

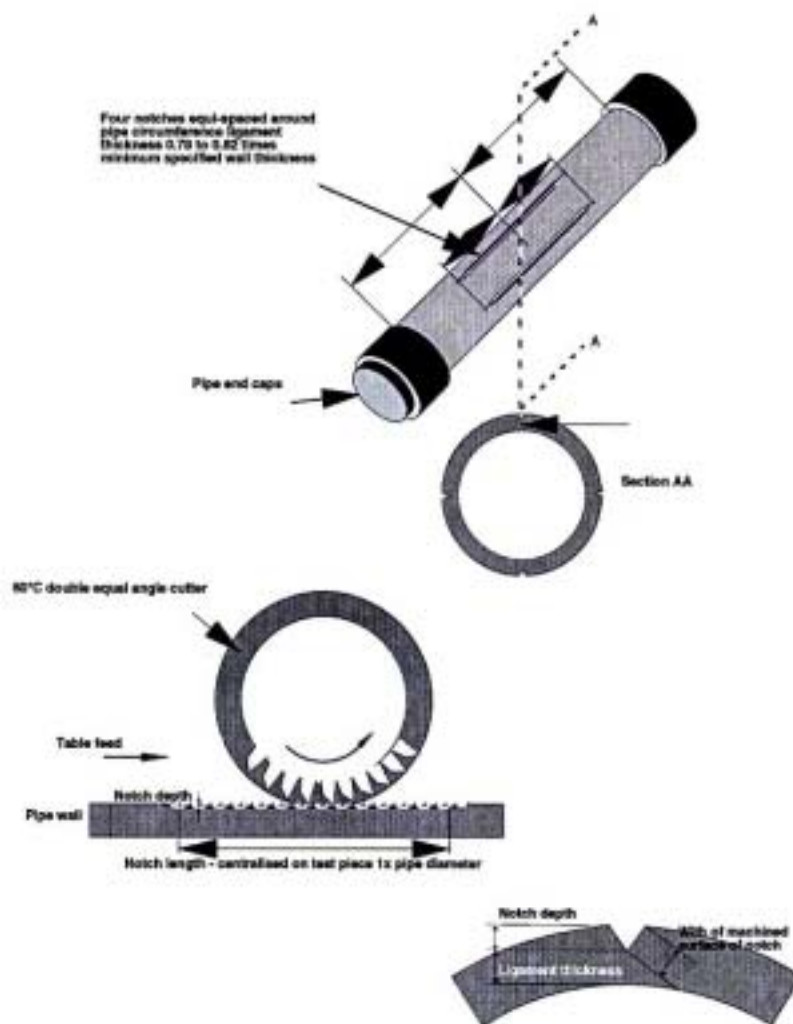
# Bodycote Report

## NOTCH PIPE TESTING

Notch pipe testing according to ISO 13479:1997 of the natural PE 80 pipe grade P301E from Korea Petrochemical Ind. Co., Ltd.

Final report

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**Bodycote Polymer** (formerly Studsvik Polymer)

Restricted distribution

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## NOTCH PIPE TESTING

**Notch pipe testing according to ISO 13479:1997 of the natural PE 80 pipe grade P301E from Korea Petrochemical Ind. Co., Ltd.**

### Final report

#### Summary

A hydrostatic pressure testing program has been performed on behalf of Korea Petrochemical Ind. Co., Ltd. In total 3 pipe specimens, 114 x 10.4 mm, were pressure tested according to the Notch Pipe Test, ISO 13479:1997. The testing conditions were 80°C water/water and 8.0 bar. All three started pipe specimens have failed. All failures were located to a notch. The average failure time can be seen in the table below.

| Material | Bodycote internal code | Internal overpressure | Average failure time |
|----------|------------------------|-----------------------|----------------------|
| P301E    | 2332                   | 8.0 bar               | 623 h                |

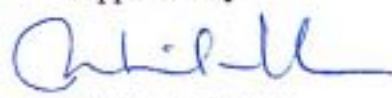
The final results show that the natural PE 80 pipe grade P301E passed the requirement of 165 h at 8.0 bar according to ISO 13479:1997.

Reviewed by



Mattias Svedberg

Approved by



Ulrika Andersson

## List of contents

|  | <b>Page</b> |
|--|-------------|
| <b>1</b> <b>Investigated pipe material</b> | 1           |
| <b>2</b> <b>Experimental procedure</b>     | 1           |
| <b>3</b> <b>Results</b>                    | 1           |

## Appendices

- A     Investigated pipe material, Table A.1
- B     Hydrostatic pressure testing table, Table B.1

2000-07-03

## 1 Investigated pipe material

The characteristics and code of the investigated material is presented in Appendix A, Table A.1.

## 2 Experimental procedure

All tests have been performed in the Polymer Laboratory at Bodycote Polymer AB. The pipes were notched by an external company, supervised by Bodycote Polymer AB, according to ISO 13479:1997. The notch cutter has 20 teeth and is rotating at 700 rpm. The transverse speed of the cutter is 150 mm/min.

The accuracy of the temperature and pressure measurements is better than  $\pm 1^\circ\text{C}$  and  $+2/-1\%$  respectively. The testing is carried out with water filled pipes, the outer environment being water at  $80^\circ\text{C}$  at an internal overpressure of 8.0 bar. The water is deionized. The pipes were fitted with Wipex brass fittings.

The measurements of the wall thicknesses are accurate within  $\pm 0.02$  mm. The accuracy of the measurements of the mean outside diameter is  $\pm 0.05$  mm.

The general testing conditions follow ISO 1167-1996.

## 3 Results

The results are presented in Appendix B, Table B.1. All three started pipe specimens have failed. All failures were located to a notch. The average failure time can be seen in the table below.

| Material | Bodycote internal code | Internal overpressure | Average failure time |
|----------|------------------------|-----------------------|----------------------|
| P301E    | 2332                   | 8.0 bar               | 623 h                |

The final results show that the natural PE 80 pipe grade P301E passed the requirement of 165 h at 8.0 bar according to ISO 13479:1997.

2000-07-03

**Table A.1**

Investigated pipe material. The pipes were delivered to Bodycote Polymer AB (formerly Studsvik Polymer AB) from Korea Petrochemical Ind. Co., Ltd.

**P301E, PE 80**

*Resin producer*

Korea Petrochemical Ind. Co., Ltd.

*Pipe dimension*

114 x 10.4 mm

*Pipe marking*

P301E with a felt pen at the top of the pipes

*Amount of pipes*

5 pipes with the length of 1.2 m

*Delivery date to Bodycote*

2000-04-25

*Bodycote code*

2332

**Table B.1**

Notch pipe testing of the natural PE 80 pipe grade P301E from Korea Petrochemical Ind. Co., Ltd. at 80°C with water as the internal and external medium. Bodycote internal code is 2332.

|  |                      |
|--|----------------------|
| Material:                                      | Natural PE 80        |
| Nominal dimension:                             | 114 x 10.4 mm        |
| Total length:                                  | 580 mm               |
| Name of test laboratory:                       | Bodycote Polymer AB  |
| Person responsible for the testing procedures: | Magdalena Carlsson   |
| Test method:                                   | ISO 13479:1997       |
| Fittings:                                      | Wipex brass fittings |
| Internal medium/External medium:               | Water/Water          |
| Conditioning time:                             | 24 h                 |

| Specimen <sup>1)</sup><br>(internal<br>code) | Temp<br>°C | Start  | D <sup>2)</sup><br>mm | p <sup>3)</sup><br>bar | Failure<br>time<br>h | Remaining ligament<br>thickness <sup>4)</sup> |         |         |         | Location<br>of failure |
|--|------------|--------|-----------------------|------------------------|----------------------|---|---------|---------|---------|------------------------|
|  |            |        |                       |                        |                      | Notch 1                                       | Notch 2 | Notch 3 | Notch 4 |                        |
| 2332-1                                       | 80         | 000518 | 113.95                | 8.0                    | 555                  | 8.48  | 8.42    | 8.42    | 8.49    | Notch IV               |
| 2332-2                                       | 80         | 000518 | 114.00                | 8.0                    | 638                  | 8.47  | 8.57    | 8.47    | 8.47    | Notch III              |
| 2332-3                                       | 80         | 000518 | 113.95                | 8.0                    | 676                  | 8.44  | 8.43    | 8.48    | 8.30    | Notch III              |

1) Internal reference code at Bodycote

2) Mean outside diameter

3) Internal overpressure

4) The remaining ligament thickness should be within 8.1-8.5 mm for a 114 x 10.4 mm PE-pipe