISO 9001 certificate expires on July 2014, when the ISO 9001 is not prolonged for any reason NUPIGECO inform SGS and the environment expert immediately.

8. Conclusion:

In view of the fact that:

- NUPIGECO is an ISO certified company,
- SMARTFLEX can only be installed by SMARTFLEX certified Installers
- All requirements mentioned in this document are strictly followed,
- SMARTFLEX and similar systems have already been approved and accepted in the Flemish region and in various countries,

SMARTFLEX can be used as an alternative system (Vlarem II art. 5.17.1.4 §2) which offers the same guarantees with regard to prevention of soil and/or groundwater pollution.

A copy of this certificate shall be send to the Flemish environmental department.

The undersigned environmental expert shall have the right to revoke the present report/certificate if pipes and fittings of this type no longer meet the accepted scientific and technological requirements.

The present report is valid for a maximum period of five years. Recertification is required before March 2019.

The environmental expert recognized
in the discipline tanks for gasses and
dangerous products (Flanders)