Design and Development of Radial air engine

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Radial air engine

Why select this project ?

- It’s work on pneumatic application.
- It is used in small distance motion apps. The speed requirement is low. It requires less power. Can be worked on low load capacity.
- This engine does not required any type of fossil fuel.
- This engine is non-polluted.

Problem definition

- “Design and construct radial air engine for mechanical application.”
- Application found in industry:- Where small efforts required for movement in machine.
- Pneumatic means air energy.
- The working of this engine is based on energy of air which converts air energy in to some rotational energy.

Project background

- 1901 :- C. M. Manly constructed a five-cylinder radial engine.
- 1903–1904:- Jacob Ellehammer used his experience constructing motorcycles to build the world's first air-cooled radial engine.

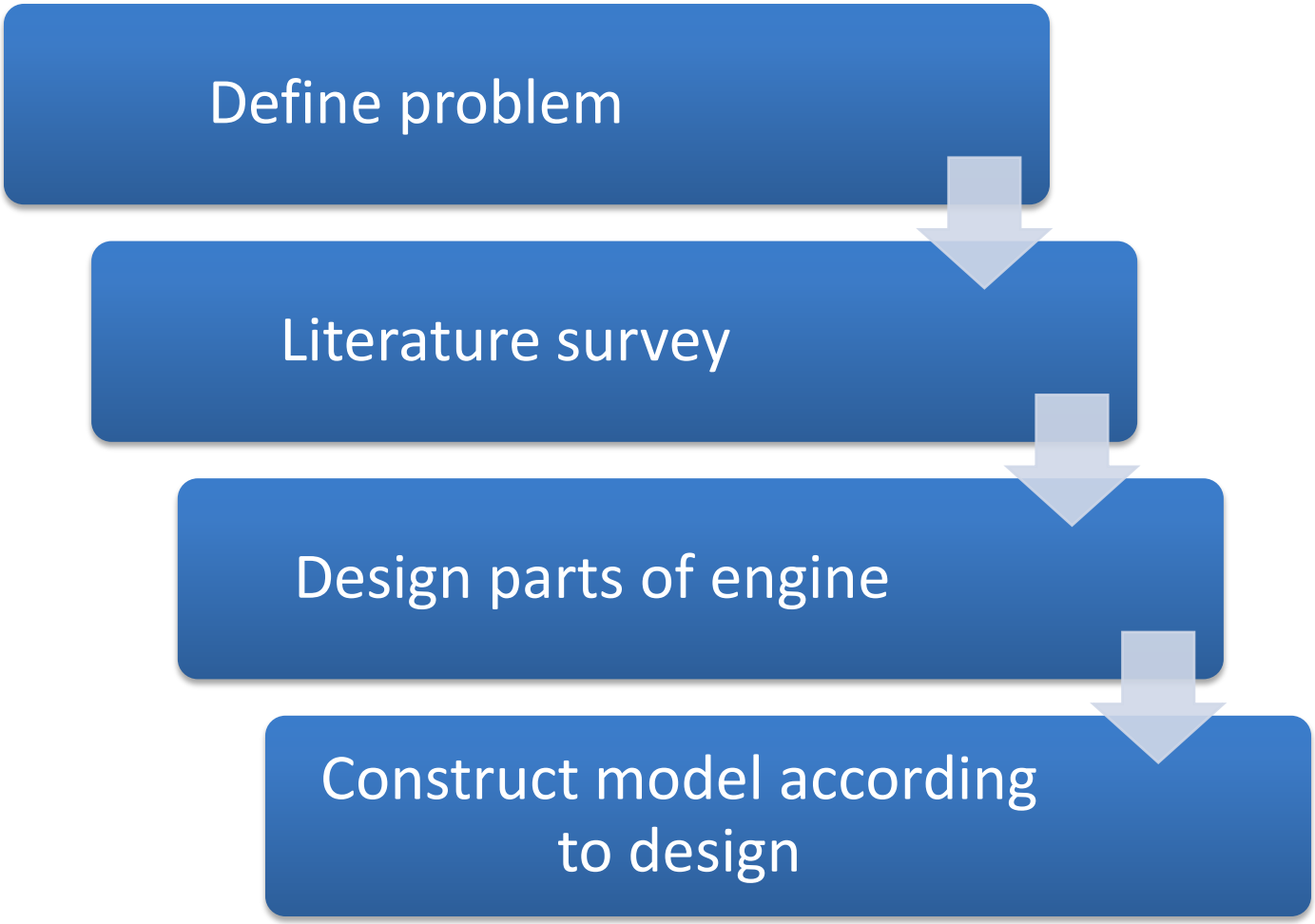
objective

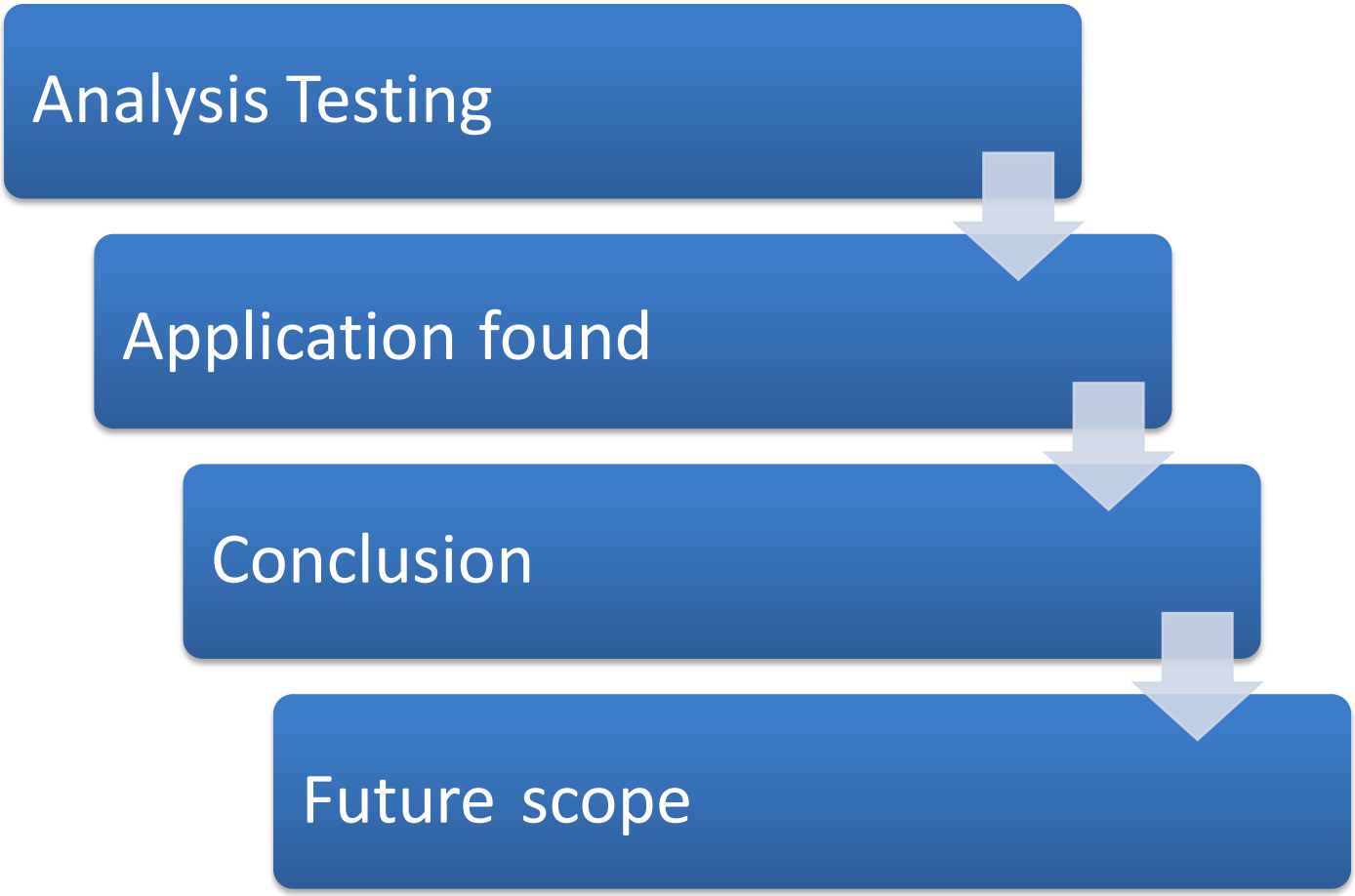
- Uses air energy for small movement of machine to reduce human effort.
- Small and light weight.
- With balance structure contained, smooth working with little vibration available.
- high efficiency, less engine cost.

SCOPE OF OBJECTIVE

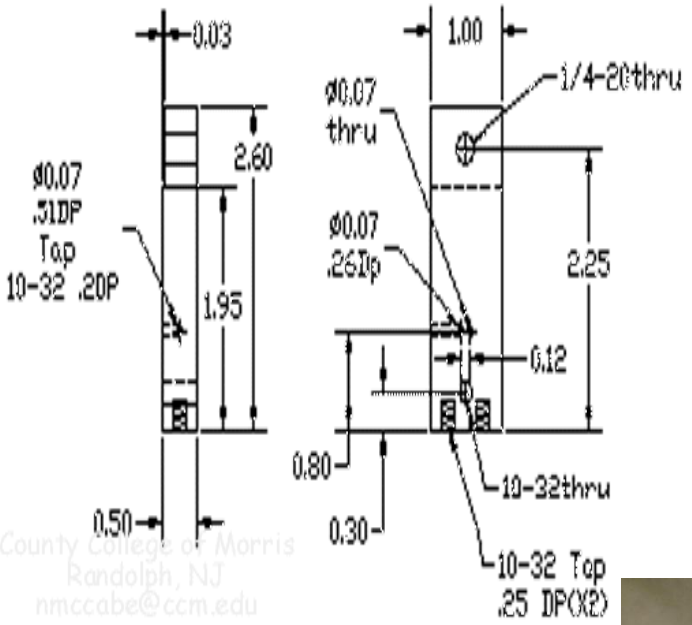
- grass cutter, surface cleaning, etc...
- Small capacity automobile vehicles.
- All type of application where air energy is used.
- Vehicular transportation using a compressed air vehicle.
- pneumatic screwdrivers.

Methodology of project

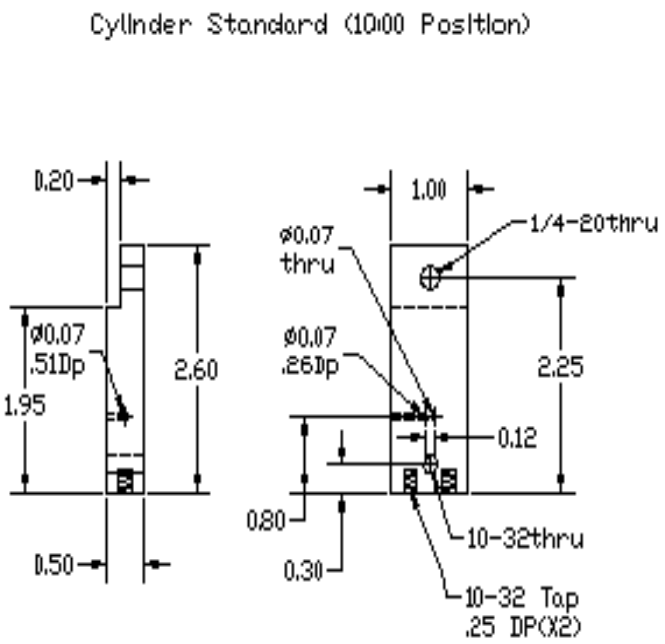


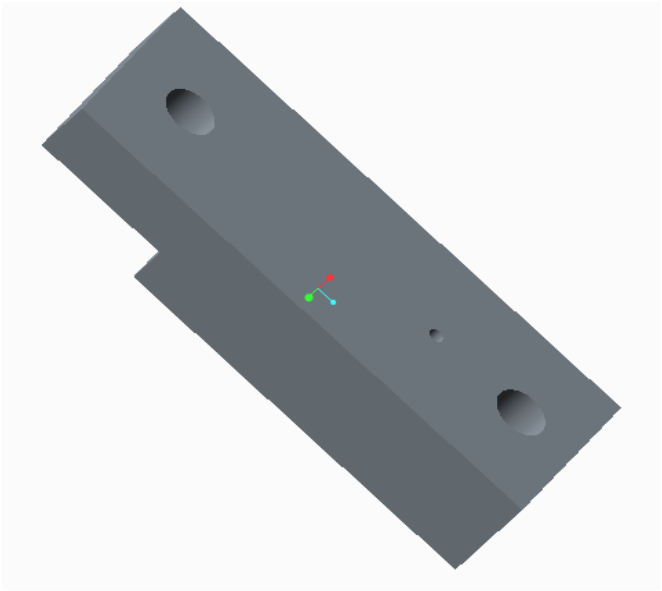

Analysis Testing
Application found
Conclusion
Future scope

Support plate

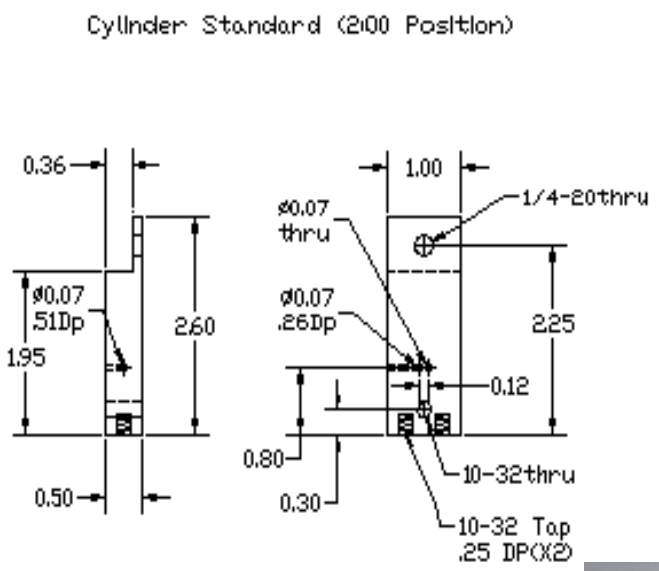


Support plate

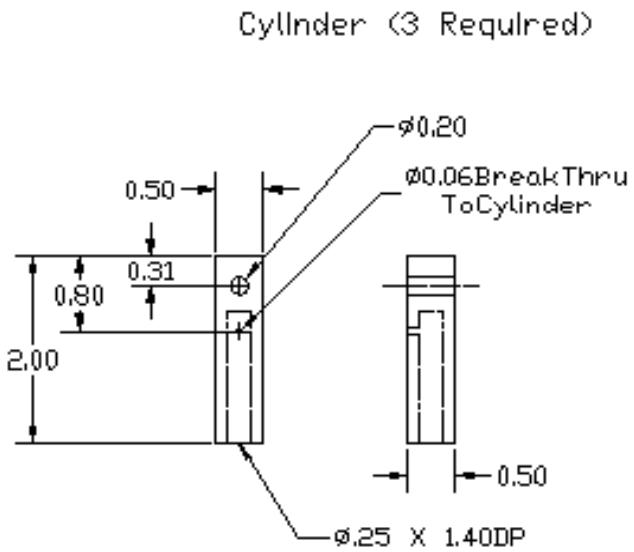




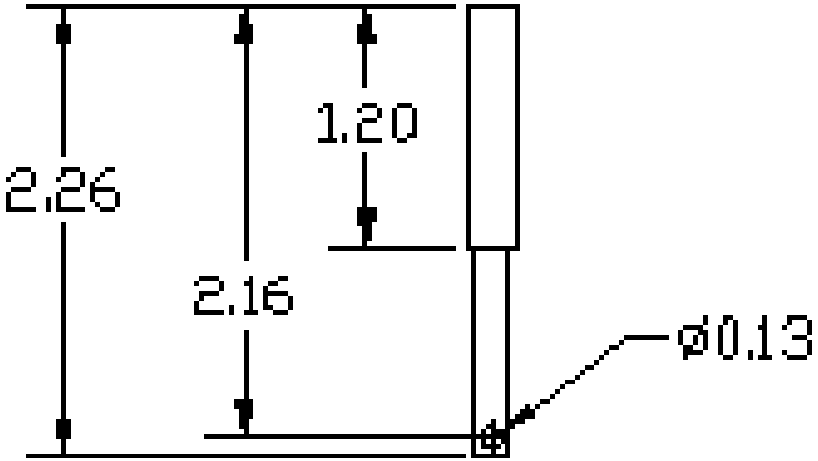
Support plate

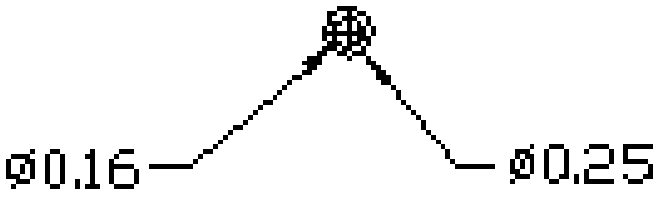


Cylinder

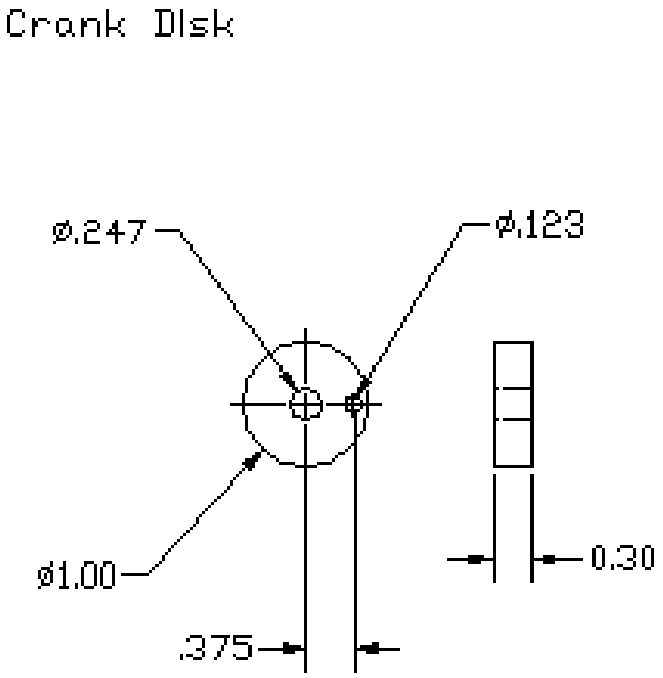

Cylinder (3 Required)
ø0.20
0.50
ø0.06BreakThru
ToCylinder
0.31
0.80
2.00
0.50
ø.25 X 1.40DP

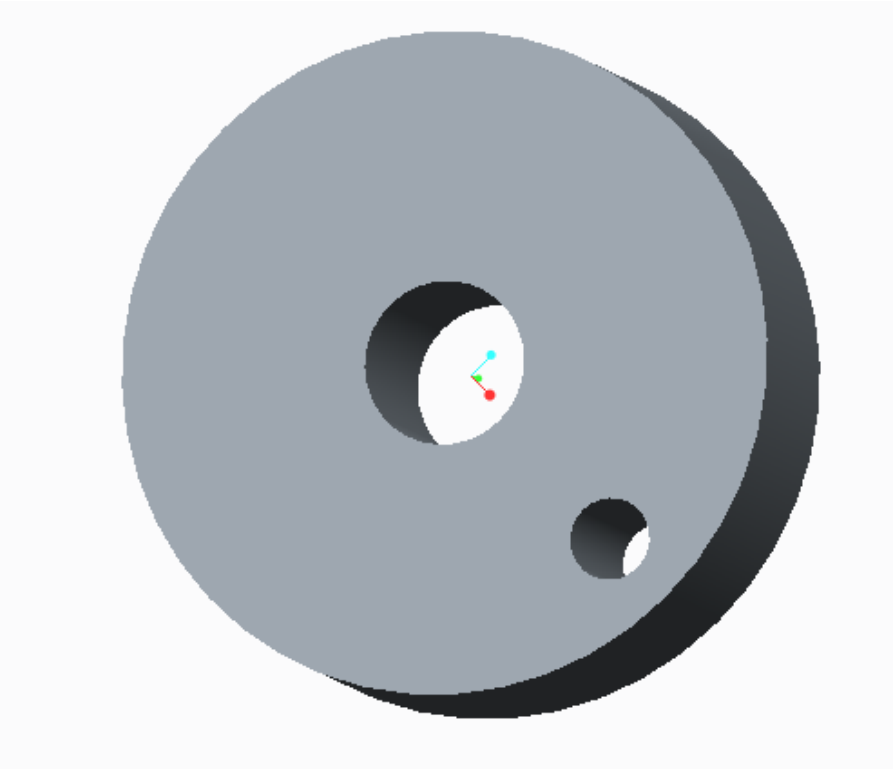
Piston & Connecting road



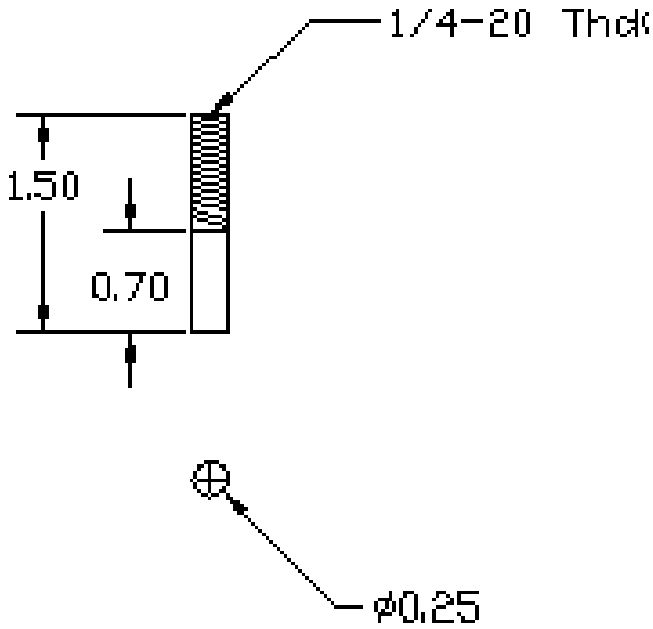


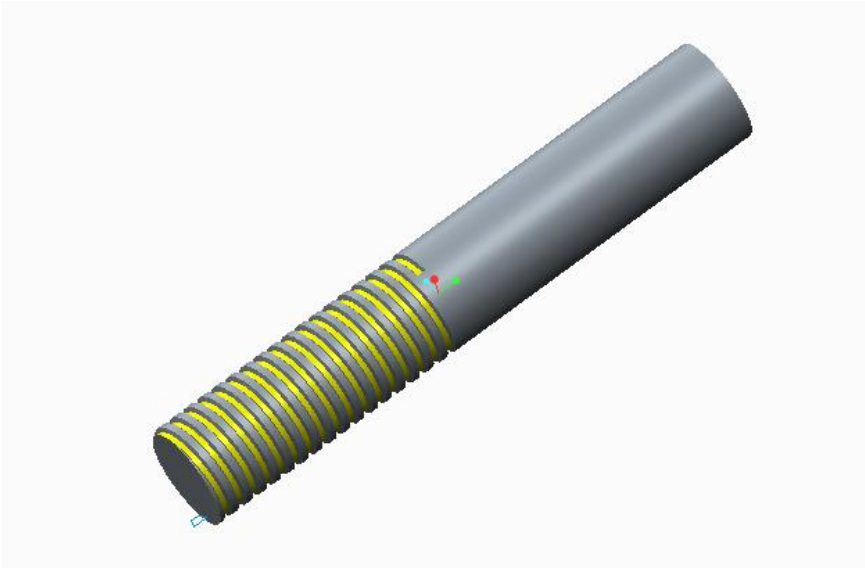
Crank disk



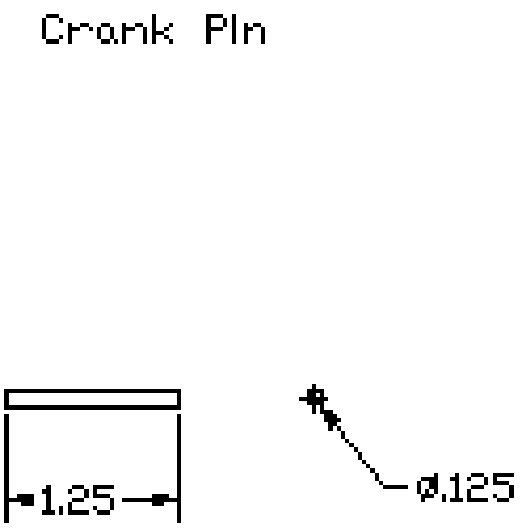


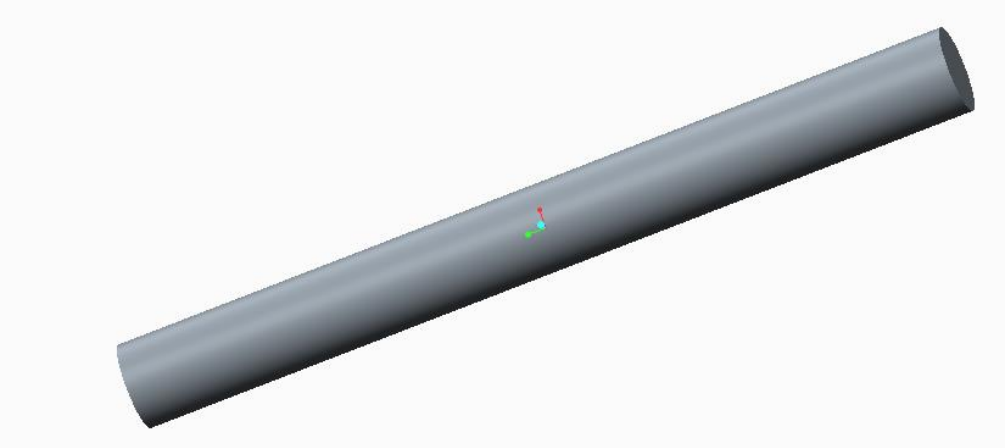
Crank shaft



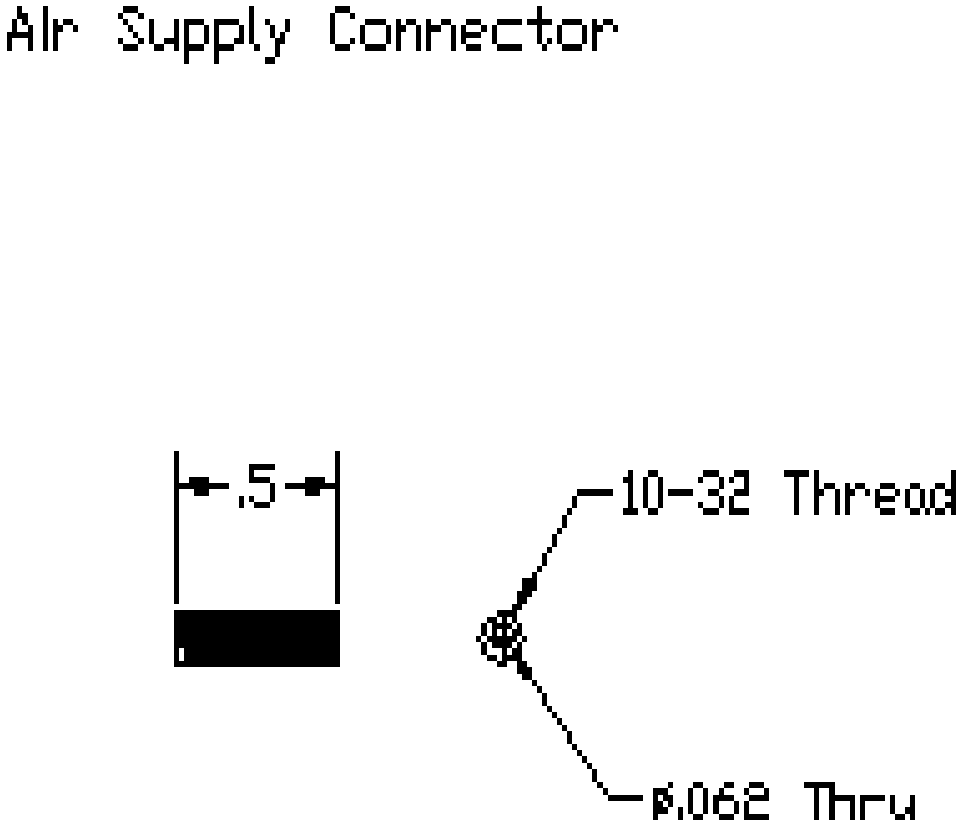


Crank pin

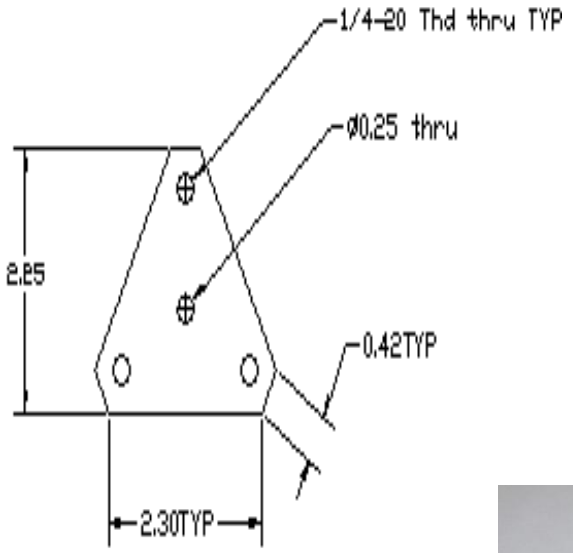


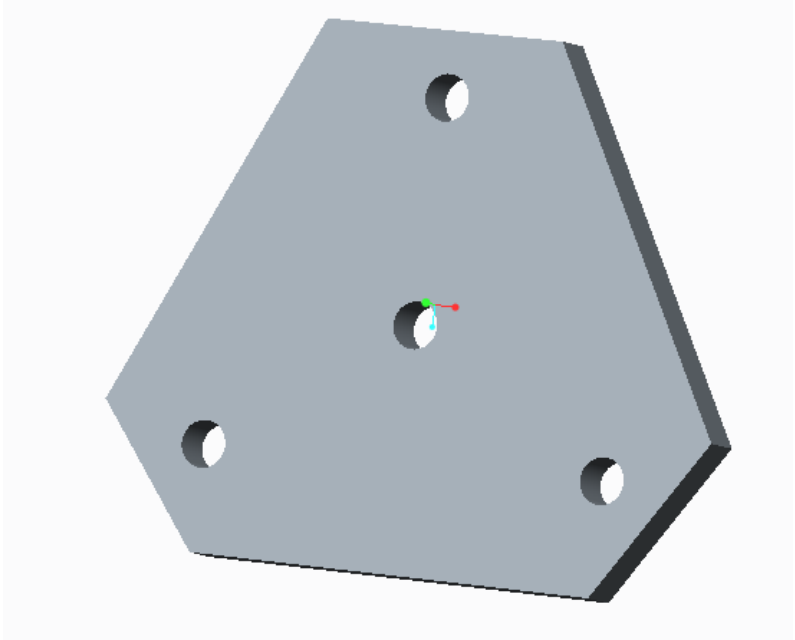


Air connecter

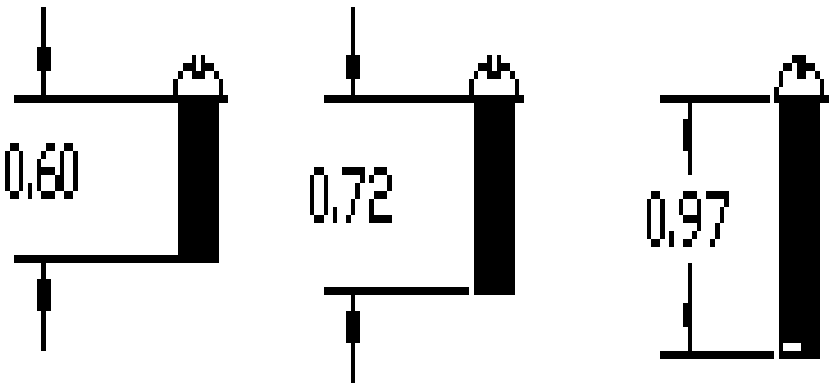


Plate

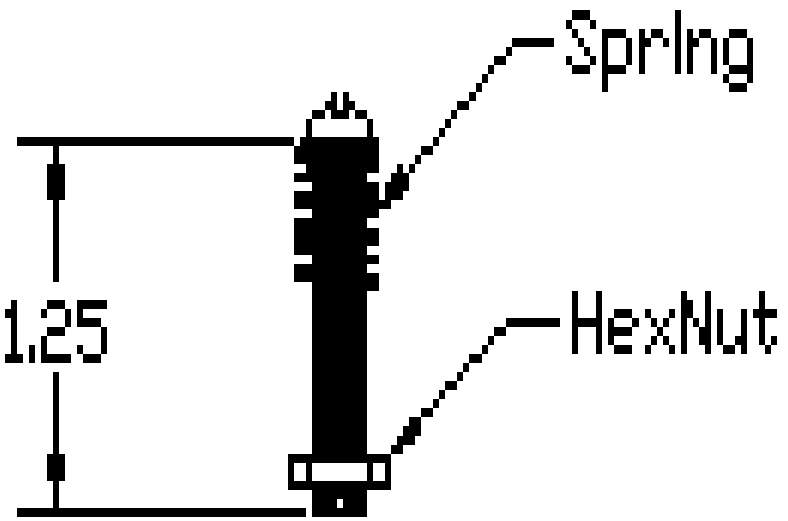




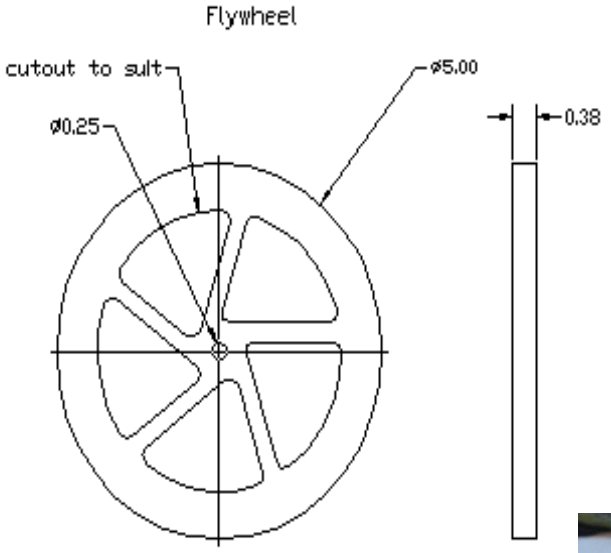
1/4-20 Screws to attach Standard
to Main Bearing-3 Required-Lengths Approximate

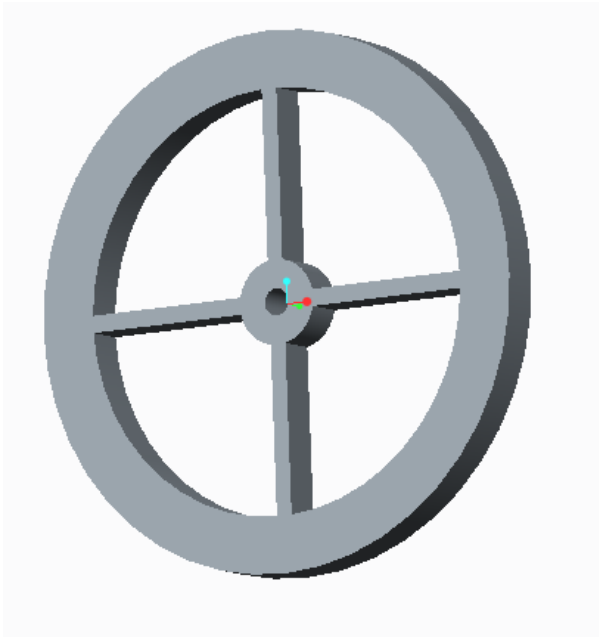


Spring loaded screw

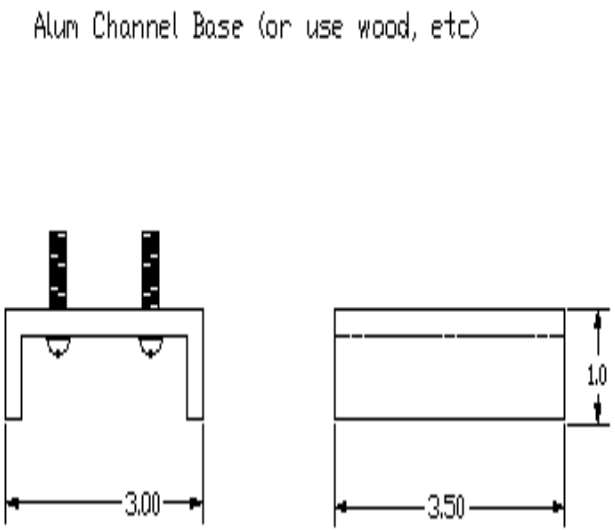


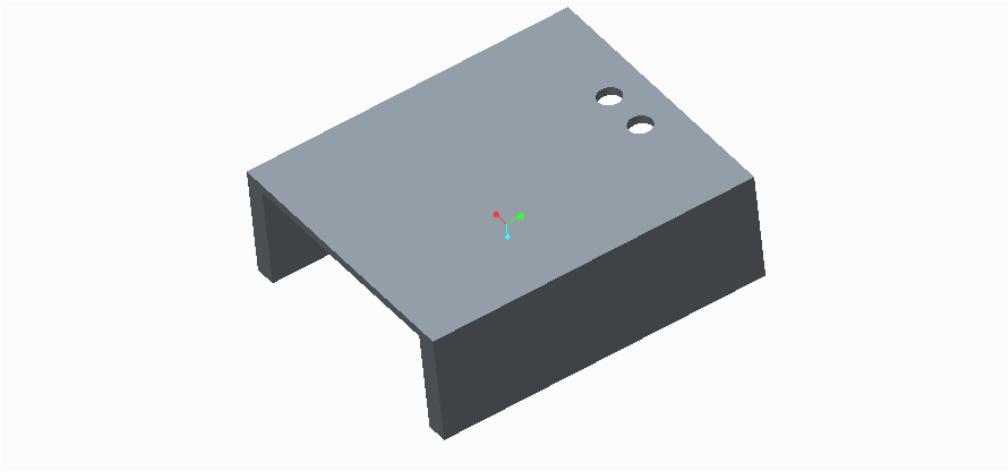
Flywheel

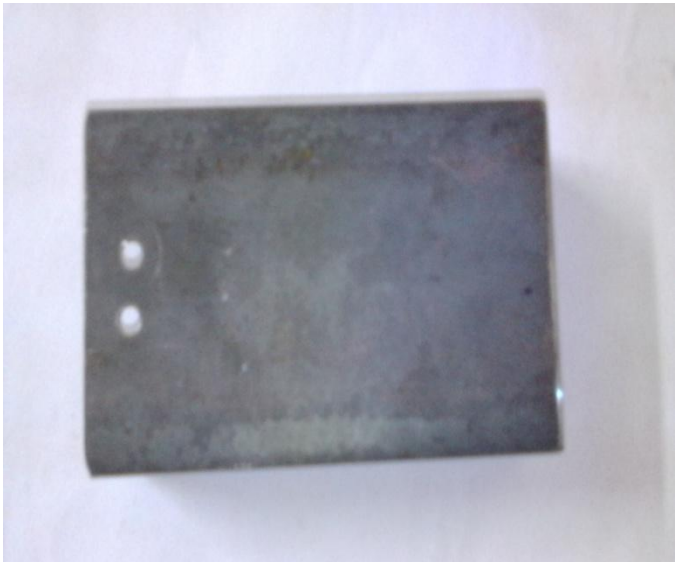




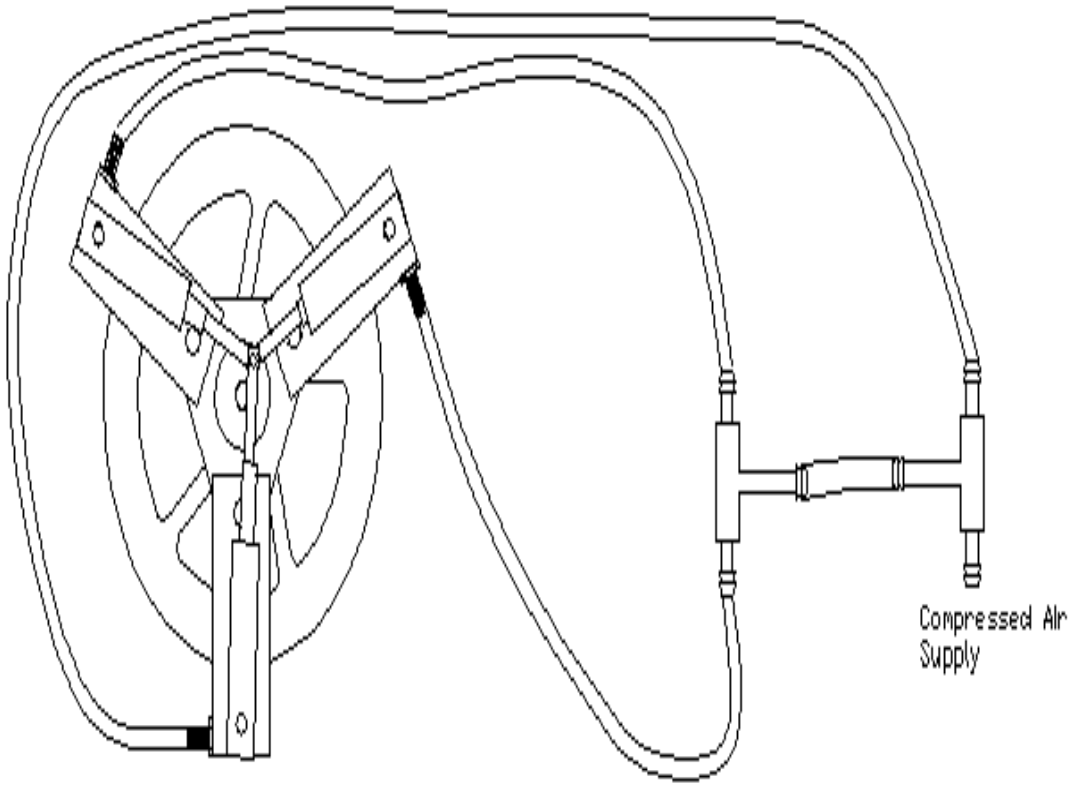
Channel base







Radial air Engine



- A Radial air engine having a plurality of cylinders, with each cylinder having an expansion chamber in part by a piston plate and a diversion chamber which is divided into two chambers by a slide plate , with the diversion chambers connected to a pressure supply line and to a pressure diversion line. The piston plate is connected to a piston rod by a lock. The expansion chamber holds an amount of compressed air held constant throughout the operation cycle. Expansion of the expansion chamber moves the piston plate and piston rod to rotate a crankshaft. At the end of the expansion stroke, the piston roads disconnected from the piston plate. The expansion chamber is compressed by pressurizing the diversion chamber below the slide plate, forcing the slide plate and push rods upwards, which pushes the piston plate upwards, until the piston plate can be held at a top position by a lock. The diversion chamber below the slide plate is pressurized by pressurized air from diversion chambers of cylinders in which the expansion chamber has been compressed. The piston force applied the connecting crank disk and crank disk rotating motion so that the crankshaft rotary motion. The flywheel to connect a crankshaft and the flywheel rotating. The air compressor supply the air through air pipe to piston.

Literature review

Sr.no.	Author	Year	Journal	Description Of work	Points to be taken
1	Zhang Et. All.	2013	Entropy	It is suggested that at low working temperatures both maximum exergy efficiency and maximum work output can be used as the design objective, however, only maximum work output can be used as the design objective for the four-stage radial turbine over the working temperature range in this work.	Concept of radial air engine.

Sr. no.	Author	Year	Journal	Description Of work	Points to be taken
2	-	2004	-	The Top Flite Radial Engine (hereafter referred to as Radial) is patterned after the Pratt & Whitney radial engines that powered numerous aircraft from the Golden Age of aviation.	Design of radial engine.
3	Prof. Sorathiya Arvind Et al.	2012	International Journal of Advanced Engineering Technology	Current four strokes single cylinder engine (bikes/moped) can be run on the compressed air with a few modifications that are the main objective of the study. Compressed air filled by electricity using a compressor. The electricity requirement for compressing air has to be considered while computing overall efficiency	Design of single cylinder.

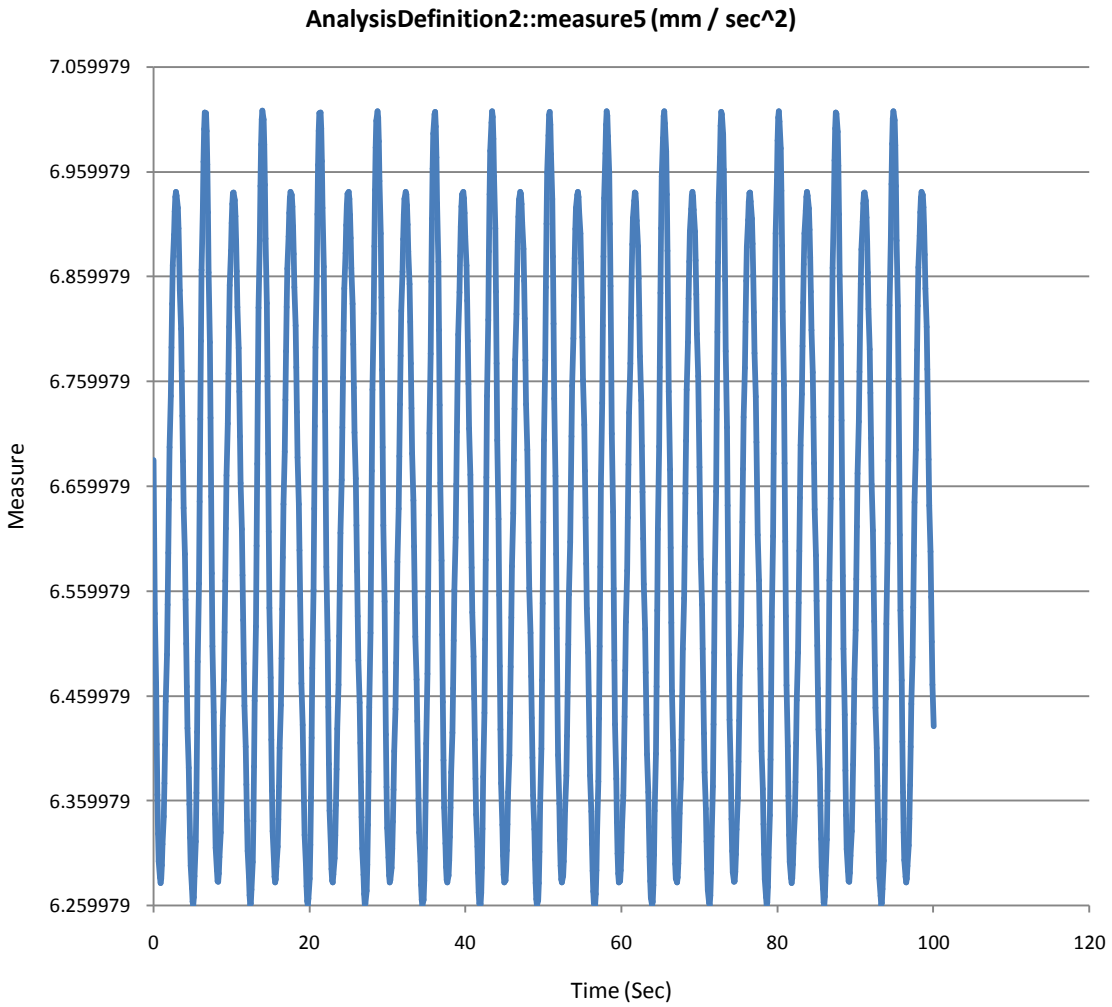
Sr. no.	Author	Year	Journal	Description Of work	Points to be taken
4.	Abhishek Lal	*2013*	INTERNATIONAL JOURNAL of RENEWABLE ENERGY RESEARCH	Compressed Air Engine is a better option to produce power to run automobile, generators etc. This paper contains design and dynamic analysis of a light weight single stroke compressed air engine it does not required any of the fossil fuels like petrol, diesel, CNG, LPG, hydrogen etc. to run engine and no power is required to start up engine only compressed air valve is to be opened. It works on compressed pressure air and hence is pollution free and 100% eco-friendly.	Compressed air engine, zero pollution, air fuel

no.				Of work	taken
5.	Chih-Yung Huang	*2013*	OPEN ACCESS *Energies*	This study presents a power output examination with the pressure and temperature measurements of a piston-type compressed air engine to be installed in compact vehicles as the main or auxiliary power system.	power performance & pressure.
6.	Prof. B. S. PATEL et al.	2011	National Conference on Recent Trends in Engineering & Technology	To convert a conventional IC engine into an Air Powered one, few components are to be replaced. First of all replace the **spark plug with a pulsed pressure control valve which can create required** pressure. Now the pulsed air firing in this valve is controlled by controlling the supply of electrical signal to the plunger.	Operation process for engine inside parts.

Sr. no.	Author	Year	Journal	Description Of work	Points to be taken
7.	**Bharat Raj Singh and Onkar Singh**	2012	International Journal of Rotating Machinery	A prototype air engine is built and tested in the laboratory. The experimental results are also seen much closer to the analytical values, and the performance efficiencies are recorded around 70% to 95%.	Improve the efficiency.
8.	**S.K.M.Asikul Islam et al.**	2012	International Mechanical Engineering Conference	The environmental pollution in the metropolitan cities is increasing rapidly mostly because of the increased number of fossil fuel powered vehicles.Many alternative options are now being studied through out the world. One of the alternative solutions can be a compressed air powered vehicle.	Compressed air engine.

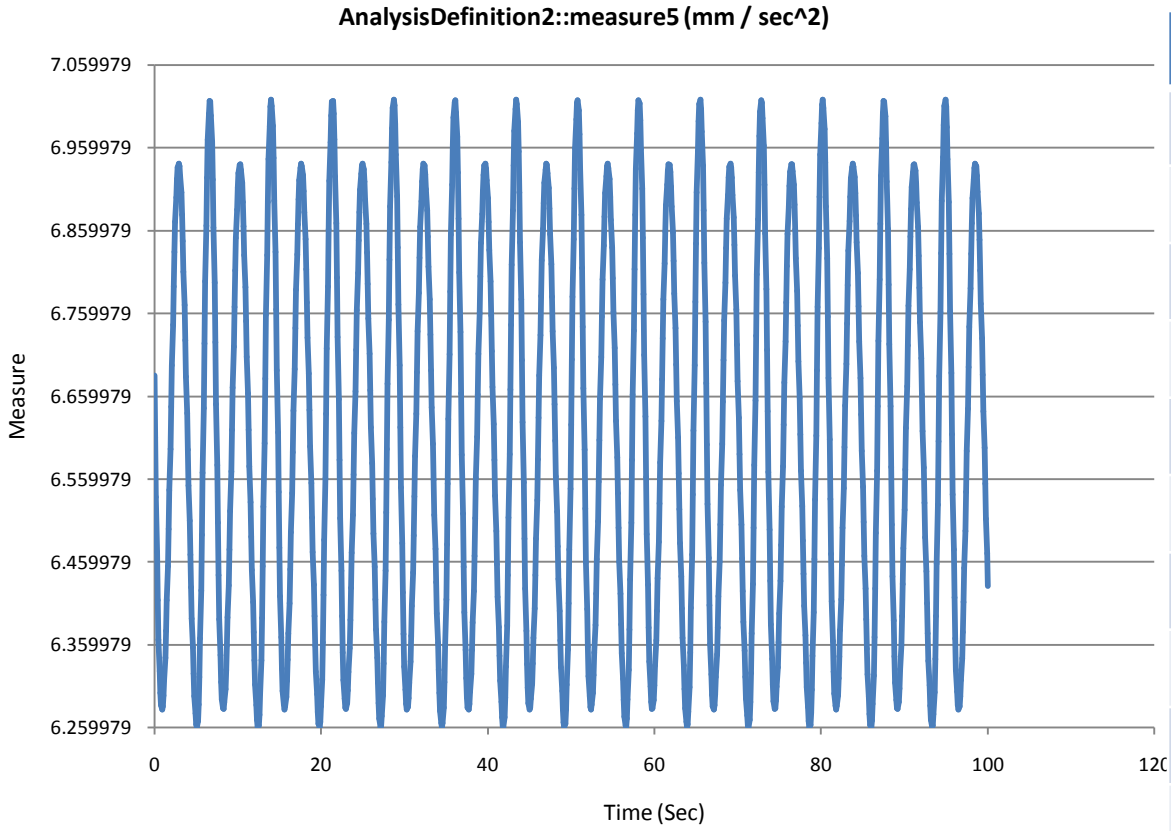
Month	Problem Defination		Literature serve		Design searching		Parts Purchasing		Parts Making	
	15 day	15 day	15 day	15 day	15 day	15 day	15 day	15 day	15 day	15 day
August										
September										
October										
November										
December										
January										
February										
March										
April										

Analysis of acceleration of piston



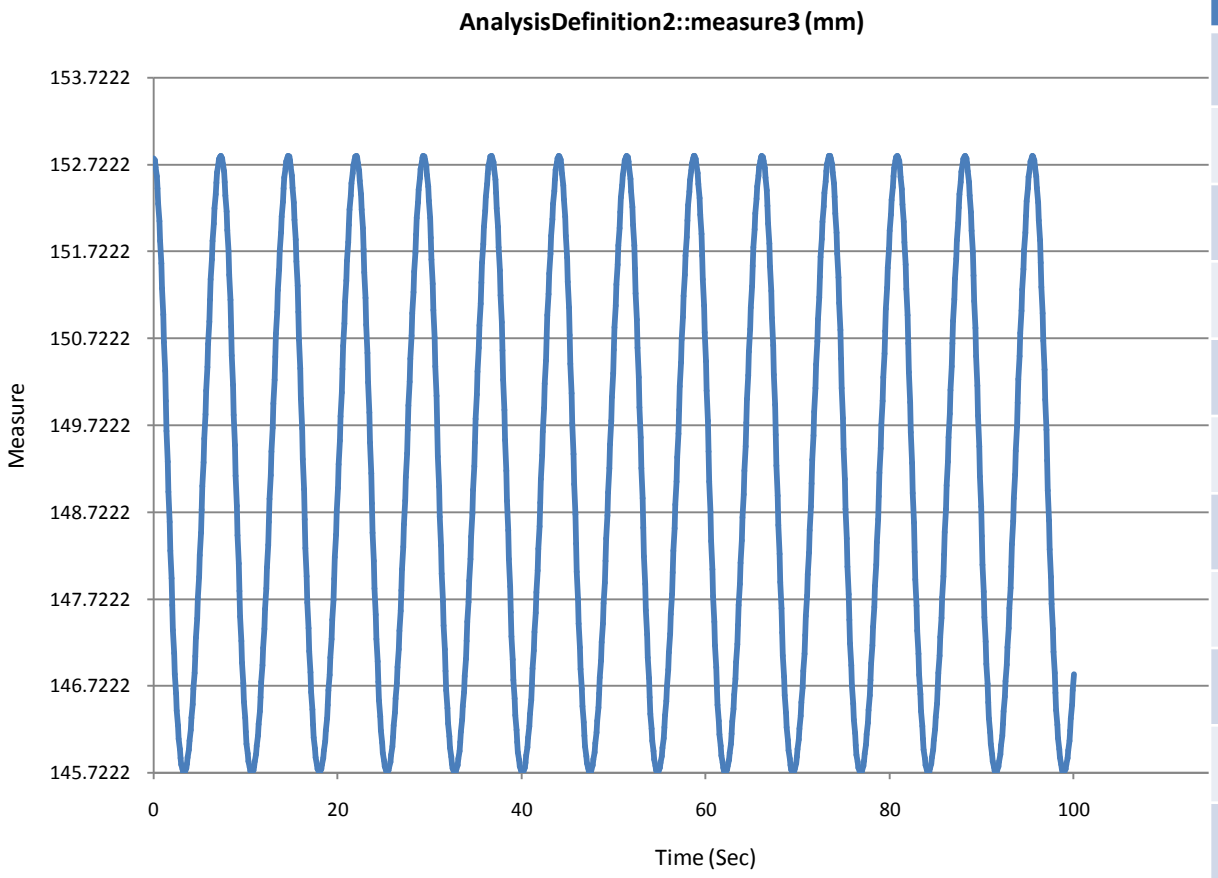
Time(second)	Measure
1	6.2859
10	6.9110
20	6.2858
30	6.3338
40	6.8987
50	6.6255
60	6.3108
70	6.6782
80	6.9893
90	6.5225
100	6.4310

Analysis of position of piston



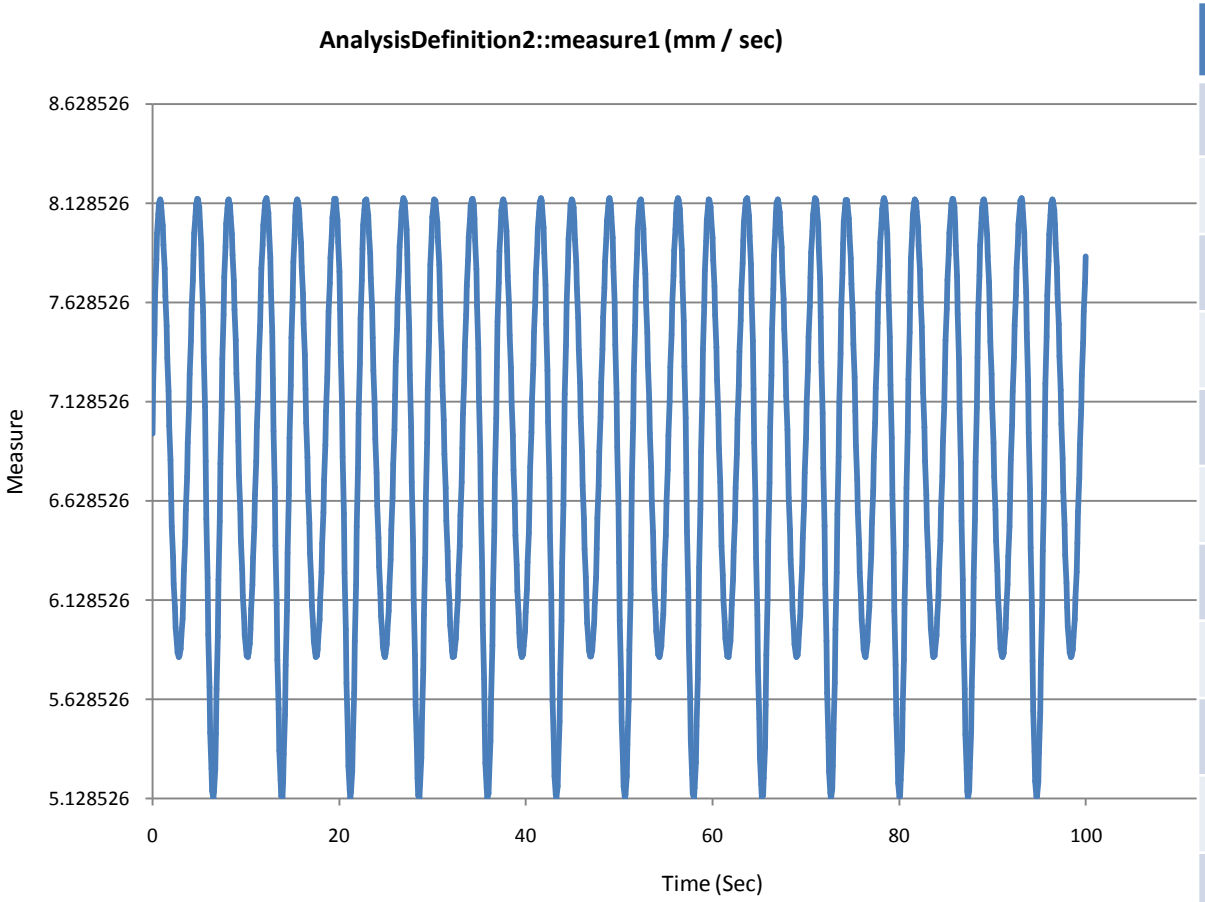
Time(second)	Measure
1	121.9194
10	113.0361
20	105.9232
30	121.9168
40	108.5413
50	109.7895
60	121.6181
70	105.0878
80	114.3191
90	119.3135
100	103.6050

Position of cylinder



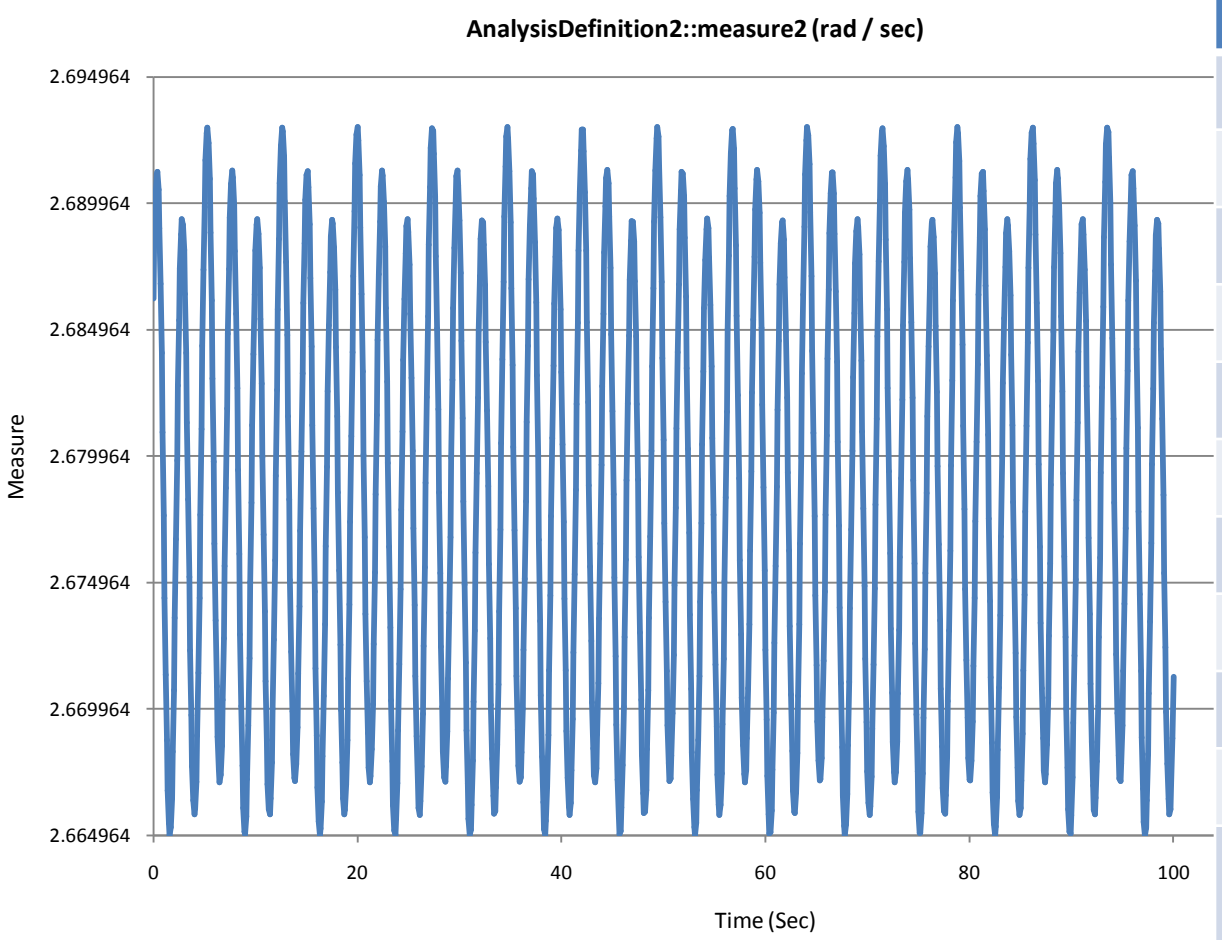
Time(second)	Measure
1	150.9989
10	146.1906
20	148.9972
30	152.1081
40	145.7260
50	150.5883
60	150.4594
70	145.9954
80	151.9601
90	148.4445
100	146.8567

Velocity of piston



Time(second)	Measure
1	8.0893
10	5.8863
20	7.7814
30	8.0580
40	6.0657
50	6.3171
60	7.9534
70	6.9426
80	5.1359
90	7.0943
100	7.8593

Velocity of Cranck disc

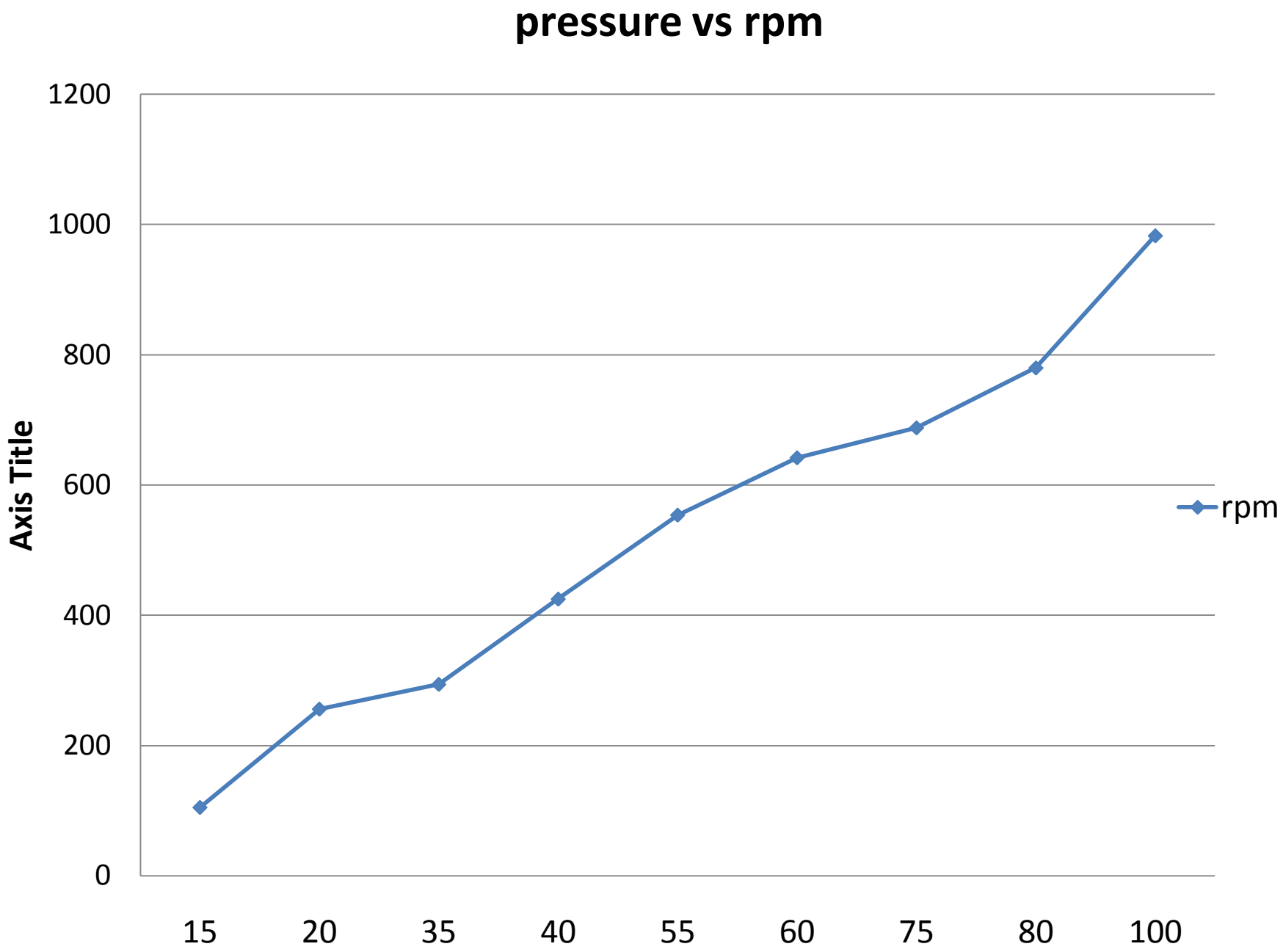


Time(second)	Measure
1	2.6776
10	2.6880
20	2.6929
30	2.6872
40	2.6833
50	2.6805
60	2.6723
70	2.6675
80	2.6671
90	2.6657
100	2.6712

Results

- **We have got the following RPM at different pressures of the compressed air fed into the piston cylinder.**
- **We have used tachometer to measure the RPM of the shaft.**
- **A graph between the air pressure and the RPM available at the output shaft has been shown in the Fig(figure no.).**

Pressure	Rpm
15	105
20	256
35	294
40	425
55	554
60	642
75	688
80	780
100	983


pressure vs rpm
1200
1000
800
600
400
200
0
Axis Title
15
20
35
40
55
60
75
80
100
rpm

CONCLUSION

- Radial air engines that we have designed can be used to operate sewing machine, surface cleaning by adding required mechanism or by using directly the rotary motion available at the output shaft.
- Nowadays glass plates are being used in the building whether at exterior or interior so for cleaning these glass surfaces we an automated and with some minimal pressure which can clean the surface gently. For these purposes we can use radial air engine to power the device.
- Engine dimensions as well as space acquired by the whole system is required to be large because of storage of pressurized air
- Engine will be operated with high pressurized air for efficient working.
- Material replacement gives another option for improvement of engine.
- Design modification give better and efficient working of engine

THANK YOU