

## BAB VI

### KESIMPULAN DAN SARAN

#### 6.1 Kesimpulan

1. Setelah dilakukan analisa, dapat dilihat bahwa pada kondisi awal waktu rata-rata antrian yang paling tinggi terjadi pada stasiun kerja Fryma yaitu sebesar 412.97 menit, panjang antrian maksimum sebesar 102 unit dengan rata-rata panjang antrian sebesar 49.050 unit. Setelah dilakukan perbaikan dan dianalisis, didapat waktu rata-rata antrian menjadi sebesar 408.45 menit, panjang antrian maksimum sebesar 39 unit dengan rata-rata panjang antrian sebesar 18.838 unit.
2. Pada penambahan mesin baru atau pada stasiun kerja Fryma 2 didapat waktu rata-rata antrian sebesar 395.16 menit, panjang antrian maksimum sebesar 53 unit dengan rata-rata panjang antrian sebesar 24.478 unit.
3. Analisa penggantian pada penelitian ini ditujukan untuk memberikan alternatif solusi/penyelesaian masalah antrian yang terjadi berdasarkan ongkos ekuivalen tahunan yang minimum. Berdasarkan hasil penghitungan dengan analisa penggantian, maka alternatif ketiga atau dengan penambahan jam tenaga kerja langsung memberikan ongkos ekuivalen tahunan paling minimum yaitu sebesar Rp. 76.828.250.

## 6.2 Saran

1. Berdasarkan hasil simulasi dengan software Arena, penambahan mesin pada stasiun kerja Fryma terbukti efektif dalam mengurangi jumlah antrian yang terjadi, sehingga perusahaan perlu mempertimbangkan hal ini lebih lanjut untuk direalisasikan.
2. Namun apabila perusahaan masih mempertimbangkan aspek ekonomi, maka yang harus dilakukan adalah dengan menambah jam kerja karyawan untuk mengurangi jumlah antrian yang terjadi pada stasiun kerja Fryma.
3. Perlu diadakan training untuk para operator mesin, sehingga penggunaan mesin akan optimal. Hal ini akan berpengaruh karena operator mesin sudah terlatih dengan kondisi mesin, sehingga proses produksi dapat berjalan lebih cepat.

## DAFTAR PUSTAKA

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<http://sutanto.staff.uns.ac.id/files/2009/03/bab10a.pdf>, tanggal akses : 5 Mei 2009.

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Mulyono, Sri, *Operations Research*, Lembaga Penerbit Fakultas Ekonomi UI, Jakarta, 2002.

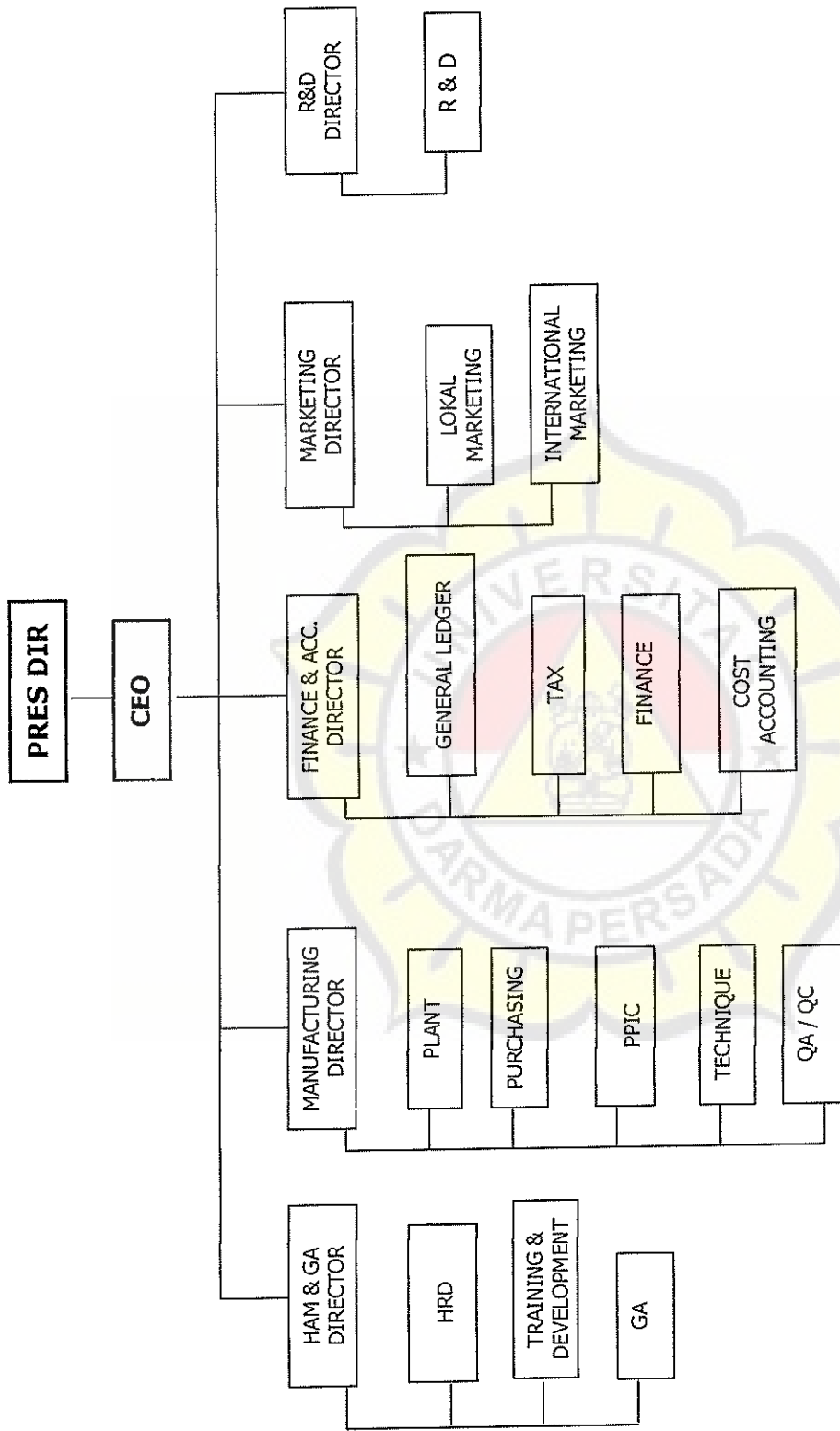
Pujawan, Nyoman I, *Ekonomi Teknik, Edisi pertama, Cetakan Ketiga*, Penerbit Guna Widya, Surabaya, 2004.

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## LAMPIRAN

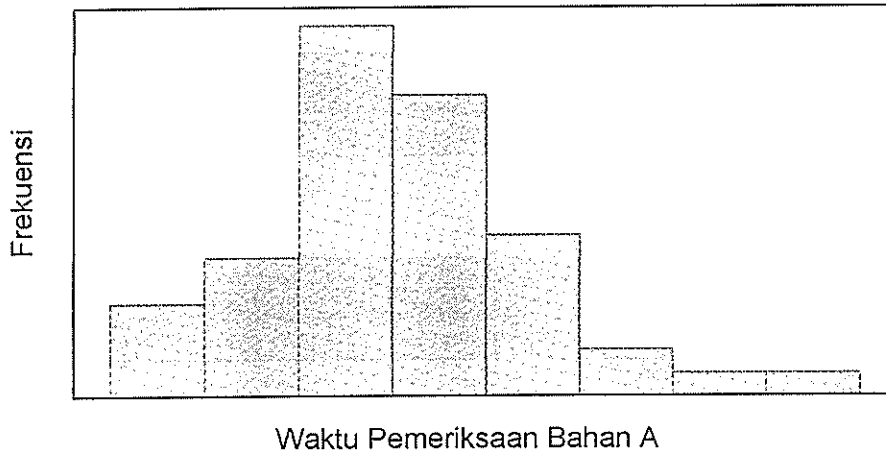
1. Struktur Organisasi
2. Data Analisis Statistik
3. Layout Plant Lantai 1
4. Layout Plant Lantai 2
5. Peta Proses Operasi
6. Data Jarak dan Waktu Antar Stasiun Kerja





STRUKTUR ORGANISASI PT. MARTINA BERTO

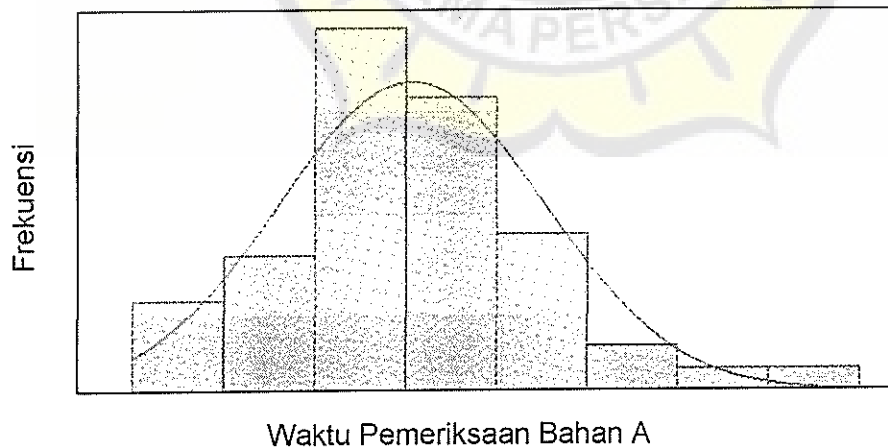
## II. Waktu pemeriksaan bahan A



**Grafik 4.3 Histogram Waktu Pemeriksaan Bahan A**

Data Summary  
Number of Data Points = 50  
Min Data Value = 18  
Max Data Value = 25  
Sample Mean = 20.6  
Sample Std Dev = 1.47

Histogram Summary  
Histogram Range = 17.5 to 25.5  
Number of Intervals = 8



**Grafik 4.4 Distribusi Normal Waktu Pemeriksaan Bahan A**

### Distribution Summary

Distribution : Normal  
Expression : NORM (20.6, 1.46)  
Square Error : 0.008443

### Chi Square Test

Number of intervals = 4  
Degrees of freedom = 1  
Test Statistic = 1.57  
Corresponding p-value = 0.223

### Data Summary

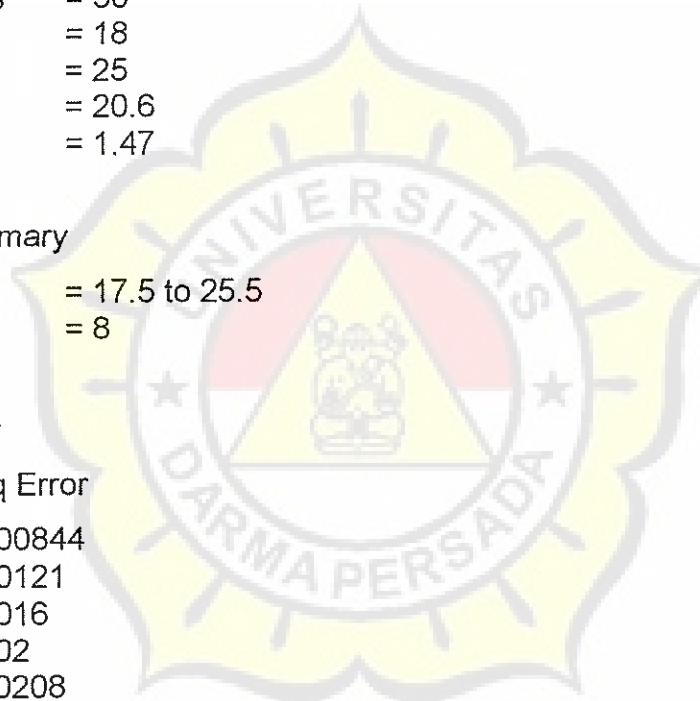
Number of Data Points = 50  
Min Data Value = 18  
Max Data Value = 25  
Sample Mean = 20.6  
Sample Std Dev = 1.47

### Histogram Summary

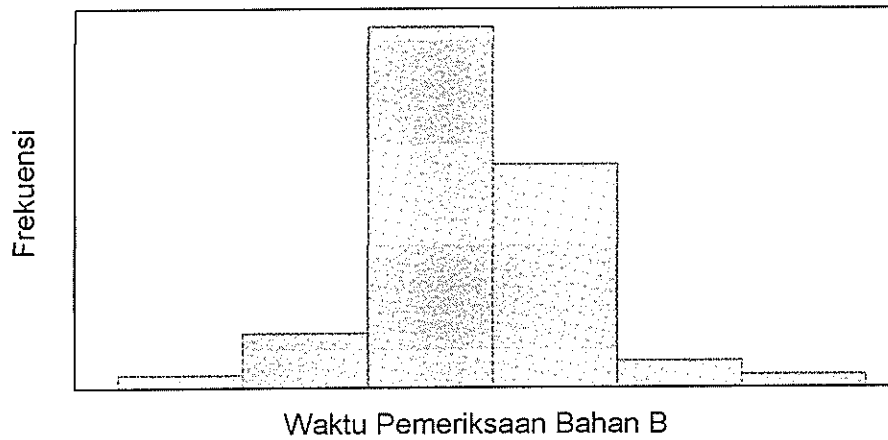
Histogram Range = 17.5 to 25.5  
Number of Intervals = 8

### Fit All Summary

Function	Sq Error
Normal	0.00844
Weibull	0.0121
Beta	0.016
Gamma	0.02
Triangular	0.0208
Erlang	0.0251
Lognormal	0.0377
Uniform	0.0878
Exponential	0.106
Poisson	0.158



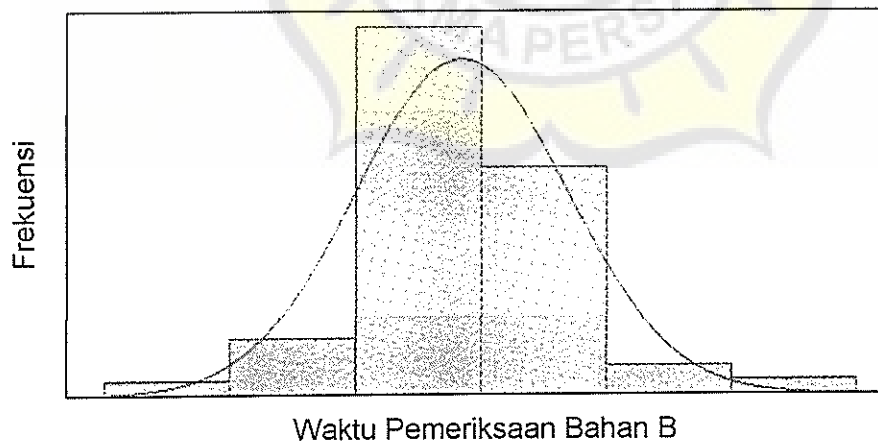
### III. Waktu pemeriksaan bahan B



**Grafik 4.5 Histogram Waktu Pemeriksaan Bahan B**

Data Summary  
Number of Data Points = 50  
Min Data Value = 8  
Max Data Value = 13  
Sample Mean = 10.3  
Sample Std Dev = 0.848

Histogram Summary  
Histogram Range = 7.5 to 13.5  
Number of Intervals = 6



**Grafik 4.6 Distribusi Normal Waktu Pemeriksaan Bahan B**



### Distribution Summary

Distribution : Normal  
Expression : NORM (10.3, 0.839)  
Square Error : 0.016890

### Chi Square Test

Number of intervals = 3  
Degrees of freedom = 0  
Test Statistic = 2.63  
Corresponding p-value < 0.005

### Data Summary

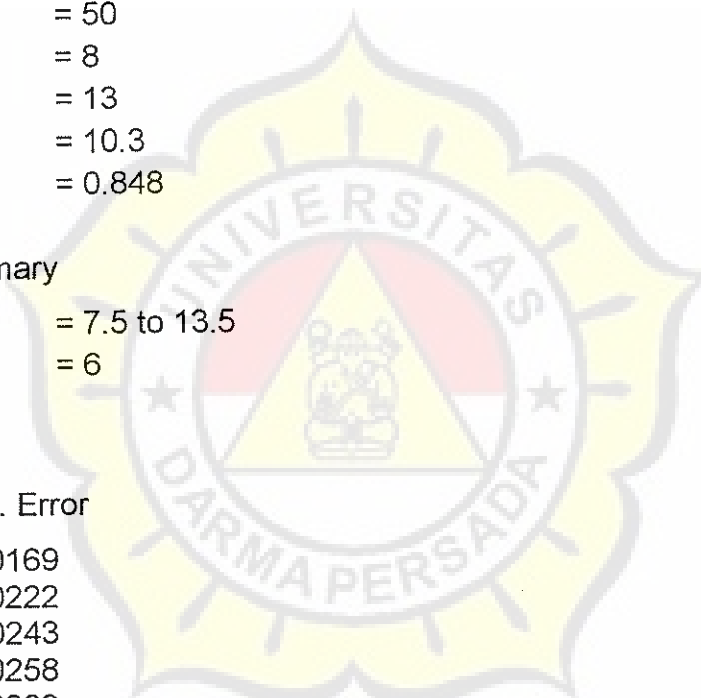
Number of Data Points = 50  
Min Data Value = 8  
Max Data Value = 13  
Sample Mean = 10.3  
Sample Std Dev = 0.848

### Histogram Summary

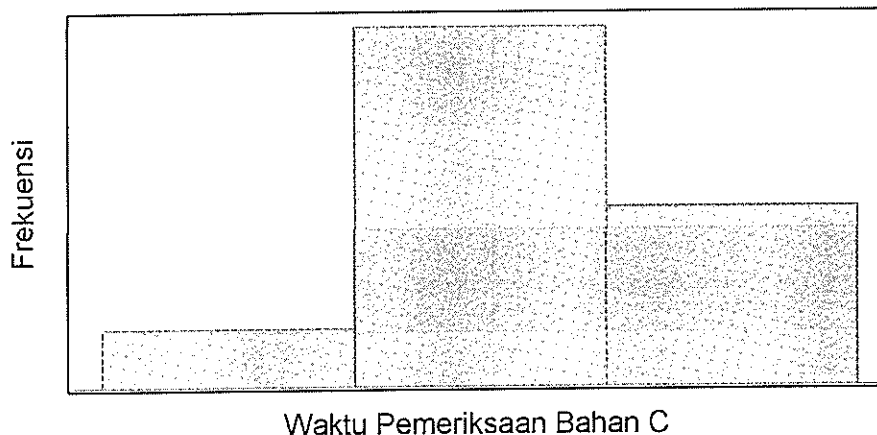
Histogram Range = 7.5 to 13.5  
Number of Intervals = 6

### Fit All Summary

Functions	Sq. Error
Normal	0.0169
Gamma	0.0222
Beta	0.0243
Erlang	0.0258
Weibull	0.0269
Lognormal	0.0348
Triangular	0.0806
Uniform	0.215
Exponential	0.282
Poisson	0.283



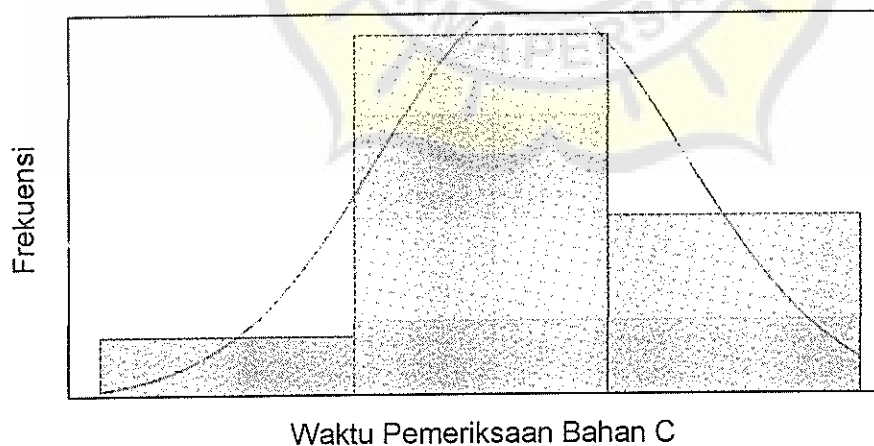
#### IV. Waktu pemeriksaan bahan C



**Grafik 4.7 Histogram Waktu Pemeriksaan Bahan C**

Data Summary  
Number of Data Points = 50  
Min Data Value = 4  
Max Data Value = 6  
Sample Mean = 5.2  
Sample Std Dev = 0.606

Histogram Summary  
Histogram Range = 3.5 to 6.5  
Number of Intervals = 3



**Grafik 4.8 Distribusi Normal Waktu Pemeriksaan Bahan C**

### Distribution Summary

Distribution : Normal  
Expression : NORM (5.2, 0.6)  
Square Error : 0.001331

### Chi Square Test

Number of intervals = 3  
Degrees of freedom = 0  
Test Statistic = 0.245  
Corresponding p-value < 0.005

### Data Summary

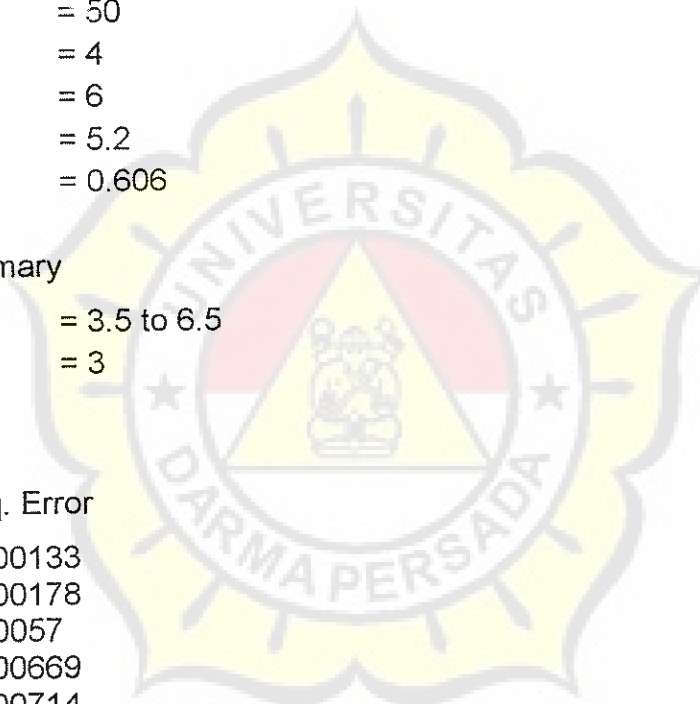
Number of Data Points = 50  
Min Data Value = 4  
Max Data Value = 6  
Sample Mean = 5.2  
Sample Std Dev = 0.606

### Histogram Summary

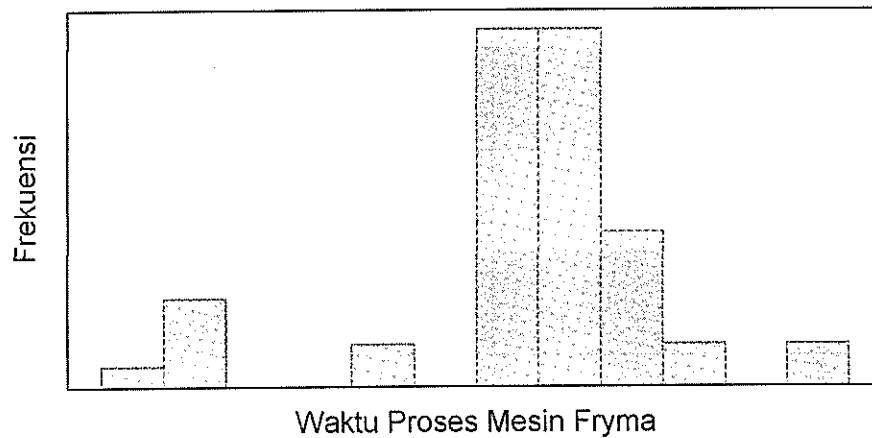
Histogram Range = 3.5 to 6.5  
Number of Intervals = 3

### Fit All Summary

Functions	Sq. Error
Normal	0.00133
Weibull	0.00178
Gamma	0.0057
Erlang	0.00669
Beta	0.00714
Lognormal	0.0118
Triangular	0.023
Uniform	0.127
Exponential	0.27
Poisson	0.297



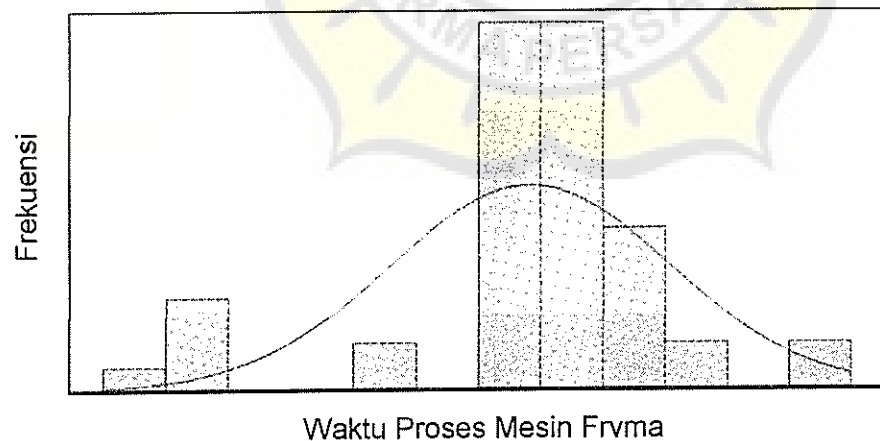
## V. Waktu proses mesin Fryma



Grafik 4.9 Histogram Waktu Proses Mesin Fryma

Data Summary  
Number of Data Points = 50  
Min Data Value = 144  
Max Data Value = 155  
Sample Mean = 150  
Sample Std Dev = 2.26

Histogram Summary  
Histogram Range = 144 to 156  
Number of Intervals = 12



Grafik 4.10 Distribusi Normal Waktu Proses Mesin Fryma

### Distribution Summary

Distribution : Normal  
Expression :  $NORM(150, 2.24)$   
Square Error : 0.084499

### Chi Square Test

Number of intervals = 7  
Degrees of freedom = 4  
Test Statistic = 27.4  
Corresponding p-value < 0.005

### Data Summary

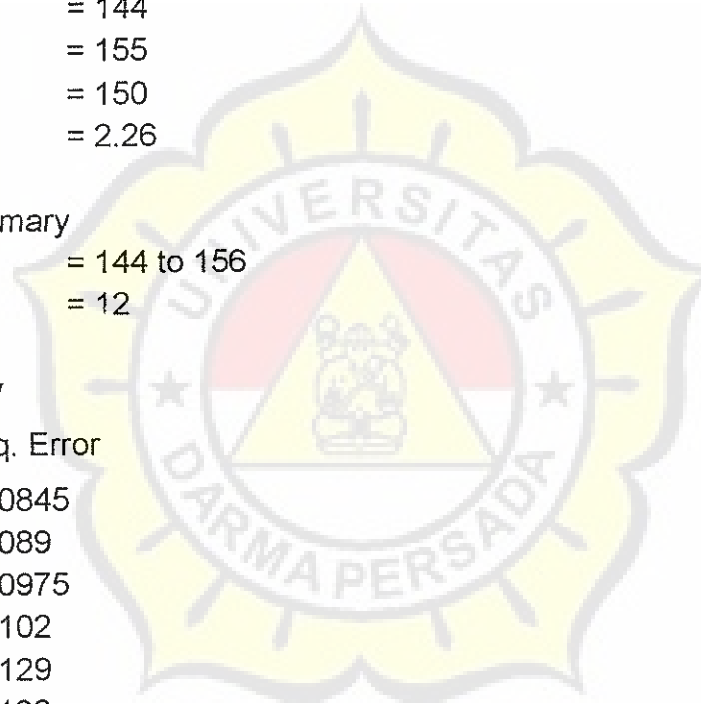
Number of Data Points = 50  
Min Data Value = 144  
Max Data Value = 155  
Sample Mean = 150  
Sample Std Dev = 2.26

### Histogram Summary

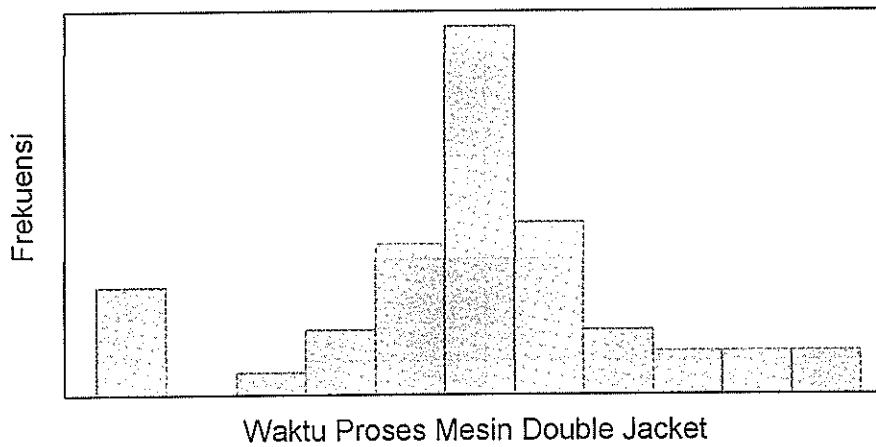
Histogram Range = 144 to 156  
Number of Intervals = 12

### Fit All Summary

Functions	Sq. Error
Normal	0.0845
Weibull	0.089
Beta	0.0975
Triangular	0.102
Erlang	0.129
Gamma	0.132
Uniform	0.153
Lognormal	0.157
Exponential	0.192
Poisson	0.274



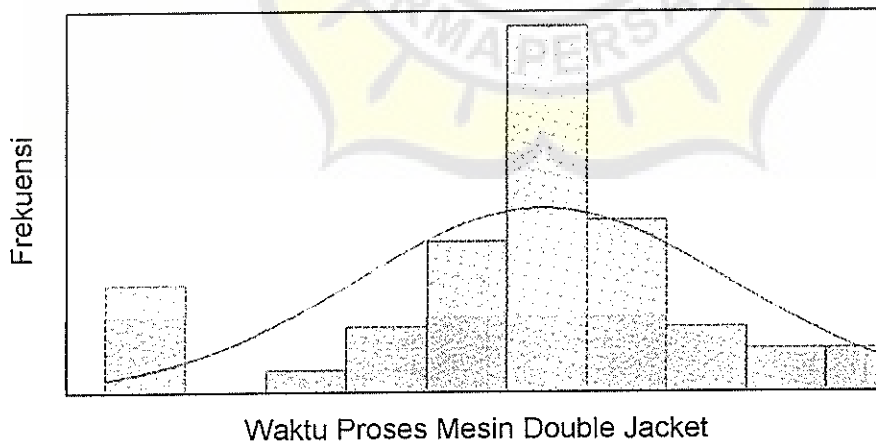
## VI. Waktu proses mesin Double Jacket



Grafik 4.11 Histogram Waktu Proses Mesin Double Jacket

Data Summary  
 Number of Data Points = 50  
 Min Data Value = 40  
 Max Data Value = 50  
 Sample Mean = 44.9  
 Sample Std Dev = 2.36

Histogram Summary  
 Histogram Range = 39.5 to 50.5  
 Number of Intervals = 11



Grafik 4.12 Distribusi Normal Waktu Proses Mesin Double Jacket

### Distribution Summary

Distribution : Normal  
Expression : NORM (44.9, 2.34)  
Square Error : 0.049473

### Chi Square Test

Number of intervals = 7  
Degrees of freedom = 4  
Test Statistic = 12.1  
Corresponding p-value = 0.0181

### Data Summary

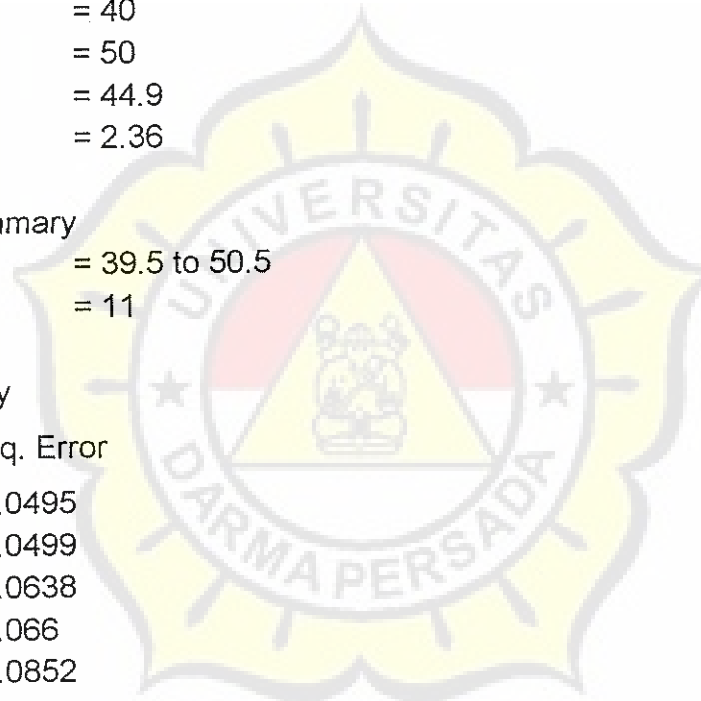
Number of Data Points = 50  
Min Data Value = 40  
Max Data Value = 50  
Sample Mean = 44.9  
Sample Std Dev = 2.36

### Histogram Summary

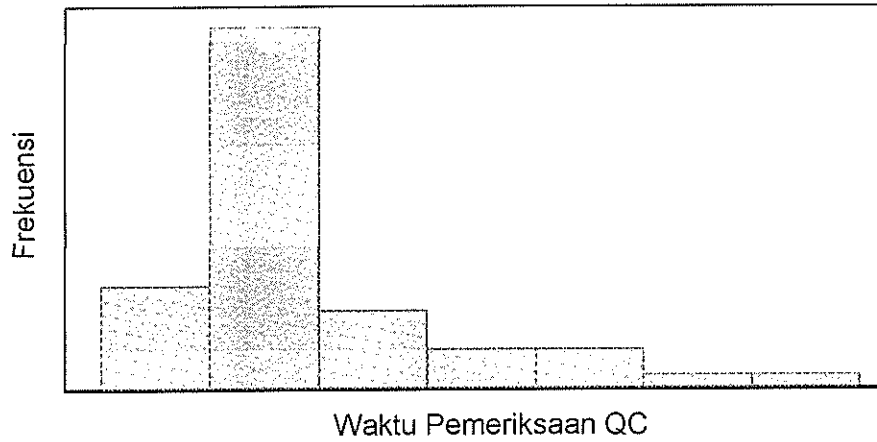
Histogram Range = 39.5 to 50.5  
Number of Intervals = 11

### Fit All Summary

Functions	Sq. Error
Normal	0.0495
Triangular	0.0499
Weibull	0.0638
Beta	0.066
Erlang	0.0852
Gamma	0.0878
Uniform	0.0923
Lognormal	0.115
Exponential	0.124
Poisson	0.125



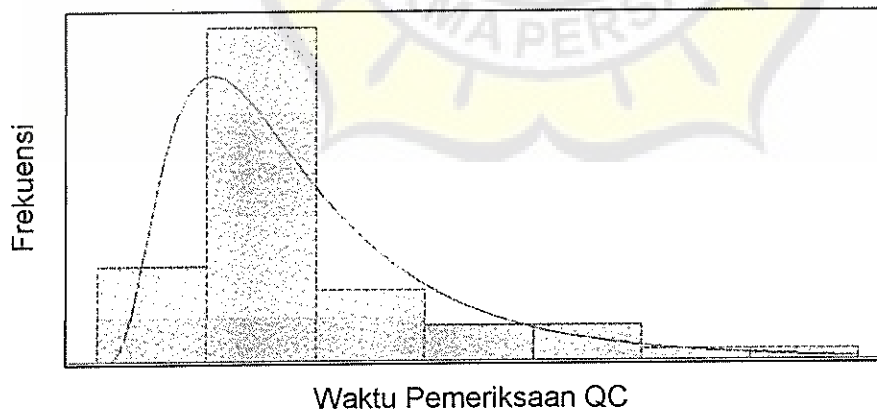
## VII. Waktu pemeriksaan QC



**Grafik 4.13 Histogram Waktu Pemeriksaan QC**

Data Summary  
Number of Data Points = 50  
Min Data Value = 14  
Max Data Value = 20  
Sample Mean = 15.4  
Sample Std Dev = 1.31

Histogram Summary  
Histogram Range = 13.5 to 20.5  
Number of Intervals = 7



**Grafik 4.14 Distribusi Lognormal Waktu Pemeriksaan QC**



### Distribution Summary

Distribution : Lognormal  
Expression :  $13.5 + \text{LOGN}(1.95, 1.4)$   
Square Error : 0.037520

### Chi Square Test

Number of intervals = 4  
Degrees of freedom = 1  
Test Statistic = 5.82  
Corresponding p-value = 0.0176

### Data Summary

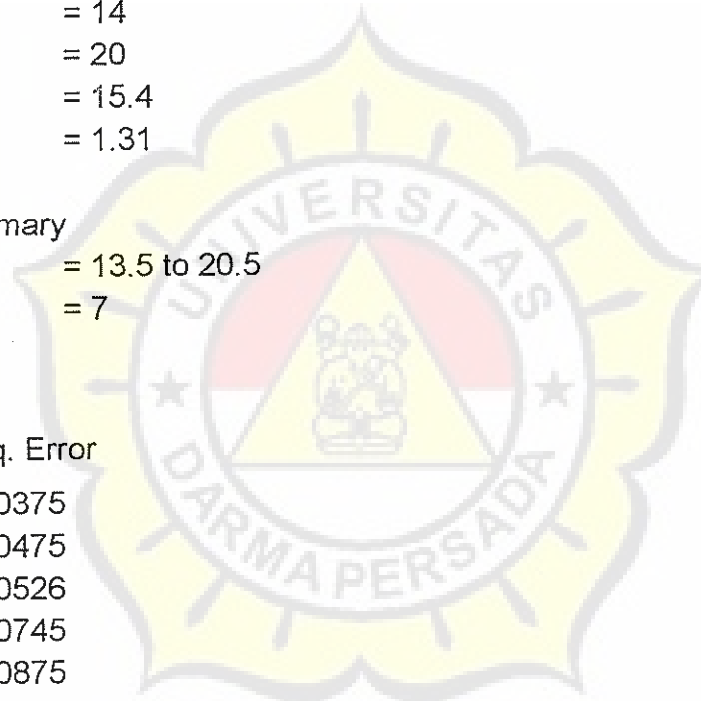
Number of Data Points = 50  
Min Data Value = 14  
Max Data Value = 20  
Sample Mean = 15.4  
Sample Std Dev = 1.31

### Histogram Summary

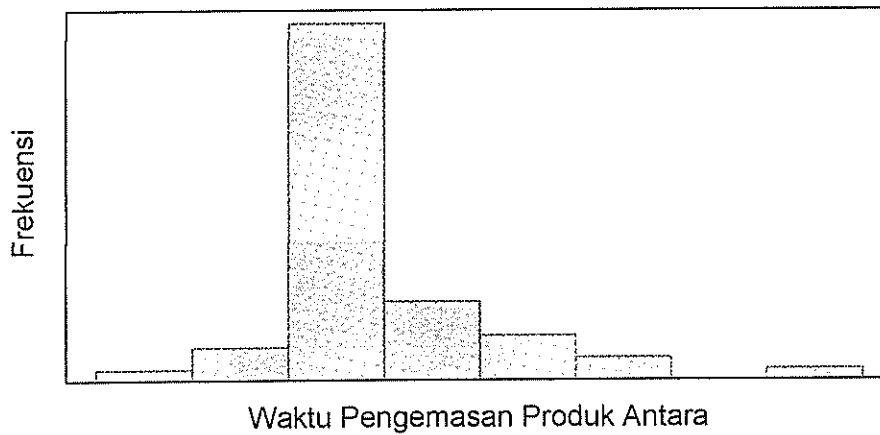
Histogram Range = 13.5 to 20.5  
Number of Intervals = 7

### Fit All Summary

Functions	Sq. Error
Lognormal	0.0375
Erlang	0.0475
Gamma	0.0526
Weibull	0.0745
Beta	0.0875
Normal	0.109
Triangular	0.133
Exponential	0.162
Uniform	0.219
Poisson	0.282



### VIII. Waktu pengemasan produk antara



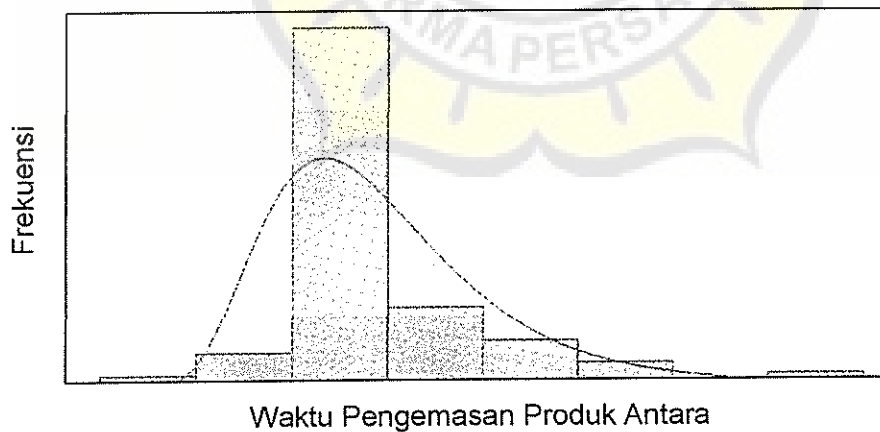
**Grafik 4.15 Histogram Waktu Pengemasan Produk Antara**

#### Data Summary

Number of Data Points	= 50
Min Data Value	= 18
Max Data Value	= 25
Sample Mean	= 20.4
Sample Std Dev	= 1.14

#### Histogram Summary

Histogram Range	= 17.5 to 25.5
Number of Intervals	= 8



**Grafik 4.16 Distribusi Lognormal Pengemasan Produk Antara**

### Distribution Summary

Distribution : Lognormal  
Expression :  $17.5 + \text{LOGN}(2.94, 1.19)$   
Square Error : 0.099532

### Chi Square Test

Number of intervals = 4  
Degrees of freedom = 1  
Test Statistic = 15.3  
Corresponding p-value < 0.005

### Data Summary

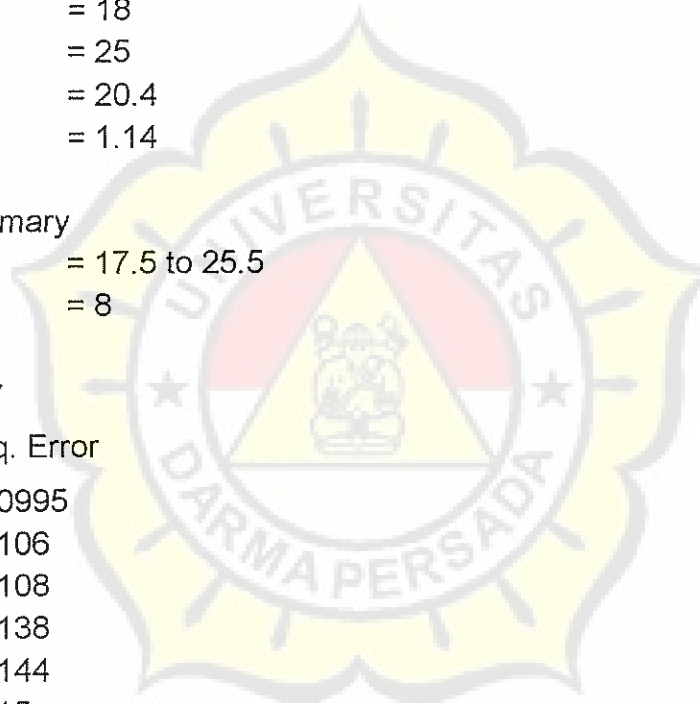
Number of Data Points = 50  
Min Data Value = 18  
Max Data Value = 25  
Sample Mean = 20.4  
Sample Std Dev = 1.14

### Histogram Summary

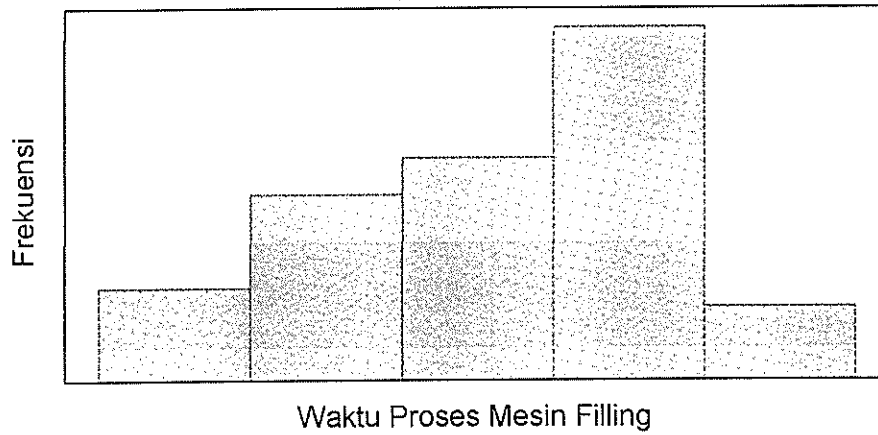
Histogram Range = 17.5 to 25.5  
Number of Intervals = 8

### Fit All Summary

Functions	Sq. Error
Lognormal	0.0995
Gamma	0.106
Erlang	0.108
Beta	0.138
Normal	0.144
Weibull	0.15
Triangular	0.196
Uniform	0.317
Exponential	0.341
Poisson	0.42



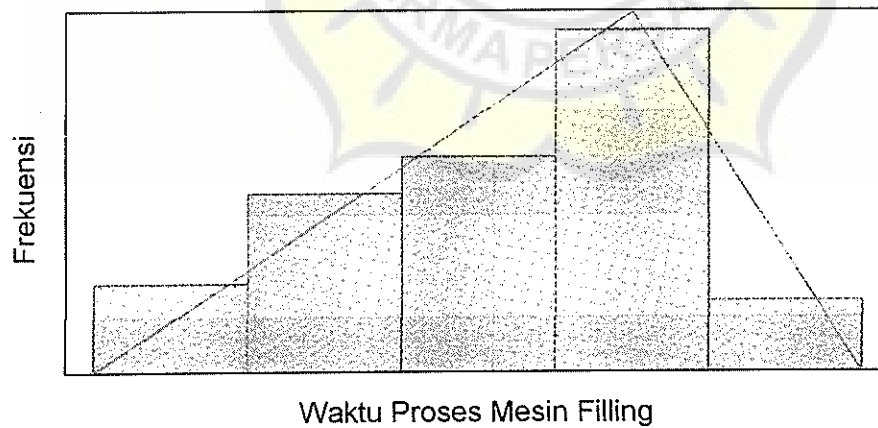
### IX. Waktu proses mesin filling



**Grafik 4.17 Histogram Waktu Proses Mesin Filling**

Data Summary  
Number of Data Points = 50  
Min Data Value = 2  
Max Data Value = 6  
Sample Mean = 4.14  
Sample Std Dev = 1.14

Histogram Summary  
Histogram Range = 1.5 to 6.5  
Number of Intervals = 5



**Grafik 4.18 Distribusi Triangular Waktu Proses Mesin Filling**

### Distribution Summary

Distribution : Triangular  
Expression : TRIA (1.5, 5, 6.5)  
Square Error : 0.008350

### Chi Square Test

Number of intervals = 4  
Degrees of freedom = 2  
Test Statistic = 2.66  
Corresponding p-value = 0.271

### Data Summary

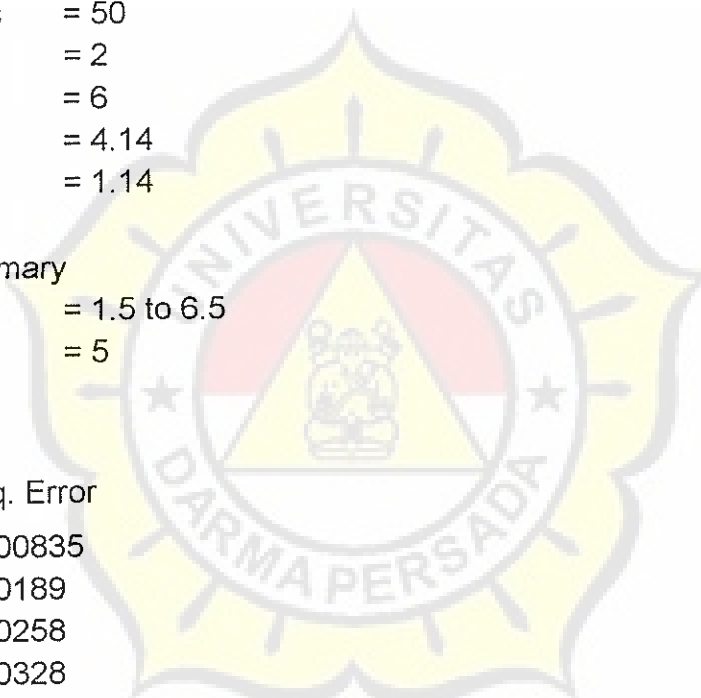
Number of Data Points = 50  
Min Data Value = 2  
Max Data Value = 6  
Sample Mean = 4.14  
Sample Std Dev = 1.14

### Histogram Summary

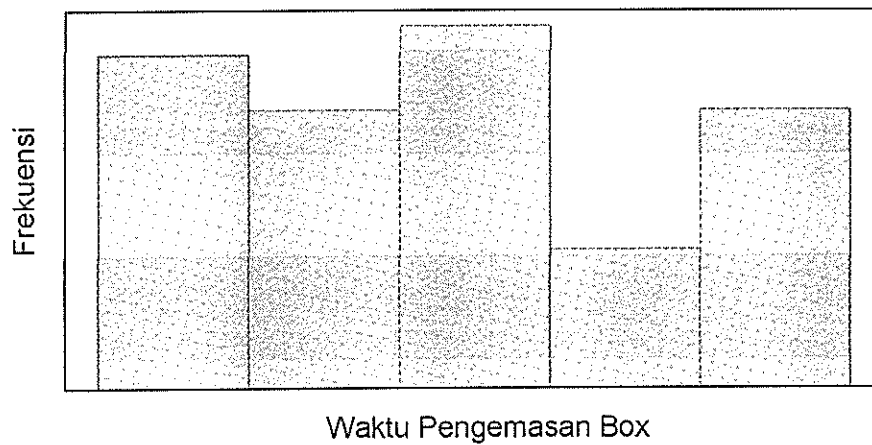
Histogram Range = 1.5 to 6.5  
Number of Intervals = 5

### Fit All Summary

Functions	Sq. Error
Triangular	0.00835
Beta	0.0189
Normal	0.0258
Weibull	0.0328
Erlang	0.0505
Gamma	0.0508
Uniform	0.0584
Poisson	0.0649
Lognormal	0.0697
Exponential	0.133



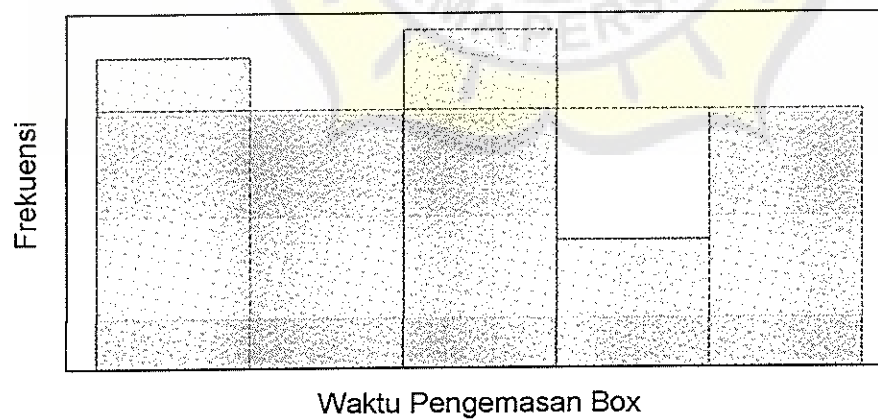
## X. Waktu pengemasan box



**Grafik 4.19 Histogram Waktu Pengemasan Box**

Data Summary  
Number of Data Points = 50  
Min Data Value = 8  
Max Data Value = 12  
Sample Mean = 9.82  
Sample Std Dev = 1.44

Histogram Summary  
Histogram Range = 7.5 to 12.5  
Number of Intervals = 5



**Grafik 4.20 Distribusi Uniform Waktu Pengemasan Box**

### Distribution Summary

Distribution : Uniform  
Expression : UNIF (7.5, 12.5)  
Square Error : 0.015200

### Chi Square Test

Number of intervals = 5  
Degrees of freedom = 4  
Test Statistic = 3.8  
Corresponding p-value = 0.445

### Data Summary

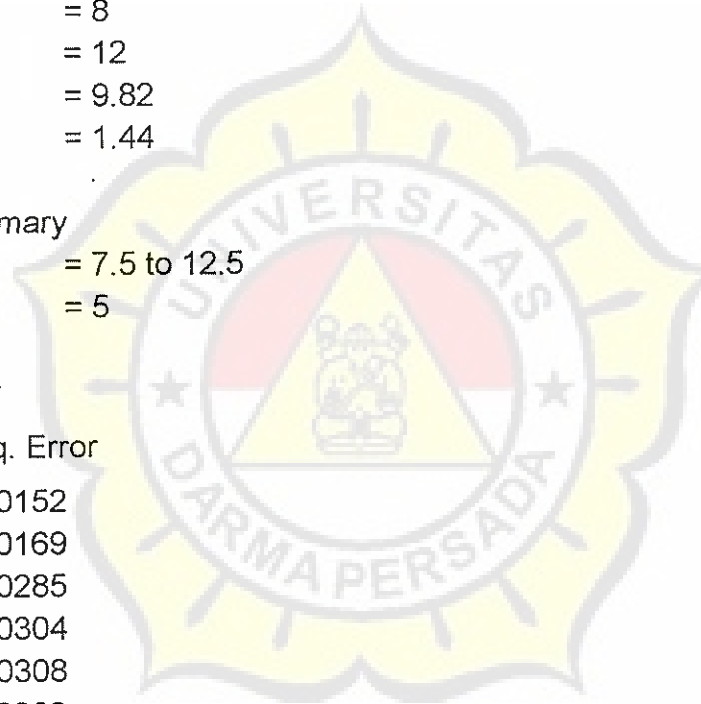
Number of Data Points = 50  
Min Data Value = 8  
Max Data Value = 12  
Sample Mean = 9.82  
Sample Std Dev = 1.44

### Histogram Summary

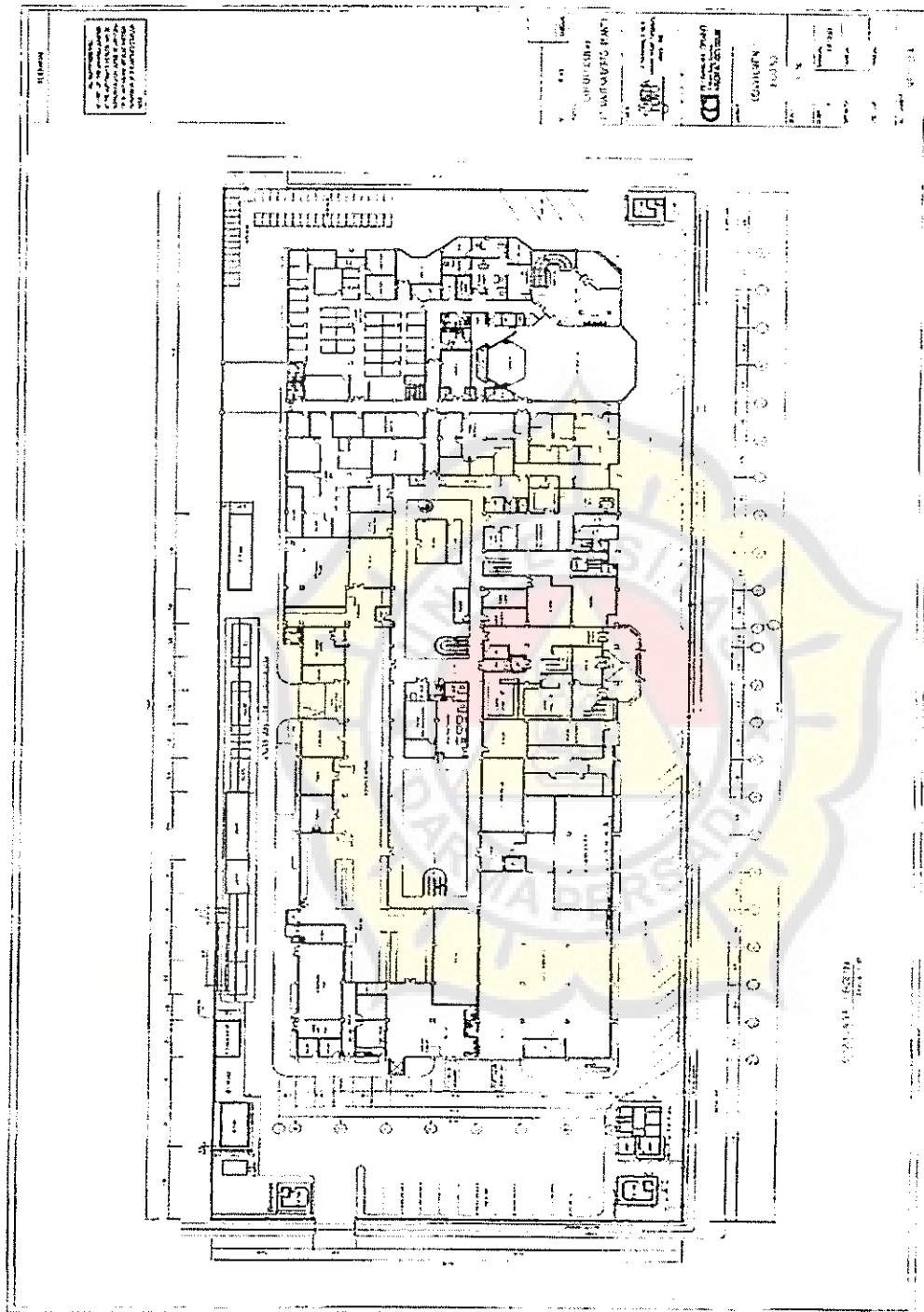
Histogram Range = 7.5 to 12.5  
Number of Intervals = 5

### Fit All Summary

Functions	Sq. Error
Uniform	0.0152
Beta	0.0169
Weibull	0.0285
Erlang	0.0304
Gamma	0.0308
Normal	0.0363
Lognormal	0.0408
Exponential	0.0444
Poisson	0.0484
Triangular	0.0625



# LAYOUT PABRIK LANTAI 1







# PETA PROSES OPERASI

NAMA OBYEK : BULK PELEMBAB  
 NOMOR PETA : 01  
 DIPETAKAN OLEH : OKMADANTI CITRASARI  
 TANGGAL DIPETAKAN : JUNI 2009

