EUROPEAN BASIC ACRYLIC MONOMER GROUP (EBAM)

Use of dry disconnect couplings
on transportation equipment for acrylic monomers service

Context

For several years this sector of the chemical industry has been looking for interchangeable quick-release couplings for transportation equipment used to carry the liquid chemicals needed in its sector of activity.

The overriding consideration when using such couplings is environmental protection. Thanks to the technology used and the manufacturer's know-how, only the strict minimum amount of products is released into the atmosphere during disconnection. Recorded leakage levels are infinitely smaller than for the conventional valve and blind flange system.

Purposes

To meet these requirements, chemical firms would like to find couplings on the market offering :

- the necessary safety guarantees,
- perfect inter-changeability, since it is quite unacceptable to have to change the type of coupling to suit a manufacturer; indeed ultimately, such specific requests are bound to result in safety malfunctions;
- pre-determined maximum allowable leakage rates.

It was against this background that Bureau Veritas was asked to oversee two series of tests, intended to assess equipment available on the market.

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The following tests were performed :

- Test 1 : Connection/disconnection operation with no pressure, on a horizontal axis
- Test 2 : Strength and tightness test at 10 bars for 15 minutes
- Test 3 : Strength and tightness test at 10 bars for 15 minutes (plug half-coupling only)
- Test 4 : Decoupling test: disconnection/connection at 6 bars water pressure
- Test 5 : Air tightness test for each half-coupling (plug and socket) from 0.1 to 6 bars for 2 minutes, with both half-couplings submerged completely in a tank of water
- Test 6 : Measurement of residual drops after disconnection, at a hydraulic pressure of 2.5 bars
- Test 7 : Measurement of residual drops after disconnection, at a hydraulic pressure of 2.5 bars, in conjunction with an inter-changeability test among different makes of coupling

These tests, carried out using EBAM procedure 001 as reference document, involved couplings produced by five different manufacturers, in nominal diameters ND 50 and ND 80.

Equipment for the two series of tests was supplied directly by manufacturers.

The tables below recapitulate the results recorded during these two series of tests.

Examination of these results may reasonably lead to the following comments and suggestions:

- According to the criteria stipulated in EBAM 001, inter-connectable dry couplings with very low leakage rates exist on the market. It is important also to note that certain couplings on the market are absolutely not inter-connectable, show tightness levels not compatible with the generic term "dry couplings", and should not be used as such.
- It remains possible to agree on technical specifications defining all the criteria applying to dry couplings. This technical specification should normally result in the drafting of a CEN standard (CEN TC 296 is probably the most appropriate group to do the work), in order to guarantee minimum performance levels.

The following points will require a consensus:

- Inter-changeability tolerances,
- range of working pressures (mechanical strength and allowable pressure during disconnection),
- maximum allowable leakage during disconnection.

As regards the general dimensions of the connecting nozzle, this future standard could be based on the November 1994 NATO standard.

Manufacturers must show that they have introduced an ISO 9000 quality assurance system, and their procedures will be scrutinised.

Manufacturers will be asked to carry out a reliability investigation of their equipment, to examine the two phenomena of fatigue and wear. This is because, unlike the devices used today, these couplings use far more sophisticated mechanical parts, which are much more vulnerable to wear.

Finally, when all these points have been validated, it will be important, in partnership with offshore and onshore authorities, to examine the issue of how to position these couplings in relation to regulations for the transport of dangerous goods (RID/ADR and IMDG).

In other words, these "dry couplings" can ultimately be regarded as secondary isolating devices on tanks.

To obtain further information about these tests, please contact your supplier.

Annex 1

TABLES RECAPPING MARKS OBTAINED FOR THE TESTS PERFORMED*

Test number / Mark	DN 50							
	1	2	3	4	5	6	7	Rating
A	2	1	1	2	1	1	1	1.28/5
B	1	1	1	1	1	1	1	1/5
C	5	1	1	1	1	2	3	2/5
D	4	5	5	1	5	3	5	4/5

Test number / Mark	DN 50								Flange
	1	2	3	4	5	6	7	. Rating	
A	1	1	1	4	3	2	1	1.28/5	Diam.
B	1	1	1	3	1	1	1	1.85/5	119mm
C	5	1	1	2	1	1	2	1.85/5	Diam
D	2	5	1	1	1	3	3	2.28/5	105mm

* Rating = from 1 for the highest rating to 5 for the lowest

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- Test 5 : Air tightness test for each half-coupling (plug and socket) from 0.1 to 6 bars for 2 minutes, with both half-couplings submerged completely in a tank of water
- Test 6 : Measurement of residual drops after disconnection, at a hydraulic pressure of 2.5 bars
- Test 7 : Measurement of residual drops after disconnection, at a hydraulic pressure of 2.5 bars, in conjunction with an inter-changeability test among different makes of coupling

Annex 2

TABLES RECAPING AMOUNTS OF LIQUID COLLECTED IN ml.

DN 50

Female / Male	A1	A2	B1	B2	E1	E2	D
A1	0,392	0,382	1,258	0,779	0,909	1,047	2,381
A2	0,572	0,580	1,264	0,712	0,868	0,679	2,768
B1	0,991	0,449	1,316	1,173	1,212	1,188	1,940
B2	0,333	0,530	1,373	0,768	1,493	1,301	1,902
E1	0,565	0,525	1,149	0,779	0,970	0,851	2,519
D	x	x	x	x	x	x	1,054

x = Measurement not possible

DN 80

Female / Male	A1	A2	B1	B2	E1	E2
A1	3,623	2,135	1,964	5,529	1,939	1,578
A2	3,419	3,023	1,417	4,234	2,272	1,810
B1	4,082	2,309	1,591	6,438	1,438	1,429
B2	3,923	2,291	1,587	4,400	1,642	1,102
E1	4,028	2,378	1,577	4,107	2,943	1,556

TABLES RECAPING MARKS OBTAINED FOR THE TEST PERFORMED*

Test number / Type	DN 50							
	1	2	3	4	5	6	7	. Rating
D	1	1	1	1	1	2	5	1.71
B1	1	1	1	1	1	2	1	1.14
E1	1	1	1	1	1	1	1	1
B2	1	1	1	1	1	1	1	1
A1	2	1	1	4	1	1	1	1.57
A2	2	1	1	1	1	1	1	1.14
E1 / E2	1	1	1	1	1	1	1	1

* Rating = from 1 for the highest rating to 5 for the lowest

Test number / Type	DN 80							
	1	2	3	4	5	6	7	. Rating
B1	1	1	1	5	1	2	1	1.71
B2	1	5	1	5	1	5	5	3.28
E1	4	1	1	5	1	3	2	2.43
A1	1	1	1	4	1	4	1	1.86
A2	1	1	1	4	1	4	1	1.86
E1 / E2	1	1	1	4	1	2	1	1.57

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