

## LAMPIRAN

## Lampiran 1

### Anggaran Biaya Tugas Akhir

No	Nama Komponen	Qty	Harga per satuan	Total Harga
1.	Motor AC	1	Rp. 600.000,-	Rp. 650.000,-
2.	Puli penggerak 4 Inch	1	Rp. 25.000,-	Rp. 25.000,-
3.	Puli yang digerakan 8 Inch	1	Rp. 110.000,-	Rp. 110.000,-
4.	V-belt Mitshubishi tipe A no. 46	1	Rp. 35.000,-	Rp. 35.000,-
5.	Poros	1	Rp. 45.000,-	Rp. 45.000,-
6.	Piringan dudukan pisau	1	Rp. 440.000,-	Rp. 440.000,-
7.	Bearing NTN	2	Rp. 40.000,-	Rp. 80.000,-
8.	Saklar kitani	1	Rp. 30.000,-	Rp. 30.000,-
9.	Kabel kitani	2,5 m	Rp. 26.500,-	Rp. 26.500,-
10.	Engsel	3	Rp. 5.000,-	Rp. 15.000,-
11.	Mur, baut dan ring	8	Rp. 2.750,-	Rp. 22.5000,-
12.	Besi hollow 40x40	2	Rp. 77.500/6 m	Rp. 155.000,-
13.	Elektroda RD-460	1 kg	Rp. 39.000,-	Rp. 39.000,-
14.	Cat avian hitam	200 cc	Rp. 22.000,-	Rp. 22.000,-
15.	Plat Galvanis tebal 0,30 x 90 mm	1,3 m	Rp. 74.000,-	Rp. 74.000,-
16.	Plat Alumunium tebal 2 mm	2 m	Rp. 135.000/1 m	Rp. 270.000,-
17.	Dempul san polac	1	Rp. 30.000,-	Rp. 30.000,-
18.	Bawang Merah	2 kg	Rp. 30.000,-	Rp. 60.000,-
19.	Timbangan Digital	1	Rp. 75.000,-	Rp. 75.000,-
20.	Paku Rivet	20	Rp. 250	Rp. 5000
<b>Total</b>				<b>Rp. 2.365.000,-</b>

## Lampiran 2

### Tegangan Tarik dan Kecepatan Potong

Material	Teg. Tarik (kg/mm <sup>2</sup> )	CS (m/mnt)	Material	Teg. Tarik (kg/mm <sup>2</sup> )	CS (m/mnt)
<b>Plain carbon steel</b>			<b>Spring Steel (JIS Grade)</b>		
ST37 / MS	37	32	SUP4, 6, 7, 9, 10, 11	125	13
1030 / S30C	48	32	SUS 302, 304, 316 WPA	170	5
1035 / S35C	52	25	SUS 302, 304, WPB	210	5
1040 / S40C	55	25	SUS 631J1 WPC	200	5
1045 / S45C / EMS45 / 1730	58	25	<b>Stainless Steel</b>		10-25
1050 / S50C / ST60	62	25	304, 304L, 316, 316L	70	18
1055 / S55C	66	25	410, 416	77	18
<b>Alloy Steel (JIS Grade)</b>			420, 420F	84	18
SNC2, 3, 21	95	18	440C, 440F	91	18
SNC22	100	13	<b>Copper</b>		70
SNCM1, 2, 22	90	18	<b>Lead Bronze</b>		50-70
SNCM7, 8, 23, 25	100	13	<b>Phospor Bronze</b>		40-50
SCr3, 4, 21, 22	90	18	<b>Pure Aluminum</b>		200-300
SCr5	100	13	<b>Aluminum Alloy</b>		70-120
SCM2, 3, 21, 22	90	18	<b>Cast Iron</b>		
SCM4, 5, 23	100	13	GG20		25
<b>Tool Steel (AISI Grade)</b>			GG25		18
W Series	70	18	GG30, 35, 40		18
O Series	135	5	GG45, 50		13
D Series	140	5	GG55, 60		5
A Series	140	5			
H Series	140	5			
L Series	100	13			
P Series	100	13			
S Series	130	5			
HSS T Series	150	5			
HSS M Series	140	5			

### Lampiran 3

Data Material, Kecepatan Potong, Sudut Mata Bor HSS dan Cairan Pendingin Proses Gurdi (Widarto, 2008) dan Rumus Empiris Gerak Makan Per Mata Potong Gurdi (Widarto, 2008)

MATERIAL	CUTTING SPEEDS <sup>1</sup>		POINT ANGLE	LIP CLEARANCE	COOLANTS
	(METERS/MINUTE)	(FEET/MINUTE)			
	MPM	FPM			
Aluminum And Alloys	61.00 - 91.50	200 - 300	90 - 130 deg	12 - 15 deg	Kerosene/Kerosene & Lard Oil/ Soluble Oil
Armor Plate	12.20 - 18.25	40 - 50	135 - 140 deg	6 - 9 deg	Light Machine Oil
Brass	61.00 - 91.50	200 - 300	118 - 118 deg	12 - 15 deg	Dry/ Soluble Oil/Kerosene/Lard Oil
Bronze	61.00 - 91.50	200 - 300	110 - 118 deg	12 - 15 deg	Dry/ Soluble Oil/Mineral Oil/Lard Oil
Bronze, High Tensile	21.35 - 45.75	70 - 150	100 - 110 deg	12 - 15 deg	Dry/ Soluble Oil/Mineral Oil/Lard Oil
Cast Iron, Soft	30.50 - 45.75	100 - 150	90 - 100 deg	12 - 15 deg	Air Jet Dry/ Soluble Oil
Cast Iron, Medium	21.35 - 30.50	70 - 100	100 - 110 deg	12 - 15 deg	Air Jet Dry/ Soluble Oil
Cast Iron, Hard	21.35 - 30.50	70 - 100	100 - 118 deg	8 - 12 deg	Air Jet Dry/ Soluble Oil
Cast Iron, Chilled	9.15 - 12.20	30 - 40	118 - 135 deg	5 - 9 deg	Air Jet Dry/ Soluble Oil
Copper	61.00 - 91.50	200 - 300	100 - 118 deg	12 - 15 deg	Air Jet Dry/ Soluble Oil
Copper Graphite Alloy (Carbon Drills)	18.30 - 21.35	60 - 70	**_**	**_**	Soluble Oil/Dry/Mineral Oil/Kerosene
Glass (Carbon Drills)	6.10 - 9.15	20 - 30	**_**	**_**	Soluble Oil/Dry/Mineral Oil/Kerosene
Iron, Malleable	15.25 - 27.45	50 - 90	90 - 100 deg	12 - 15 deg	Light Machine Oil
Magnesium And Alloys	76.25 - 122.0	250 - 400	70 - 118 deg	12 - 15 deg	Soluble Oil
Monel Nickel	4.15 - 13.28	30 - 50	118 - 125 deg	10 - 12 deg	Compressed Air/Mineral Oil
Nickel Alloys	12.20 - 18.30	40 - 60	135 - 140 deg	5 - 7 deg	Lard Oil/Soluble Oil
Plastic, Hot Set	30.50 - 91.50	100 - 300	60 - 90 deg	10 - 12 deg	Lard Oil/Soluble Oil
Plastic, Cold Set	30.50 - 91.50	100 - 300	118 - 135 deg	12 - 20 deg	Soap Solution
Steel, Low Carbon, 0.2-0.3ct	24.40 - 33.55	80 - 110	110 - 118 deg	7 - 9 deg	Soap Solution
Steel, Medium Carbon 0.4-0.5c	21.35 - 24.40	70 - 80	118 - 125 deg	7 - 9 deg	Soluble Oil/Mineral Oil/Sulfur Oil/Lard Oil
Steel (High Carbon 1.2c)	15.25 - 18.30	50 - 60	118 - 145 deg	7 - 9 deg	Soluble Oil/Mineral Oil/Sulfur Oil/Lard Oil
Steel, Forged	15.25 - 18.30	50 - 60	118 - 145 deg	7 - 12 deg	Soluble Oil/Mineral Oil/Sulfur Oil/Lard Oil
Steel, Alloy	15.25 - 21.35	50 - 70	118 - 125 deg	10 - 12 deg	Mineral Lard Oil
Steel, Alloy 300 To 400 Brinell	6.10 - 9.15	20 - 30	130 - 140 deg	7 - 10 deg	Soluble Oil
Steel, Stainless, Free Machining	9.15 - 24.40	30 - 80	110 - 118 deg	8 - 12 deg	Soluble Oil
Steel, Stainless, Hard	4.57 - 15.25	15 - 50	118 - 135 deg	6 - 8 deg	Soluble Oil
Steel, Manganese	3.66 - 4.57	12 - 15	140 - 150 deg	7 - 10 deg	Soluble Oil
Stone (Carbide Drills)	7.63 - 9.15	25 - 30	**_**	**_**	Water Solution
Wood	91.50 - 122.2	300 - 400	60 - 70 deg	10 - 15 deg	Dry

- Untuk baja

$$f = 0.084\sqrt[3]{d}; mm / put \dots\dots\dots(8.2)$$

- Untuk besi tuang

$$f = 0.1\sqrt[3]{d}; mm / put \dots\dots\dots(8.3)$$

## Lampiran 4

Kecepatan Potong Proses Bubut Rata dan Ulir Untuk Pahat HSS (Widarto, 2008)  
dan Putaran Spindle

MATERIAL	STRAIGHT TURNING SPEED		THREADING SPEED	
	FEET PER MINUTE	METERS PER MINUTE	FEET PER MINUTE	METERS PER MINUTE
LOW-CARBON STEEL	80-100	24.4-30.5	35-40	10.7-12.2
MEDIUM-CARBON STEEL	60-80	18.3-24.4	25-30	7.6-9.1
HIGH-CARBON STEEL	35-40	10.7-12.2	15-20	4.6-6.1
STAINLESS STEEL	40-50	12.2-15.2	15-20	4.6-6.1
ALUMINUM AND ITS ALLOYS	200-300	61.0-91.4	50-80	15.2-18.3
ORDINARY BRASS AND BRONZE	100-200	30.5-61.0	40-50	12.2-15.2
HIGH-TENSILE BRONZE	40-60	12.2-18.3	20-25	6.1-7.6
CAST IRON	50-80	15.2-24.4	20-25	6.1-7.6
COPPER	60-80	18.3-24.4	20-25	6.1-7.6



## Lampiran 5

Gerak Makan Pada Mesin Bubut dan Tabel Kecepatan Potong Untuk Proses Frais Untuk Pasangan Benda Kerja dan Pisau HSS (Widarto,2008)

PITCH				LONGITUDINAL FEED				TRANSVERSE FEED					
D.P.				M				M					
D	E	F	G	D	E	F	G	D	E	F	G		
120	60	30	15	1	0.044	0.088	0.176	0.352	1	0.020	0.039	0.079	0.158
112	56	28	14	2	0.050	0.099	0.198	0.396	2	0.022	0.044	0.089	0.178
108	54	27	13 1/2	3	0.052	0.105	0.210	0.420	3	0.023	0.047	0.094	0.188
104	52	26	13	4	0.055	0.110	0.220	0.440	4	0.024	0.049	0.098	0.196
96	48	24	12	5	0.060	0.121	0.242	0.484	5	0.027	0.054	0.109	0.218
92	46	23	11 1/2	6	0.063	0.127	0.254	0.508	6	0.028	0.057	0.114	0.228
88	44	22	11	7	0.066	0.132	0.264	0.528	7	0.029	0.059	0.118	0.236
80	40	20	10	8	0.072	0.144	0.287	0.574	8	0.032	0.064	0.128	0.256
76	38	19	9 1/2	9	0.075	0.149	0.298	0.596	9	0.033	0.067	0.134	0.268
72	36	18	9	10	0.077	0.154	0.308	0.616	10	0.034	0.069	0.138	0.276
64	32	16	8	11	0.083	0.166	0.331	0.662	11	0.037	0.074	0.148	0.296

MATERIAL	CUTTING SPEED (sfpm) :			
	PLAIN MILLING CUTTERS		END MILLING CUTTERS	
	Roughing	Finishing	Roughing	Finishing
Aluminum .....	400 to 1,000	400 to 1,000	400 to 1,000	400 to 1,000
Brass, composition .....	125 to 200	90 to 200	90 to 150	90 to 150
Brass, yellow .....	150 to 200	100 to 250	100 to 200	100 to 200
Bronze, phosphor and manganese .....	30 to 80	25 to 100	30 to 80	30 to 80
Cast iron (hard) .....	25 to 40	10 to 30	25 to 40	20 to 45
Cast iron (soft and medium) .....	40 to 75	25 to 80	35 to 65	30 to 80
Monel metal .....	50 to 75	50 to 75	40 to 60	40 to 60
Steel, hard .....	25 to 50	25 to 70	25 to 50	25 to 70
Steel, soft .....	80 to 120	45 to 110	50 to 85	45 to 100

## Lampiran 6

Tebal Beram Per Gigi Untuk Beberapa Tipe Pisau Frais dan Benda Kerja Yang Dikerjakan (satuan dalam inchi) (Widarto,2008) dan Tabel Kecepatan Pada Mesin Frais Hijau

TYPE OF CUTTER	ALUMINUM		BRONZE		CAST IRON		FREE MACHINING STEEL		ALLOY STEEL	
	HSS	CAR SIDE	HSS	CAR SIDE	HSS	CAR SIDE	HSS	CAR SIDE	HSS	CAR SIDE
FACE MILLS	.007	.007	.005	.003	.004	.008	.003	.004	.002	.003
	to	to	to	to	to	to	to	to	to	to
	.022	.020	.014	.012	.016	.020	.012	.018	.008	.014
HELICAL MILLS	.006	.008	.003	.004	.004	.007	.002	.003	.002	.003
	to	to	to	to	to	to	to	to	to	to
	.018	.016	.011	.010	.018	.018	.010	.013	.007	.012
SIDE CUTTING MILLS	.004	.004	.003	.003	.002	.003	.002	.003	.001	.002
	to	to	to	to	to	to	to	to	to	to
	.013	.012	.008	.007	.009	.012	.007	.009	.005	.008
END MILLS	.003	.003	.003	.002	.002	.003	.001	.002	.001	.002
	to	to	to	to	to	to	to	to	to	to
	.011	.010	.007	.008	.008	.010	.006	.008	.004	.007
FORM RELIEVED CUTTERS	.002	.002	.001	.001	.002	.002	.001	.002	.001	.001
	to	to	to	to	to	to	to	to	to	to
	.007	.006	.004	.004	.005	.006	.004	.005	.003	.004
CIRCULAR SAWS	.002	.002	.001	.001	.001	.002	.001	.001	.005	.001
	to	to	to	to	to	to	to	to	to	to
	.005	.005	.003	.003	.004	.006	.003	.004	.002	.004

**TABLE FEED RATE**

mm/min

Rapid feed 60 % 2056  
50 % 1713

	1		2		3	
	60 %	50 %	60 %	50 %	60 %	50 %
<b>A</b>	21	17	34	29	56	47
<b>B</b>	93	77	149	124	246	203

## Lampiran 7

Gambar Proses Pembubutan Pada Poros, Proses Pengelasan Pada Rangka dan Proses Pengerindaan Untuk Membersihkan Sisa Pemotongan

