

DAFTAR ISI

TESIS	i
LEMBAR PENGESAHAN TESIS	ii
PERNYATAAN BEBAS PLAGIASI	iii
HALAMAN PERSEMBAHAN	iv
KATA PENGANTAR.....	v
DAFTAR ISI.....	vii
DAFTAR GAMBAR.....	x
DAFTAR TABEL	xiv
DAFTAR NOTASI DAN SINGKATAN.....	xv
INTISARI	xvii
ABSTRACT	xviii
BAB I PENDAHULUAN.....	1
1.1. Latar Belakang.....	1
1.2. Rumusan Masalah.....	2
1.3. Batasan Masalah	2
1.4. Tujuan Penelitian	3
1.5. Manfaat Penelitian	3
BAB II TINJAUAN PUSTAKA.....	5
2.1. <i>Microbubble</i>	5
2.2. <i>Microbubble Generator</i>	6
2.2.1. <i>Spherical Body</i>	6
2.2.2. Rotary Liquid Flow Microbubble Generator	7
2.2.3. Ventury Type Microbubble Generator.....	7
2.2.4. Ejector Type Microbubble Generator	8

2.2.5. Orifice type microbubble generator.....	9
2.2.6. Swirl type Microbubble Generator	10
2.3. Karakter Hidrodinamis <i>Microbubble</i> pada <i>Microbubble Generator</i> tipe <i>Swirl</i>	11
2.4. <i>Image Processing Analysis</i> Pada <i>Microbubble</i>	12
2.5. <i>Wavelet Analysis</i> dan <i>Chaotic Analysis</i> Pada Aliran Dua Fase.....	13
BAB III DASAR TEORI	15
3.1. Aliran Dua Fase	15
3.1.1 <i>Bubble Flow</i>	16
3.1.2 <i>Stratified Flow</i>	17
3.1.3 <i>Annular Flow</i>	17
3.1.4 <i>Plug Flow</i>	17
3.1.5 <i>Slug Flow</i>	17
3.2. <i>Microbubble</i>	17
3.3. Sifat dan Karakteristik <i>Microbubble</i>	18
3.3.1 Ukuran <i>Microbubble</i>	19
3.3.2 Laju Transfer Massa.....	19
3.3.3 <i>Rising Speed</i>	19
3.3.4 Hambatan Gesek	20
3.3.5 Tekanan Internal <i>Microbubble</i>	21
3.3.6 <i>Specific Interfacial Area Microbubble</i>	21
3.4. Aplikasi <i>Microbubble</i>	22
3.5. <i>Swirl Type Microbubble Generator</i>	23
3.6. <i>Pressure Drop Microbubble Generator</i>	26
3.7. <i>Probability Density Function</i>	26
3.8. <i>Power Spectral Density</i>	27
3.9. <i>Wavelet Analysis</i>	27
3.10. <i>Chaotic Analysis</i>	28

3.11. <i>Digital Image Processing</i>	28
3.11.1. <i>Binary Image dan Grayscale Image</i>	28
3.11.2. <i>Substraksi Background Gambar</i>	29
3.11.3. <i>Filtering process</i>	30
3.11.4. <i>Region Proportional Method</i>	30
3.11.5. <i>Teknik Watershed</i>	31
BAB IV METODOLOGI PENELITIAN	33
4.1. <i>Lokasi Penelitian</i>	33
4.2. <i>Alat Penelitian</i>	33
4.2.1. <i>Swirl Type Microbubble Generator</i>	33
4.2.2. <i>Pompa Sentrifugal</i>	34
4.2.3. <i>Akuarium Uji</i>	35
4.2.4. <i>Phantom High-Speed Camera</i>	35
4.2.5. <i>Water flowmeter</i>	36
4.2.6. <i>Gas Flowmeter</i>	36
4.2.7. <i>Lampu LED</i>	37
4.2.8. <i>Pressure Tranducer</i>	37
4.2.9. <i>Inverter</i>	38
4.2.10. <i>Data Acquisition Model</i>	38
4.2.11. <i>Komputer</i>	39
4.3. <i>Instalasi Alat Penelitian</i>	39
4.4. <i>Bahan Penelitian</i>	40
4.4.1. <i>Saluran Instalasi Sistem</i>	40
4.4.2. <i>Fluida Uji</i>	40
4.5. <i>Variasi Pengambilan Data</i>	40
4.6. <i>Diagram Alur Penelitian</i>	41

4.7. Alur Penelitian	41
4.7.1. Studi Literatur	41
4.7.2. Desain dan Manufaktur <i>Microbubble Generator</i>	41
4.7.3. Persiapan Sarana Pendukung	42
4.7.4. Pengambilan data	42
4.7.5. Pengolahan data	44
BAB V HASIL DAN PEMBAHASAN	46
5.1. Hasil Tangkapan Gambar <i>Microbubble</i>	46
5.2. Proses Generasi <i>Microbubble</i>	49
5.3. Perilaku <i>Microbubble</i>	50
5.4. Distribusi Ukuran <i>Microbubble</i>	52
5.5. <i>Pressure Signal</i>	58
5.6. Signal Analysis	60
5.6.1 <i>Probability Density Function</i>	60
5.6.2 <i>Power Spectral Density</i>	62
5.6.3 <i>Wavelet Energy</i>	64
5.6.4 <i>Chaotic Analysis</i>	70
BAB VI KESIMPULAN DAN SARAN.....	72
6.1. Kesimpulan.....	72
6.2. Saran	73
DAFTAR PUSTAKA	75