

**ANALISIS TEGANGAN PIPA PADA SISTEM PERPIPAAN *STRIPPER*
REBOILER MENUJU *AMINE STRIPPER COLUMN*
MENGUNAKAN METODE NUMERIK**



PROGRAM STUDI TEKNIK MESIN
FAKULTAS TEKNIK
UNIVERSITAS MERCU BUANA
JAKARTA 2021

LAPORAN TUGAS AKHIR

ANALISIS TEGANGAN PIPA PADA SISTEM PERPIPAAN *STRIPPER*
REBOILER MENUJU *AMINE STRIPPER COLUMN*
MENGUNAKAN METODE NUMERIK



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DIAJUKAN UNTUK MEMENUHI SYARAT KELULUSAN MATA KULIAH
TUGAS AKHIR PADA PROGRAM SARJANA STRATA SATU (S1)
FEBRUARI 2021

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Stripper Reboiler Menuju Amine Stripper Column
Menggunakan Metode Numerik

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ABSTRAK

Perancangan sistem perpipaan yang baik dan aman sangat dibutuhkan untuk menjamin kelangsungan dari proses dan *life time* dari sistem perpipaan. Fluida mengalir dari *Amine stripper column* menuju *Stripper reboiler* pada temperatur operasi 134 °C dengan temperatur desain 170 °C. Pada saat beroperasi sistem perpipaan akan menerima beban baik itu beban statik (*sustain load*) dan beban termal (*thermal expansion load*) yang mengakibatkan perubahan tegangan di sepanjang sistem perpipaan. Analisa tegangan dilakukan menggunakan beban tetap (*sustained load*) yang terdiri dari tegangan axial, tegangan tekuk, tegangan sirkumferensial dan analisa beban dilakukan *sustained load*, *occasional load*, dan *thermal load*. Analisa yang dilakukan menggunakan metode perhitungan matematis *simple beam formula* dan *software Caesar II* berdasarkan *ASME Code B31.3* dengan ketebalan pipa 4,78 mm dan jarak antar penyangga 6,1 m. Hasil perhitungan matematis menunjukkan tegangan akibat beban tetap pada node 210-220 sebesar 22,4 MPa, tegangan akibat beban termal sebesar 23,4 MPa dan tegangan akibat beban okasional sebesar 9,4 MPa. Hasil perhitungan tegangan akibat beban tetap menggunakan simulasi sebesar 12,7 MPa dengan *allowable stress* 112 MPa, tegangan akibat beban termal sebesar 31,9 MPa dengan *allowable stress* 273 MPa dan tegangan akibat beban okasional sebesar 13,2 MPa dengan *allowable stress* 150 MPa. Berdasarkan nilai tersebut pipa tersebut dinyatakan aman karena hasil perhitungan matematis dan simulasi masih dibawah tegangan izin.

Kata Kunci : *Amine Stripper Column*, *Stripper Reboiler*, ASME B31.3, perangkat lunak CAESAR II, *Stress Analysis*, *Sustained Load*, *Thermal Expansion Load*

Pipe Stress Analysis of Piping System Stripper Reboiler to Amine Stripper Column Using Numeric Methode

ABSTRACT

The design of good and safe piping system design is needed to ensure the continuity of the process and the life time of the piping system. Fluid flows from the Amine stripper column to the stripper reboiler at an operating temperature of 134 °C with a design temperature of 170 °C. When operating the piping system will receive both static loads (sustain load) and thermal expansion load which results in a change in voltage along the piping system. Stress analysis is performed using a sustained load consisting of axial stress, bending stress, circumferential stress and load analysis is carried out by sustained load, occasional load, and thermal load. The analysis was performed using a simple beam formula mathematical calculation method and Caesar II software based on ASME Code B31.3 with a pipe thickness of 4.78 mm and a distance between the supports of 6.1 m. The results of mathematical calculations show that the stress due to fixed loads at node 210-220 is 22,4 MPa, the stress due to thermal loads is 23,4 MPa /m² and the stress due to occupational loads is 9,4 MPa. The results of the calculation of stress due to fixed loads using a simulation of 12,7 MPa with allowable stresses of 112 MPa, stress due to thermal loads of 31,9MPa with allowable stress of 273MPa and stress due to occupational loads of 13,2 MPa , with an allowable stress of 150 MPa. Based on this value, the pipe is declared safe because the results of mathematical calculations and simulations are still below the permit stress.

Keyword : Amine Stripper Column, Stripper Reboiler, ASME B31.3, Software CAESAR II, Stress Analysis, Sustained Load, Thermal Expansion Load

DAFTAR ISI

| | |
|--|-------------------------------------|
| ABSTRAK | 4 |
| ABSTRACT | 5 |
| DAFTAR ISI | 6 |
| DAFTAR GAMBAR | 8 |
| DAFTAR TABEL | 9 |
| BAB I Error! Bookmark not defined. | |
| PENDAHULUAN | Error! Bookmark not defined. |
| 1.1 LATAR BELAKANG | Error! Bookmark not defined. |
| 1.2 RUMUSAN MASALAH | Error! Bookmark not defined. |
| 1.3 TUJUAN PENELITIAN | Error! Bookmark not defined. |
| 1.4 RUANG LINGKUP DAN BATASAN MASALAH | Error! Bookmark not defined. |
| 1.5 SISTEMATIKA PENULISAN | Error! Bookmark not defined. |
| BAB II | Error! Bookmark not defined. |
| TINJAUAN PUSTAKA | Error! Bookmark not defined. |
| 2.1 PIPA | Error! Bookmark not defined. |
| 2.1.1. <i>Welded Pipe</i> (pipa welded) | Error! Bookmark not defined. |
| 2.1.2. <i>Seamless pipe</i> (pipa seamless) | Error! Bookmark not defined. |
| 2.2 PERANCANGAN SISTEM PIPA | Error! Bookmark not defined. |
| 2.2.1. Pemilihan Material Pipa | Error! Bookmark not defined. |
| 2.2.2. Komponen Sistem Perpipaan | Error! Bookmark not defined. |
| 2.2.3. Perhitungan Tebal Pipa (<i>Calculation of Wall Thickness</i>) | Error! Bookmark not defined. |
| 2.2.4. Pembebanan Pada Sistem Pipa | Error! Bookmark not defined. |
| 2.2.5. Analisis Tegangan Pipa..... | Error! Bookmark not defined. |
| 2.2.6. <i>Safety Factor</i> | Error! Bookmark not defined. |
| 2.3 PENYANGGA PIPA (<i>Pipe Support</i>) | Error! Bookmark not defined. |
| 2.3.1. Fungsi Penyangga Pipa | Error! Bookmark not defined. |
| 2.3.2. Jenis-jenis Penyangga Pipa | Error! Bookmark not defined. |
| 2.3.3. Jarak Penyangga Pipa (<i>Pipe Span Support</i>)..... | Error! Bookmark not defined. |
| 2.4 CAESAR II..... | Error! Bookmark not defined. |

| | |
|---|-------------------------------------|
| BAB III..... | Error! Bookmark not defined. |
| METODOLOGI..... | Error! Bookmark not defined. |
| 3.1 DIAGRAM ALIR..... | Error! Bookmark not defined. |
| 3.2 PERSIAPAN PERHITUNGAN TEGANGAN PIPA | Error! Bookmark not defined. |
| 3.3 PENGOLAHAN DATA..... | Error! Bookmark not defined. |
| BAB IV | Error! Bookmark not defined. |
| HASIL DAN PEMBAHASAN | Error! Bookmark not defined. |
| 4.1 PERHITUNGAN MATEMATIS BEBAN STATIS.. | Error! Bookmark not defined. |
| 4.1.1 Perhitungan tebal dinding pipa (<i>wall thickness</i>) . | Error! Bookmark not defined. |
| 4.1.2 Perhitungan Berat Total Pipa | Error! Bookmark not defined. |
| 4.1.3 Perhitungan Modulus Pada Pipa | Error! Bookmark not defined. |
| 4.1.4 Penyangga (<i>Pipe Support</i>) / <i>Pipe Span</i> (L) | Error! Bookmark not defined. |
| 4.1.5 Perhitungan Tegangan Longitudinal | Error! Bookmark not defined. |
| 4.1.6 Perhitungan <i>Hoop Stress</i> atau Tegangan Sirkumferensial | Error! Bookmark not defined. |
| 4.1.7 Perhitungan Tegangan Radial (<i>Radial Stress</i>) | Error! Bookmark not defined. |
| 4.1.8 Perhitungan Tegangan akibat beban sustain (<i>Sustain Load</i>)..... | Error! Bookmark not defined. |
| 4.1.9 Perhitungan Tegangan Akibat Beban Okasional (<i>Occasional Load</i>) | Error! Bookmark not defined. |
| 4.1.10 Perhitungan Tegangan Akibat <i>Thermal Expansion</i> ... | Error! Bookmark not defined. |
| 4.2 LANGKAH SIMULASI MENGGUNAKAN CAESAR II..... | Error! Bookmark not defined. |
| 4.2.1 Proses <i>input</i> data | Error! Bookmark not defined. |
| 4.2.2 Running Model | Error! Bookmark not defined. |
| 4.3 HASIL PERHITUNGAN BEBAN STATIS | Error! Bookmark not defined. |
| 4.3.1 Hasil Metode Perhitungan Matematis Beban Statis... | Error! Bookmark not defined. |
| 4.3.2 Hasil Metode Perhitungan <i>Software</i> CAESAR II Beban Statis.... | Error! Bookmark not defined. |
| 4.4 HASIL PERBANDINGAN PERHITUNGAN BEBAN STATIS..... | Error! Bookmark not defined. |

| | | |
|-----------------------|--|-------------------------------------|
| 4.5 | HASIL PERHITUNGAN BEBAN STATIS <i>SOFTWARE CAESAR</i> .. | Error! Bookmark not defined. |
| BAB V | | Error! Bookmark not defined. |
| PENUTUP | | Error! Bookmark not defined. |
| 5.1 | KESIMPULAN | Error! Bookmark not defined. |
| 5.2 | SARAN | Error! Bookmark not defined. |
| DAFTAR PUSTAKA | | Error! Bookmark not defined. |
| LAMPIRAN A | | Error! Bookmark not defined. |
| LAMPIRAN B | | Error! Bookmark not defined. |
| LAMPIRAN C | | Error! Bookmark not defined. |
| LAMPIRAN D | | Error! Bookmark not defined. |



DAFTAR GAMBAR

| | |
|---|-------------------------------------|
| Gambar 2. 1 ERW | Error! Bookmark not defined. |
| Gambar 2. 2 <i>Spiral Welded</i> | Error! Bookmark not defined. |
| Gambar 2. 3 Pipa <i>seamless</i> | Error! Bookmark not defined. |
| Gambar 2. 4 Jalur pipa kritis pada peralatan statis..... | Error! Bookmark not defined. |
| Gambar 2. 5 Jalur kritis pada peralatan berputar | Error! Bookmark not defined. |
| Gambar 2. 6 Material pipa | Error! Bookmark not defined. |
| Gambar 2. 7 <i>Flange</i> | Error! Bookmark not defined. |
| Gambar 2. 8 <i>Gate valve</i> | Error! Bookmark not defined. |
| Gambar 2. 9 <i>Fittings</i> | Error! Bookmark not defined. |
| Gambar 2. 10 Aksial <i>force</i> | Error! Bookmark not defined. |
| Gambar 2. 11 Tegangan <i>Longitudinal Pressure</i> | Error! Bookmark not defined. |
| Gambar 2. 12 <i>Bending Stress</i> | Error! Bookmark not defined. |
| Gambar 2. 13 Tegangan tangensial (<i>Hoop stress</i>) | Error! Bookmark not defined. |
| Gambar 2. 14 <i>Radial Stress</i> | Error! Bookmark not defined. |
| Gambar 4. 1 Data dimensi dan berat pada pipa 16 inch Sch 10s | Error! Bookmark not defined. |
| Gambar 4. 2 Diagram Benda Bebas Terdistribusi | Error! Bookmark not defined. |
| Gambar 4. 3 Tampilan <i>file</i> baru pada CAESAR II 2018 | Error! Bookmark not defined. |
| Gambar 4. 4 Classic piping input CAESAR II 2018 . | Error! Bookmark not defined. |
| Gambar 4. 5 <i>Properties</i> pipa | Error! Bookmark not defined. |
| Gambar 4. 6 Pemodelan pipa lurus | Error! Bookmark not defined. |
| Gambar 4. 7 Pemodelan belokan pipa (<i>Bend</i>)..... | Error! Bookmark not defined. |
| Gambar 4. 8 Pemodelan <i>flange & reducer</i> | Error! Bookmark not defined. |
| Gambar 4. 9 Pemodelan penyangga pipa (<i>support</i>) ... | Error! Bookmark not defined. |
| Gambar 4. 10 Warning pada pemodelan saat terjadi kesalahan | Error! Bookmark not defined. |
| Gambar 4. 11 Tampilan <i>output</i> pada beban yang akan dianalisa..... | Error! Bookmark not defined. |
| Gambar 4. 12 Hasil data <i>running Caesar II 2018</i> | Error! Bookmark not defined. |

Gambar 4. 13 Grafik perbandingan tegangan pada pipa..... **Error! Bookmark not defined.**

Gambar 4. 14 Grafik gaya *axial*, *bending* dan *circumferential*. **Error! Bookmark not defined.**

Gambar 4. 15 Grafik *sustained load* pipa **Error! Bookmark not defined.**

Gambar 4.16 Grafik *Occasional Load* **Error! Bookmark not defined.**

Gambar 4. 17 Grafik *Thermal Expansion Load*..... **Error! Bookmark not defined.**

DAFTAR TABEL

Tabel 2. 1 Nilai tegangan material **Error! Bookmark not defined.**

Tabel 2. 2 Nilai *quality factor* (ASME, 2014) **Error! Bookmark not defined.**

Tabel 2. 3 Nilai Koefisien Y (ASME, 2014) **Error! Bookmark not defined.**

Tabel 3. 1 *Modulus Elastisitas* (ASME B31.1)

Error! Bookmark not defined.

Tabel 3. 2 Persiapan Perhitungan Pipa.....32

Tabel 3.3 *Allowable Stress* Berdasarkan ASME B31.3.....33

Tabel 4. 1 Nilai tegangan aksial..... **Error! Bookmark not defined.**

Tabel 4. 2 Nilai tegangan *inner pressure* **Error! Bookmark not defined.**

Tabel 4. 3 Nilai tegangan sirkumferensial..... **Error! Bookmark not defined.**

Tabel 4. 4 Nilai tegangan okasional..... **Error! Bookmark not defined.**

Tabel 4. 5 Nilai beban termal..... **Error! Bookmark not defined.**

Tabel 4.6 Hasil Perhitungan Matematis Beban Pada Pipa..... **Error! Bookmark not defined.**

Tabel 4.7 Hasil Perhitungan beban menggunakan *software* CAESAR II..... **Error! Bookmark not defined.**

Tabel 4.8 Perbandingan Analisis Tegangan Pipa..... **Error! Bookmark not defined.**

Tabel 4.9 Nilai Axial Stress, Bending Stress, dan Circumferential Stress Pipa 240-AM-1023-16"-01H0-H **Error! Bookmark not defined.**

Tabel 4.10 Hasil *Sustained*, *Occasional* dan *Expansion Load*.. **Error! Bookmark not defined.**