

James bird
Laboratory experiment FMET4–Two-stage air compressor
2212304

Data:

RECEIVER PRESSURE	AIR AT INLET	AIR TO INTERCOOLER	AIR FROM INTERCOOLER	AIR AT DELIVERY	1st STAGE DELIVERY PRESSURE	1st STAGE DELIVERY PRESSURE AFTER INTERCOOLER	A1	A2	V1	V2
bar gauge	°C	°C	°C	°C	bar gauge	bar gauge	Amp	Amp	Volt	Volt
p3	T1	T4	T5	T6	p1	p2				
10 Without intercooler	22	104	104	180	1.5	1.5	7.1	13	100	100
10 With intercooler	22	104	40	177	1.5	1	7.1	12.1	100	100
9 With intercooler	22	102	35	175	1.2	1	7.1	11.9	100	100
8 With intercooler	22	103	30	165	1.2	0.9	6.9	11	100	100
7 With intercooler	22	103	28	164	1.2	0.9	7	10.9	100	100
6 With intercooler	22	102	27	154	1.1	0.8	6.8	10	100	100
5 With intercooler	22	100	26	143	1	0.8	6.5	9	100	100
4 With intercooler	22	99	25	131	1	0.8	6.5	7.9	100	100

	Mass flow rate	Stage 1 n	Stage 2 n	Power stage 1	Power stage 2
10	0.004565378	1.36551742	1.10717819	165.6288	1028.687276
10	0.004565378	1.36551742	1.1871806	165.6288	1138.505653
9	0.004531685	1.4374617	1.194354	71.96589	1118.946281
8	0.004548563	1.44447494	1.18067831	72.25637	1151.636508
7	0.004565378	1.44447494	1.18319433	72.5235	1150.910716
6	0.004565378	1.47800207	1.16246934	37.43272	1190.6181
5	0.004582132	1.51162594	1.15041842	0	1176.766117
4	0.004615457	1.50282757	1.13699487	0	1165.350826

cd=	0.62
A=	0.000127
E=	1.032795559

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RECEIVER PRESSURE p3	PRESSURE DROP	SHAFT SPEED N1	SHAFT SPEED N2	ELECTRIC POWER STAGE 1	ELECTRIC POWER STAGE 2	INDICATED POWER		Overall electric power	Overall Air indicated power	efficiency of system	Index of compression (n)	
						1st stage	2nd stage				1st stage	2nd stage
bar gauge	mmH2O	rev.min-1	rev.min-1	W	W	W	W	W	W			
10 Without intercooler	136	750	750	710	1300	165.6288012	1028.687	2010	1194.316077	0.5941871	1.365517	1.107178
10 With intercooler	136	750	750	710	1210	165.6288012	1138.506	1920	1304.134454	0.67923669	1.365517	1.187181
9 With intercooler	134	750	750	710	1190	71.96589265	1118.946	1900	1190.912173	0.62679588	1.437462	1.194354
8 With intercooler	135	750	750	690	1100	72.25637463	1151.637	1790	1223.892882	0.68373904	1.444475	1.180678
7 With intercooler	136	750	750	700	1090	72.52349708	1150.911	1790	1223.434213	0.6834828	1.444475	1.183194
6 With intercooler	136	750	750	680	1000	37.43271796	1190.618	1680	1228.050818	0.73098263	1.478002	1.162469
5 With intercooler	137	750	750	650	900	0	1176.766	1550	1176.766117	0.75920395	1.511626	1.150418
4 With intercooler	139	750	750	650	790	0	1165.351	1440	1165.350826	0.80927141	1.502828	1.136995

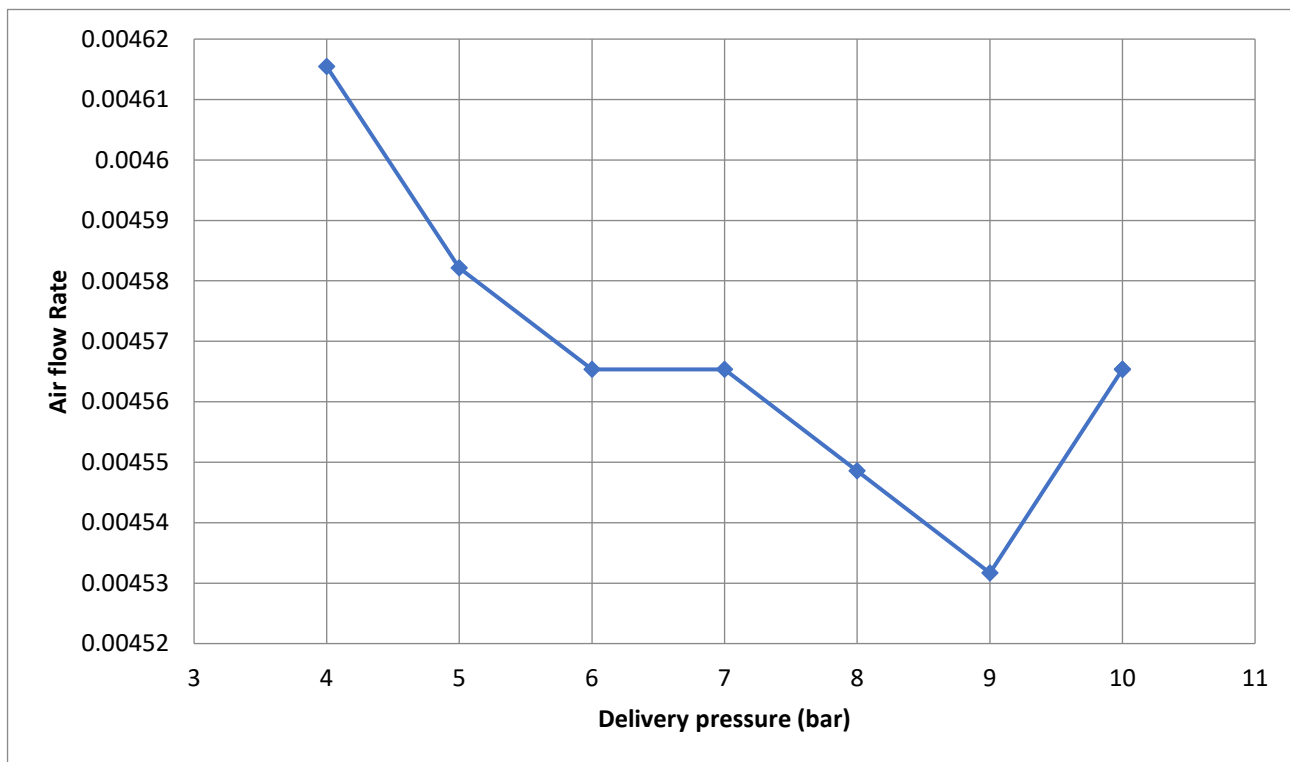


Figure 1. Graph of air flow rate against the delivery pressure.

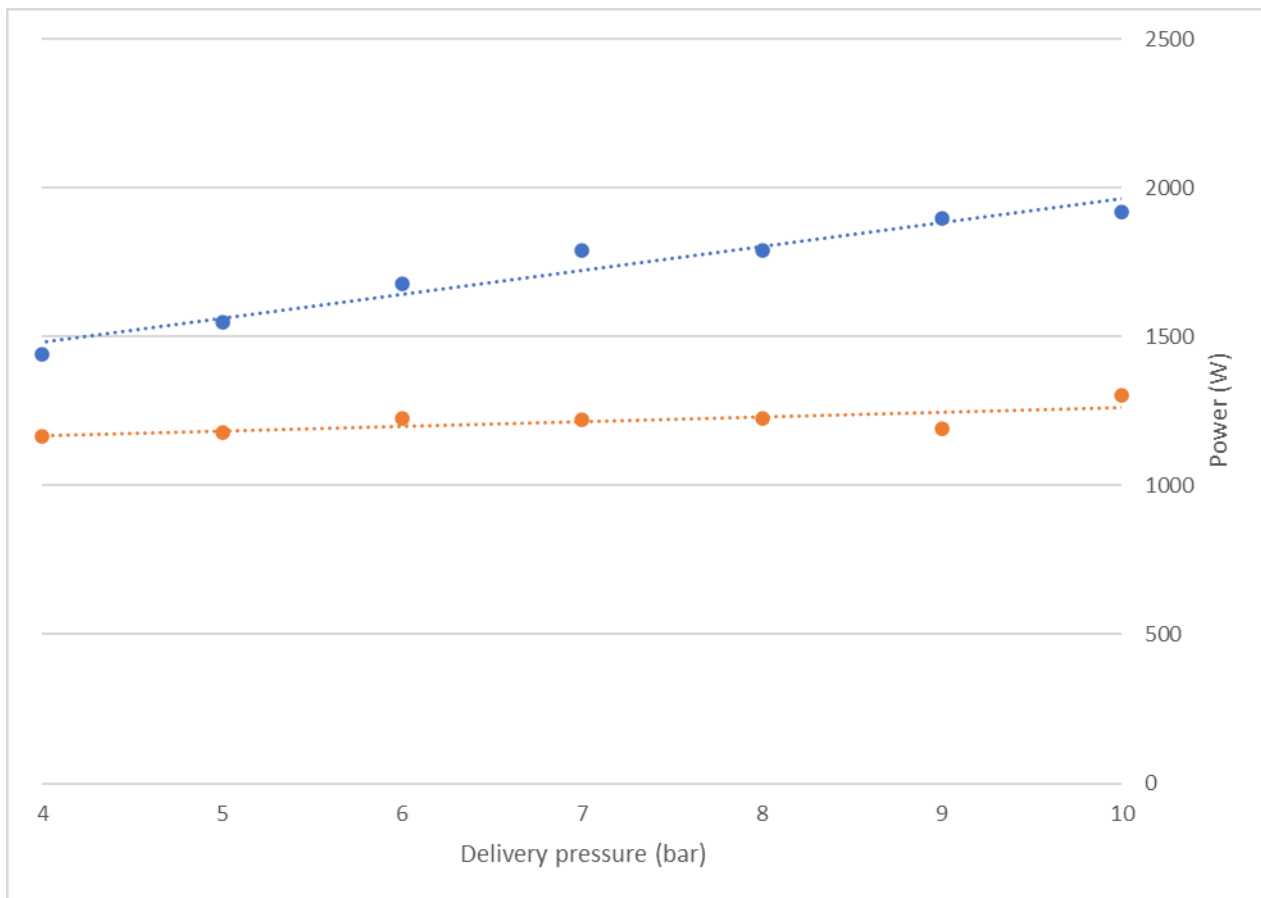


figure 2. graph of the two calculated powers, where the orange is air indicated power and the blue represents the electrical power.

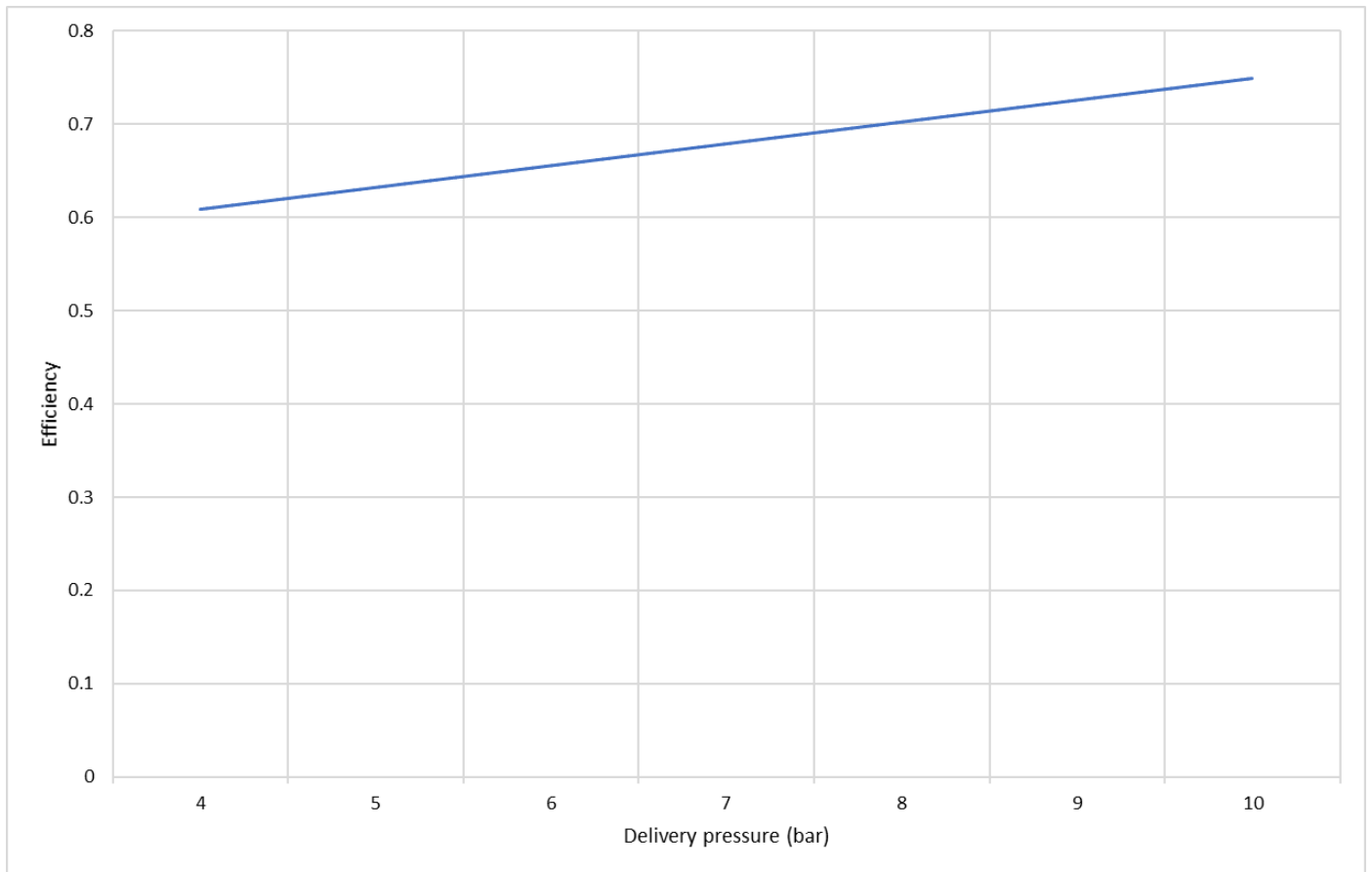


figure 3. graph of calculated efficiency against the pressure.

Discussion:

In our experiment we calculated the index of comparison which is usually between 1.2 and 1.3 for the machine in this practical which matches our results. In figure 1 we see the airflow rate which has a maximum at four Bar pressure and a minimum at 9 bar pressure which similarly follows the given two stage air compressor graph given in the lab worksheet. In figure 2 I have plotted the graph of the calculated power which increases for each, air indicated power and electrical power as the pressure increases. Figure 3 shows the efficiency of the machine which also increases as the pressure goes up which would be due to less pressure being wasted in the machinery during the readings. Sources of error during the experiment could be human error whilst reading and recording the data from the machinery, the machinery could also be calibrated incorrectly creating inaccuracies in the results. Additionally it is very important the pressure is stable whilst recording or you will measure a false value of the air flowrate.

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