a. **Name of the Course: 330:148 (g) Machine Design**

b. **Name of the project: Design Project**

c. **Project due date: December 6, 2004**

d. **To: P. Nageswara Rao**

e. **From: Your name**

330:148 (g) Machine Design
Design Project

Design statement: Design a power transmission for an industrial saw that will be used to cut tubing for vehicle exhaust pipes to length prior to the forming process. The saw will receive 25 hp from the shaft of an electric motor rotating at 1750 rpm. The drive shaft for the saw should rotate at approximately 500 rpm.

Functions of the project:

1.
2.
3.

Design requirements

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

Selection criteria used

1. Safety
2. Cost
3. Small size
4. High reliability
5. Low maintenance
6. Smooth operation

Design alternatives examined for the various components

Belt drive
Chain drive
Single stage gear reducer with couplings

Criteria	Belt	Chain	Gear reducer
Safety			
Cost			
Small size			
High reliability			
Low maintenance			
Smooth operation			

Based on the above, Single stage gear reducer with couplings is chosen.

Detailed design of the individual components in the system such as housing, gears, shafts, bearings, seals, couplings, etc.

Gears

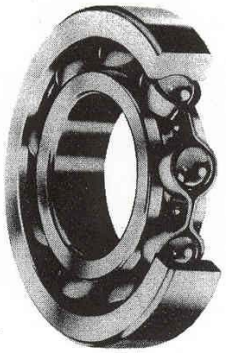
Shafts

Input shaft

Output shaft

Keys

Bearings



Ball Bearings

6200 Series

Single Row, Deep Groove, Conrad Type

Bearing Number	Nominal Bearing Dimensions						Preferred Shoulder Diameters			
	d		*D*		*B*		*r* *	da (in)		Da (in)
	mm	inch	mm	inch	mm	inch	inch	min	max	max
6200	10.00	0.3937	30	1.1811	9	0.3543	0.024	0.500	0.630	0.984
6201	12.00	0.4724	32	1.2598	10	0.3937	0.024	0.578	0.670	1.063
6201-08	12.70	0.5000	32	1.2598	10	0.3937	0.024	0.595	0.670	1.063
6201-13	13.00	0.5118	32	1.2598	10	0.3937	0.024	0.610	0.670	1.063
6202	15.00	0.5906	35	1.3780	11	0.4331	0.024	0.703	0.749	1.181
6202-10	15.90	0.6250	35	1.3780	11	0.4331	0.024	0.730	0.749	1.181
6202-16	16.00	0.6299	35	1.3780	11	0.4331	0.024	0.740	0.749	1.181
6203	17.00	0.6693	40	1.5748	12	0.4724	0.024	0.787	0.926	1.380
6203-625	15.90	0.6250	40	1.5748	12	0.4724	0.024	0.750	0.926	1.380
6204	20.00	0.7874	47	1.8504	14	0.5512	0.039	0.969	1.044	1.614
6205	25.00	0.9843	52	2.0472	15	0.5906	0.039	1.172	1.261	1.811
6206	30.00	1.1811	62	2.4409	16	0.6299	0.039	1.406	1.517	2.205
6207	35.00	1.3780	72	2.8346	17	0.6693	0.039	1.614	1.753	2.559
6208	40.00	1.5748	80	3.1496	18	0.7087	0.039	1.811	1.990	2.874
6209	45.00	1.7717	85	3.3465	19	0.7480	0.039	2.008	2.187	3.071
6210	50.00	1.9685	90	3.5433	20	0.7874	0.039	2.205	2.364	3.268
6211	55.00	2.1654	100	3.9370	31	0.7874	0.059	2.441	2.620	3.602
6212	60.00	2.3622	110	4.3307	22	0.8661	0.059	2.717	2.935	3.996
6213	65.00	2.5591	120	4.7244	23	0.9055	0.059	2.913	3.152	4.390
6214	70.00	2.7559	125	4.9213	24	0.9449	0.059	3.110	3.310	4.587
6215	75.00	2.9528	130	5.1181	25	0.9843	0.059	3.307	3.546	4.783
6216	80.00	3.1496	140	5.5118	26	1.0236	0.079	3.504	3.763	5.118
6217	85.00	3.3465	150	5.9055	28	1.1024	0.079	3.740	4.019	5.512
6218	90.00	3.5433	160	6.2992	30	1.1811	0.079	3.937	4.236	5.906
6219	95.00	3.7402	170	6.6929	32	1.2598	0.079	4.213	4.492	6.220
6220	100.00	3.9370	180	7.0866	34	1.3386	0.079	4.409	4.787	6.614
6221	105.00	4.1339	190	7.4803	36	1.4173	0.079	4.606	5.024	7.008
6222	110.00	4.3307	200	7.8740	38	1.4961	0.079	4.803	5.280	7.402
6224	120.00	4.7244	215	8.4646	40	1.5748	0.079	5.197	5.752	7.992
6226	130.00	5.1181	230	9.0551	40	1.5748	0.098	5.669	6.206	8.504
6228	140.00	5.5118	250	9.8425	42	1.6535	0.098	6.063	6.757	9.291
6230	150.00	5.9055	270	10.6299	45	1.7717	0.098	6.457	7.328	10.079
6232	160.00	6.2992	290	11.4173	48	1.8898	0.098	6.850	7.959	10.886
6234	170.00	6.6929	310	12.2047	52	2.0472	0.118	7.362	8.471	11.535
6236	180.00	7.0866	320	12.5984	52	2.0472	0.118	7.758	8.786	11.929
6238	190.00	7.4803	340	13.3858	55	2.1654	0.118	8.150	9.298	12.717

*Maximum fillet which corner radius of bearing will clear.

Application Data	
Radial Internal Clearance	— Table 9.35 on page 252
Bearing Tolerances	— Table 9.12 thru Table 9.16 on page 236
Snap Ring Dimensions	— Table 9.9 on page 232
Shaft & Housing Fits	— Table 9.31 and Table 9.33 on page 250

Couplings

Coupling Nominal Rated Torque ***Chart 3***

Size	Min. Bore (in)	Max. Bore (in)	EPDM Torque in-lb	EPDM Torque Nm	EPDM Max. RPM	Neoprene Torque in-lb	Neoprene Torque Nm	Neoprene Max. RPM	Hytrel[1] Torque in-lb	Hytrel[1] Torque Nm	Hytrel[1] Max. RPM
3	.375	.875	60	6.78	9200	60	6.78	9200	N/A	N/A	N/A
4	.500	1.000	120	13.56	7600	120	13.56	7600	N/A	N/A	N/A
5	.500	1.188	240	27.12	7600	240	27.12	7600	N/A	N/A	N/A
6	.625	1.438	450	50.84	6000	450	50.84	6000	1800	203.37	6000
7	.625	1.625	725	81.91	5250	725	81.91	5250	2875	324.83	5250
8	.750	1.938	1135	128.24	4500	1135	128.24	4500	4530	511.82	4500
9	.875	2.375	1800	203.37	3750	1800	203.37	3750	7200	813.49	3750
10	1.125	2.750	2875	324.83	3600	2875	324.83	3600	11350	1282.38	3600
11	1.250	3.375	4530	511.82	3600	4530	511.82	3600	18000	2033.73	3600
12	1.500	3.875	7200	813.49	2800	7200	813.49	2800	31500	3559.03	2800
13	2.000	4.500	11350	1282.38	2400	11350	1282.38	2400	47268	5340.57	2400
14	2.000	5.000	18000	2033.73	2200	18000	2033.73	2200	72480	8189.15	2200
16	2.000	5.500	47250	5338.54	1500	N/A	N/A	N/A	N/A	N/A	N/A

Note: 1. Operating Hytrel within a high service factor application is not recommended.

Housing

Lubrication

Seals

Final layout drawing of the assembly of individual component components of the designed power transmission showing all the necessary dimensions.