Power Generation from Speed Breakers Using Air Compression Method

INTRODUCTION

In scientific period, all the equipments rely on the electricity. Electricity serves as a back bone to these success. we cant imagine without electricity ?can we?   .

There are several methods for electricity generation. In this sector we got a new method for electricity generating through speed breakers which is eco-friendly.

Coming to the design, the speed breakers which are fully developed and made with springs. IT works as When a vehicle loads a speed breaker it just compresses air in it and this air which is used to drive the impeller. This supply as a resource for the alternator.

**Speed breakers**

We do have several speed brakers In roads, at present we contain speed breakers of rigid type, In which this is made of steel or with tar.For example while a heavy load crosses the speed breaker it ruins unchanged, finally by yourself the limits the speed of vehiclesThe national highways come with minimum 8 meters wide, 0.015m thickness. We are proposing minor changes in the current roads.

**Proposed design**

Now in these design we are manufacture the speed breaker of vibrating type, As soon as a vehicle moves and crosses the speed breaker, immediately they are in depressed state and finally come back to their back to its original position.

**Dimensions**

These are some of the dimensions for these model and for novel method

Height of speed breaker            : 0.2m

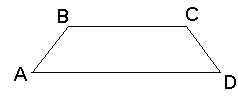
Width of speed breaker             : 0.4m

Length of speed breaker            : 4m

For the complete manufacturing steel is used for speed breaker: Steel

### Speed breaker -design

The fitting range of speed breakers are with helical spring at the base. It is trapezoidal shape, for the reason that as soon as a vehicle comes to point A, the load will be acting between A and B. Then it compresses the speed breaker, this will get down by the presence of spring. When a vehicle is in between B & C, there will be maximum load on the speed breaker. At the C & D, there will be minimum load on speed breaker. Flow chart for the representation.



. The following are the dimensions for A hollow trench are

Height: 0.35m

Length : 4m

Width   :0.45m

A hollow trench, In these base is completely filled with concrete or with wooden plates of 0.5m. only for the cushion effect. beyond this layer helical springs of n windings is wounded.

The speed breaker is supposed to be a uniformly distributed load.

For design , the design weight can be create by the product of factor of safety and its whole weight. The factor of safety verify the maximum level that the beam (speed breaker) can be loaded.

### Spring design

Before loading The definite height of spring is 0.3m . The deflection of the spring is given by

δ = 64 w \*n\*N\*R^3 /(Gd^4)

Where

δ-deflection (in our case maximum δ =0.1m)

w=designed load

R= mean diameter of coil

d =diameter of wire

n=no of spring turns

G= Modulus of rigidity = 8\*10^4 N/mm2

N= No. of springs

#### Impact of vehicle on speed breaker

The no of turns in the spring to get the deflection of 0.1m is given by

n= δGd^4/(64 w\*N\*R^3)

when the vehicle crosses the speed breaker, the air inside which is at the base will be compressed.

### Pneumatic design

once load is on the speed breaker, the volume of air compressed by it is generally found by,

Volume of compressed air = Volume of air in base – Volume of spring

d^2/4π= l\*b\*h – N\*n\*

= x m^3/s

The x m^3/s air released is occupied all the way through the passage at one end of speed breaker. A pneumatic cylinder with an FRL unit is joined to the passage of this pipe. while the pressure in the FRL unit go beyond the definite level and by this the valve opens and the pressurized air is given to the nozzle.

The distance of the inlet it is nothing but nozzle should be greater than that of the outlet.

di>d0

At this point the pressure energy is converted to kinetic energy i.e pressure→high velocity. The atmospheric air which is compressed by the speed breaker and then it is used to drive the impeller.

### Impeller-design

while air through higher velocity clout the vanes of impeller, Then that results by it starts rotating. The energy existing at that time in inlet is merely kinetic energy and the outlet is atmospheric. The impeller has

1. Nozzle
2. Runner and bucket
3. Casing

The quantity of air striking the vanes of runner is inhibited is nothing but by provided that a spear in nozzle

#### Runner

It consists of a circular disc on the outside edge of which include number of buckets consistently spaced are fixed. every bucket is separated in to 2 symmetrical parts by a dividing wall which is well-known as splitter. The splitter break up air jet in to two equal parts. The buckets are shaped in such a way that jet gets deflect through 160 or 170 degree. The Materials used in these are cast iron, caste steel, or stainless.

#### Casing

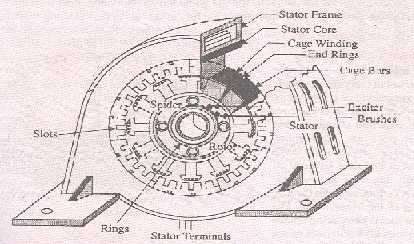
This can be make available to safeguard not in favour of accidents. as soon as air jet strikes the runner turn round for a longer time due to inertia.

### Alternator

Generally An electrical generator is a machine which adapt mechanical energy in to electrical energy. The energy conversion is totally based on the principle of production of dynamically induced e.m.f. According to Faraday’s laws of electromagnetic induction, at whatever time a conductor cuts magnetic flux, dynamically induced e.m.f. is produced in it. So this e.m.f source a current to flow if the conductor circuit is closed.

Two basic essential parts of an electric generator are

1. A magnetic field and
2. A conductor or conductors which can so as to move to cut the flux.



Alternator varies from d.c generator in the portion of stationary armature rise on a stationary element called stator and field windings on a rotating element called rotor. So slip rings, brushes and commutator are removed.

Generation of induced e.m.f: When the rotor rotates, the stator conductors are cut by the magnetic flux, hence they have induced e.m.f. produced in them.

#### Speed and frequency

In an alternator, there exists a definite relationship between the rotational speed (N) of the rotor, the frequency(f) of the generated e.m.f. and the number of poles (P).

Consider the armature conductor marked x situated at the centre of a N-pole rotating in clockwise direction. The conductor being, situated at the place of maximum flux density will have maximum e.m.f. induced in it.

The direction of the induced e.m.f. is given by Fleming’s right hand rule. i.e the thumb indicates the direction of the motion of the conductor relative to the field.

When the conductor is in the interpolar gap as at gap A, it has minimum e.m.f. induced in it, because flux density is minimum. Again when it is at the centre of a S- pole, it has maximum e.m.f induced in it, because flux density at B is maximum. But the direction of e.m.f. when the conductor is over a N- pole is opposite to that when it is over a S- pole. Obviously one cycle of e.m.f. is induced in a conductor when one pair of poles passes over it. In other words, the e.m.f. in an armature conductor goes through one cycle in angular distance equal to twice the pole-pitch.

Let

P= total no of magnetic poles

N= rotative speed of the rotor in r.p.m

f= frequency of generated e.m.f. in hz

Since one cycle of e.m.f is produced when a pair of poles passes past a conductor the no of cycles of e.m.f produced in one revolution of the rotor is equal to the no of pair of poles.

No of cycles/revolution = P/2

and

No of revolutions/second = N/60Frequency = (P/2)\*(N/60) = P\*N/120 hz

Thus the mechanical energy from speed breaker serves as an input source to the alternator which generates the electricity of 10kw.