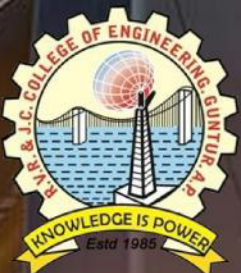


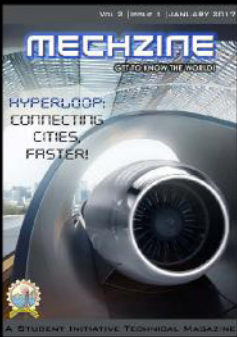
# MECHZINE

GET TO KNOW THE WORLD!

**HYPERLOOP:  
CONNECTING  
CITIES,  
FASTER!**







# Contents



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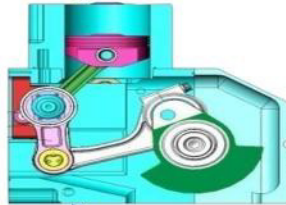
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01

Upgrading E-Commerce



03

Piston Deactivation Engine



05

Atkinsons Engine

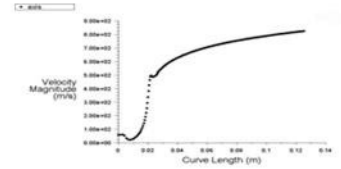


07

Student Articles

09

Fun Zone



02

Particle Impact Conditions on Material Deposition



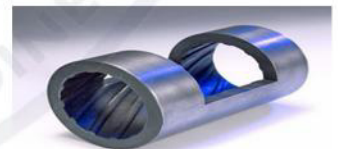
04

Hyperloop: Connecting Cities Faster



06

Changing Engine Oil



08

Clever Brooks Technique



# Upgrading E-Commerce



-Srikanth Gogineni  
M.D. Amend Info. Tech.



## Is our current ecommerce industry serving 100% market demand?

Our plans in taking technology to the retail ecommerce industry

Amazon, Flipkart, eBay, SnapDeal, Just Dial, India Mart, Trade India and so on....

I have seen many big players in the ecommerce and Marketplace industries and still we keep getting inquires for development of ecommerce applications for many businesses.

When there are so many big players in to ecommerce business why do small and medium companies need individual websites and mobile apps to serve the same purpose of selling online. Is that for the desire for having an independent platform to showcase their products & services or the existing doesn't meet their requirements.

Let us come to the customer point of view...

If I want to buy a mobile or laptop I may choose to buy it from an ecommerce giant who can offer me at an unbelievable price. There are cases where some

brands sell only on ecommerce portals and not available in open market. Well if I need to buy a pen or book or towel or any groceries, do I really need to ping those billion dollar companies.

## How it will be if I can buy it from a shop near my house ?

We the team at Amend IT, developed a SAAS Model approach to help many small players offer ecommerce applications for their customers, which drives their business to the better levels. The day is very close where a shop near your college shares a QR code of their app to make an order.

*"Communication is at the heart of e-commerce and community."*

*- Meg Whitman, President and CEO of Hewelett - Packard*



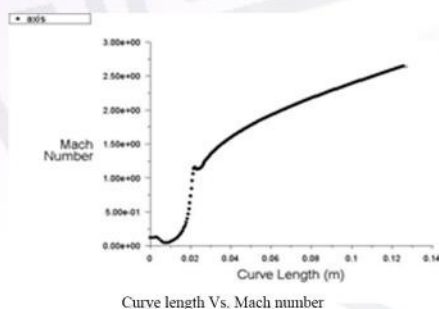
# Simulation of particle impact conditions using ANSYS-Fluent and the effect of those conditions on the materials deposition



Sri S. Seshu Babu  
Assistant Professor

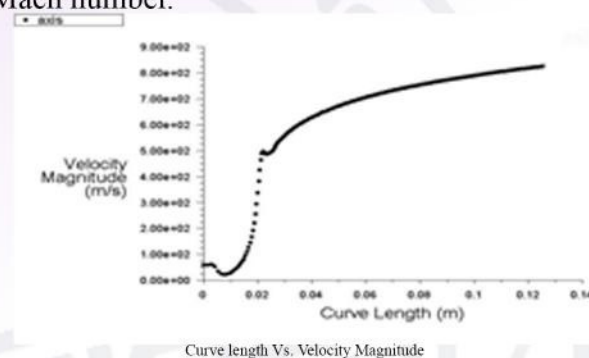
## Introduction:

CGDS (Cold Gas Dynamic Spray) is an advanced coating technology belongs to thermal spray family is used to protect the materials from corrosion and wear. In general ductile materials like Al, Cu, Ti, Ni and alloys of these materials are used for coatings. When the velocity of the particle overcomes the critical velocity of that material the deposition takes place on the substrate. The velocity is depends upon different parameters like gas temperature, pressure, type of gas used and the geometry of nozzle. In this project the nozzle geometry is taken into consideration and optimizes the nozzle after doing simulation for different nozzle geometries. The simulation was done by using the ANSYS Fluent workbench. The exit velocity and temperature of the particles which are obtained from the FLUENT are further used for impact analysis of the particles on using substrate using ABAQUS.



takes place at the substrate surface”.

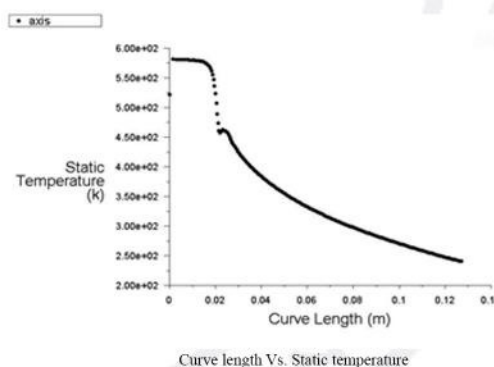
The nozzle geometry is designed based on the different Mach numbers. The following formulae show, how the nozzle geometry depends upon the Mach number.



$$A/A^* = (1/M) \left[ \frac{2}{(\gamma+1)} (1+0.2M^2) \right]^{(\gamma/2(\gamma-1))}$$

A – Cross sectional area at Nozzle exit

A\* - Throat cross sectional area



## Cold Gas Dynamic Spray:

The principle of cold spray technology is “Due to plastic deformation of powder particles while hitting with the high velocities (300-1200m/s) the bonding will takes place at the substrate surface”.

The nozzle geometry is designed based on the different Mach numbers. The following formulae show, how the nozzle geometry depends upon the Mach number.

## Conclusions:

- The gas velocity and temperature increases with the increase of Mach number along the length of the nozzle.
- The convergent length of the nozzle has very little influence on the exit velocity and temperature.
- The throat and exit cross sectional areas of nozzle plays very important role in the increase of velocity at the exit of the nozzle.



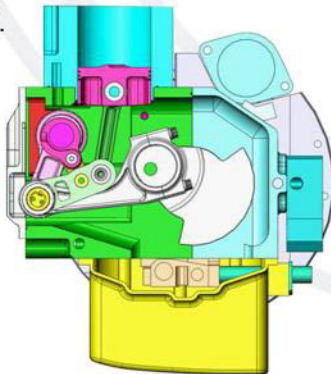
# PISTON DEACTIVATION ENGINE

*Courtesy - Joseph Scalzo*

## The Piston Deactivation Engine

For many decades it has been the desire of motor engineers to create a “flexible” engine with the ability to vary a number of parameters in order to achieve ultimate economy and/or ultimate performance. This flexibility is necessary to respond to the variable loads and conditions that are required by a vehicle to reduce fuel consumption. We have seen the introduction of many innovations, however, the “Holy Grail” of flexibility is Variable Capacity (VC) and to some degree, Variable Compression Ratio (VCR)

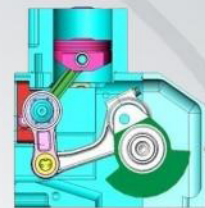
The Piston Deactivation Engine has been developed to allow complete flexibility in the quest to achieve maximum fuel economy in the way an engine is used in a vehicle. It is an innovative design that allows designated pistons to be stopped or “parked” when not required (unlike the cylinder deactivation engines where the pistons continue to be dragged within the cylinder). Not only do the active pistons operate at a higher efficiency, but the reduction in friction provided by the parked pistons, substantially increase fuel economy and reduce emissions. This is very much a fundamental requirement in the way an engine operates in a vehicle where partial loads are the norm.



*Figure 1*

A prototype 1.7 litre three cylinder Piston Deactivation Engine (PDE) has run successfully on one, two and three pistons. The principal of operation is demonstrated in the cross sections below:

Figure 1 shows the engine in the active position and comprises of a conventional crankshaft connected to the piston via a rocking adjustable four bar mechanism that has all pin jointed connections positioned on the opposite side of the cylinder relative to the crankshaft. The angular movement of the piston conrod is very small throughout the cycle almost eliminating the piston side force and hence friction.



*Figure 2*

By rotating the adjustor relative to the oscillator, the lower pin of the piston conrod is positioned to be concentric with rotational axis of the oscillator and the piston motion is reduced to zero while the closed oscillating mechanism remains in sync with the crankshaft at all times. Activation and deactivation can be achieved very quickly in response to vehicle demand with a helical spline actuator (not shown). See Fig 2.

This technology can be applied to a V6 engine to produces a 2-4-6 configuration as well as to diesel engines of all capacities.



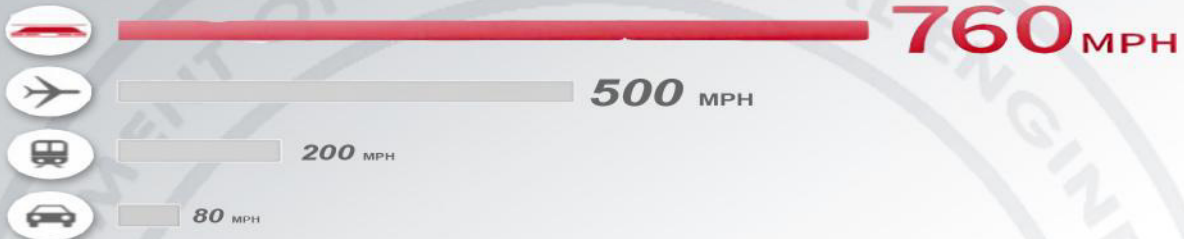
*Figure 3*

The prototype three cylinder engine is a 1.7 liter capacity based on one half of a popular six cylinder engine and utilizes part of the cylinder block with pistons, and the complete head and part of the manifold. Effectively creating a multi capacity engine of 567cc, 1130cc and 1700cc. This is shown in Figure 3.



# Hyperloop: Connecting Cities Faster

- M. Sai Swaroop  
Y13ME885



Speed, the one thing that everyone needs today. Back in time, Ships were the only transportation system that would take us to countries afar in few months, but now it takes days at the maximum, thanks to Aeroplanes. Our transportation system evolved in a way that a journey of few thousand miles can be completed in few days. Yet, we long for more. We yearn for something that can cover greatest of distances in shortest of times, something that would take us to our work, at thousand miles afar from our home, and bring us back to our beloved families by sunset.

And Hyperloop provides us with such an opportunity. Hyperloop, brain child of Elon Musk, is a Fifth generation transportation system which is being designed to travel a distance of up to 400 miles (640 kilo meters) in 30 minutes at a speed of 600 mph (970 kmph). The initial analytical test results show that it can travel a distance of 360 miles (560 km) in 30 minutes. So you can reach Delhi, capital of India, from Chennai, capital of Tamil Nadu, in just mere 'Two Hours'. Well, isn't that fast? Yes it is, faster than any train, ship or an aeroplane in the present day.

So, how does it work? And therein lies the beauty. It works on the principles of physics that we have only seen in theory. It's not just a new generation transportation system, but a new innovation and invention. The ideas proposed for its working were quite intriguing, of them lot, Air Levitation, Mechanical Propulsion and Quantum Levitation were quite interesting.

the passengers, in a 'Tube', at supposedly 600mph. This entire system of Pod in Tube is suspended on long vertical columns capable enough to withstand high stresses, buckling, vibrations and wears. Is it financially affordable? On a large scale, YES!

Hyperloop isn't something very new. It was there since a while in time, lurking in the minds of several intellectuals. Then how and why did come to lime light now? By Hyperloop design challenge hosted by 'SpaceX' in 2016. Several interesting and mind boggling ideas were pitched in this design challenge from all around the world. Several teams of Schools, Universities and Private firms took part in this challenge and presented their ideas. Of them all only a few were selected for finals.

And one among such teams was from our college. The only team from our state and one of few from our country, called Invictus, was selected for finals. We might be wondering when this technology of new transportation will be visiting our Country. Well, as a matter of fact, it is going to be 'Very Soon'. An organization called Hyperloop One is negotiating with Indian government on the terms. As per various sources the track might cover major metropolitans.

*Faster, Faster, Faster, until the thrill of speed overcomes the fear of death.*

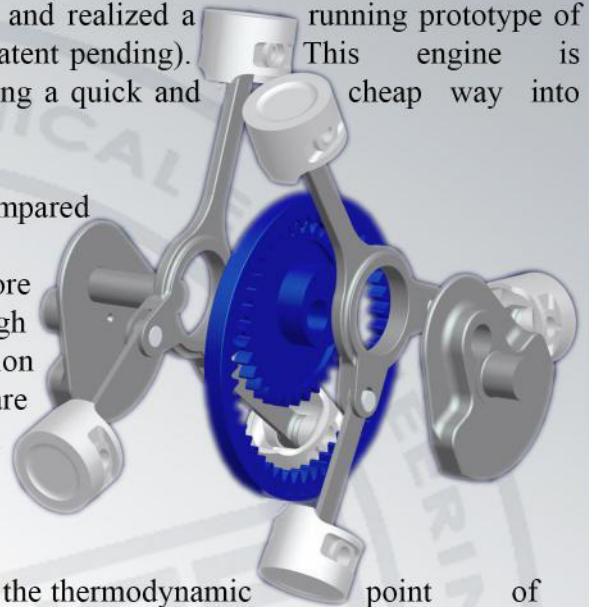


# ATKINSON CYCLE ENGINE

COURTESY: Giovanni Catalano

CTL Engineering of Lugano, Switzerland, has designed and realized a running prototype of a compact, modular Atkinson cycle engine (currently patent pending). This engine is entirely based upon well proven technologies, supporting a quick and cheap way into the industrialized production.

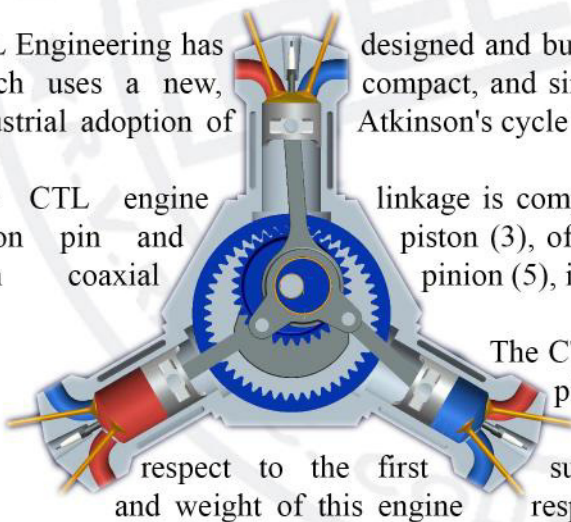
The benefit of Atkinson cycle is the higher efficiency when compared to the Otto cycle (up to 20%) thanks to the expansion stroke exceeding the compression stroke, this allows to extract more energy from the hot gas before the exhaust phase. A high efficiency is delivered already at relatively low compression ratios: this is an advantage when low octane number fuels are used. Furthermore low compression ratios reduce maximum temperatures, improving the lifespan of hot engine components.



This makes the Atkinson cycle very attractive especially from the thermodynamic point of view, while requiring a particular crank mechanism able to confer to the piston a different stroke according to the phase of the cycle. So far the crank mechanism required to enable the Atkinson cycle uses a toggle system which is almost inapplicable in today's IC engines due to high dimensions and weight.

CTL Engineering has designed and built a test engine operating according to the Atkinson cycle which uses a new, compact, and simple crank mechanism, opening new perspectives for the industrial adoption of Atkinson's cycle based engines.

The CTL engine linkage is composed, apart the traditional connecting rod (1), crank (2), piston pin and piston (3), of a fixed wheel with internal tothing (4) and an eccentric pinion (5), in this way there is provided an epicyclic crank mechanism.



The CTL linkage allows to connect the same eccentric to up to 3 pistons with the axes arranged at  $120^\circ$ . It is also possible to add a second eccentric to the pinion on the opposite side supporting therewith 6-pistons version, containing costs, size respect to various Atkinson engines proposed in the past.

In a radial multi-cylinder engine the cost of the crank mechanism is divided on several cylinders, furthermore the friction losses of the crank mechanism are proportionally lower because all the pistons are connected to the only hydrodynamic bearing of the main connecting rod. For all these reasons a multi-cylinder engine that uses the CTL crank mechanism has a high efficiency and a favourable power to weight ratio that makes it very competitive with the traditional technique.

The CTL linkage is applicable to internal combustion engines for any use and size, including stationary use, cogeneration units, traction of vehicles. Furthermore a motor according to the invention is fully compatible with the various technical devices already known in the field of IC engines ( eg supercharging ) to increase power and reduce fuel consumption, which may be applied according to the needs.



# Changing Engine Oil is Very Easy

Courtesy: Marc Payne and Team

**C**astrol reinvents the oil change with NEXCEL: the revolutionary technology that makes oil changes quick, smart and simple.

The NEXCEL system is a sealed oil cell that contains both the engine oil and the oil filter, which means it can be easily removed and replaced by hand, a process that takes just 90 seconds. The sealed oil cell ensures that used oil is collected and handled safely facilitating enhanced recycling and reuse of the waste oil into high quality lubricants through a dedicated re-refining process. For the road cars of tomorrow, NEXCEL aims to provide three benefits:

1. Reduced tailpipe carbon dioxide emissions
2. Simplification of vehicle servicing
3. Improvement of vehicle environmental sustainability

**Emissions:** Castrol has demonstrated that NEXCEL delivers a reduction in carbon dioxide emissions on modern engines through improved thermal management (SAE Paper 2016-01-0892, Reduction of CO2 Emissions through Lubricant Thermal Management During the Warm Up of Passenger Car Engines). Additionally, the technology paves the way for a new generation of precision-engineered engine oils delivering further engine performance and carbon dioxide benefits.

**Servicing:** NEXCEL makes the oil change super quick and clean for workshops, allowing them to offer more flexible and convenient service options to customers. The new technology allows your oil to be changed in around 90 seconds, more than 13 times faster than a conventional oil change of 20 minutes. The sealed system ensures no spillage of used engine oil resulting in improved safety for technicians servicing the vehicles. Moreover, it does away with the requirements for a large and often dirty tank for bulk storage of used oil at workshop premises.

**Sustainability:** After use, the Oil cells are collected, avoiding wastage of used oil. This oil can then be re-refined back into high quality lubricants. The NEXCEL oil cells are designed from materials that will enable them to be re-used up to five times. A resilient engineering thermoplastic has been utilised in the



design that enables scalable manufacturing in line with the requirements of the automotive manufacturing industry. Furthermore, the oil cells are capable of being fully recycled at the end of their useful life. If NEXCEL were fitted onto every car in the world today, it would save more than 200,000 road tankers of virgin oil from being produced, every year.

The NEXCEL system, which includes the oil cell, oil cell dock and lubricant, is integrated into vehicles at the design stage. Currently the system is fitted as standard in the new Aston Martin Vulcan track-only supercar. Road cars fitted with NEXCEL are expected to go into

production within five years.

Testing and installing NEXCEL on a low volume car like the Vulcan is an important milestone in development of this innovation and has allowed the oil cell's development to be accelerated. This increases the likelihood of faster and deeper mass market adoption. Castrol is currently in discussions with many other vehicle manufacturers ranging from passenger car to the larger scale heavy duty and off-highway sectors.





# Mars Exploration Rover



-K. Rahul Tagore Singh  
Y14ME892

NASA's Mars Exploration Rover (MER) mission is an ongoing robotic space mission involving two Mars rovers, exploring the planet Mars. It began in 2003 with the launch of the two rovers: MER-A Spirit and MER-B Opportunity to explore the Martian surface and Geology. Both rovers outlived their planned missions of 90 Martian solar days. MER-A was active until 2010. MER-B is still active. The success of the two MERs led to another mission, sending a bigger rover Curiosity in 2012. The MER-A and MER-B when launched landed in widely separated equatorial locations on Mars.

The mission's scientific objective was to search, characterize compositions and analyze wide range of rocks and soils at deterministic locations that hold clues of any water activity on Mars.

### Drive system:

Each rover has six wheels mounted on a rocker-bogie suspension system that ensures wheels remain on the ground while driving over rough terrain. The design reduces the range of motion of the rover body by half, and allows the rover to go over obstacles or through dumps that are more than a wheels'



diameter. The rover wheels are designed with integral compliant flexures which provide shock absorption during movement. Additionally, the wheels have cleats which provide grip for climbing in soft sand and scrambling over rocks. The two front and two rear wheels each have individual steering motors and own drive motors. This allows the vehicle to turn in place, a full revolution, and to swerve and curve, making arching turns. The rover is designed to withstand a tilt of 45 degrees in any direction without overturning. However, the rover is programmed through its "fault protection limits" in its hazard avoidance software to avoid exceeding tilts of 30 degrees.

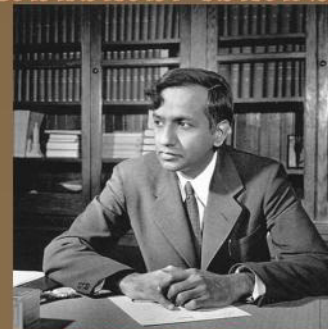
The scientific objectives of the Mars Exploration Rover mission are to:

Determine what geologic processes have shaped the local terrain and influenced the chemistry. Such processes could include water or wind erosion, sedimentation, hydrothermal mechanisms, volcanism, and cratering.

Perform calibration and validation of surface observations made by Mars Reconnaissance Orbiter instruments.

Assess whether those environments were conducive to life.

## BHARATHA "RATHNA"



### S. Chandrasekhar

*Subrahmanayam Chandrasekhar was born on October 19, 1910 at Chennai in Tamil Nadu. He graduated from the Presidency College, Chennai. He did his Bachelors in Physics in June, 1930. He did his Ph.D. from Cambridge University in 1933. He received the degree of D.Sc. in 1942.*

*Dr. Chandrasekhar won the Nobel Prize for Physics in 1983, for his theory of black holes or dying stars. A Theoretical Astrophysicist, Dr.*

*Chandrasekhar did innovating work in the evolution of stars and the discovery of neutron stars and black holes. A theory known as 'Chandrasekhar Limit' was concluded by Dr. Chandrasekhar, which said that if a stellar mass is 1.4 times the solar mass at the time it starts the process of shrinkage, then the shrunk body at the end of its evolution would have zero radius.*

*He won various medals and awards. He got the I.N.S.A.-Vainu Bappu Memorial Medal in 1985.*

World's First Machine Gun



Helge Palmcrantz (1842–1880), Swedish inventor and industrialist, was born in Hamnerdal, in the province of Jämtland. He was enlisted as a cadet in his father's regiment, where he worked on land survey. In 1868, the first version of his machine-gun was finished and a demonstration of its capacity was held on Ladugårdsgärdet, Stockholm in front of the Swedish Defense Minister; G.R. Abel. After a couple of modifications and improvements, he patented the multi-barrel, lever-actuated, machine gun and it was bought into the Swedish army as Kulspruta 1873. Same year, the machine-gun was shown on the 1873 Vienna World's Fair

# A TRIP TO IISC

-Rakumanu Pavan Kumar  
Y13ME849

Whatever we study in life is an experience. One of my best experience is 60 days of my life in Indian Institute of Science – Bangalore.

Indian academy of sciences gives an opportunity to apply for an internship in various prestigious institutes of India in one go. Through this I got selected and got an internship in IISC under the guidance of Prof Saptarshi Basu who is an eminent professor in department of Mechanical Engineering and specialised in Fluid Mechanics.

Through this internship I acquired a huge exposure on the present research work going in the India's prestigious institute. As a part of that, I worked on a project entitled "Droplet Combustion of Nano Fuels" along with another research scholar.

In brief the project is to study the combustion characteristics of the fuels which are specially used in aerospace industry. Through this I came to know the various preparatory methods of Nano Fuels and worked on various equipment's for the stabilisation of fuel and to study the combustion characteristics.

Later I was assigned to work on the analysis of the images which were obtained during the time of experimentation. Meanwhile I visited other laboratories and got to know various research works happening in the institute and interacted with many people. Best part is staying with the students from various institutes from all over India who have the same creative and crazy ideas. In addition to that the host organised recreation trips around Bangalore at the end of every month. The real essence of my engineering studies was understood and felt. Through this I take an opportunity to thank my friend who gave her continuous support till the completion of my fellowship.





# Cleaver Brooks Technique to Make Boilers More Efficient

-Kondaveeti Kalyan  
L15ME993

**I**n the boiler world, most upgrades over the years have been small innovative steps rather than anything highly revolutionary as the industry continues to improve safety, efficiency and to control emissions. Today, efficiency is the name of the game, and recently, companies have been focusing on changing the way the burner operates on the boiler as it is an important way to gain greater efficiency. The result has been found by Alan Wedal, product manager for commercial boilers at Cleaver-Brooks Inc., He calls the paramount major development in decades or perhaps since World War II. It is all possible due to advancement in computer modelling .

## Oxygen Level

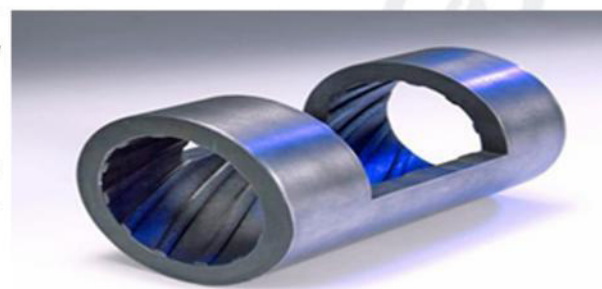
The goal was to get to a constant oxygen level across the entire firing range of the boiler, which is accomplished through controls and sensors. A traditional burner typically operates at lower efficiency ratings because additional oxygen is required for the burner to fire properly. Excess air when added with oxygen can lower boiler efficiency.

According to Cleaver-Brooks research, it has shown that 15% of excess air is the optimal amount to introduce into the boiler combustion process. While some boilers have been able to achieve 15% of excess air at the top end of a boiler's firing range, the challenge comes at the lower end when the boiler is operating below its maximum capacity. That's because most boilers tend to demand greater excess air in the lower range. If we can improve the efficiency at the lower firing range and the overall effect can be a good efficiency gain for the end user.

## New Design

Engineers started by designing a new boiler incorporating the idea of changing the burner. One critical factor was a re-design of the tubes within the boiler to increase heat transfer in the tubes. They added helical ribs to the inside of the tubes, creating more turbulence of the hot flue gasses and thus more heat transfer.

But it was only with the aid of CAD embedded with CFD that engineers were able to perform extremely complex calculations on various elements of a boiler system, including analyzing problems that involve fluid flows. Calculations allowed simulation of the interaction of liquids and gases with surfaces, which in turn enabled engineers to improve the tube profile and increase heat transfer by 85% compared to a traditional bare tube.



Tubes with added helical ribs increase the heat transfer coefficient in applications using a gas or fluid with low thermal conductivity.

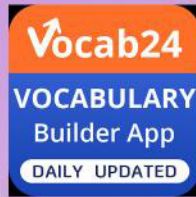
Now that the equipment is available commercially, more than half of the boilers are manufactured by Cleaver Brooks Inc., are with this new design, which provides between 1 to 5 percentage of greater efficiency in the lower ranges and is comparable in cost to older models .It's changing the marketplace as people learn about it and understand it because it is being driven by the efficiency gains.

The new boilers have many applications for heating buildings and for all sorts of industrial processing from food, paper and plastic manufacturers to pharmaceutical and computer chip manufacturing facilities to providing process steam at healthcare facilities and other institutions.



## Annoying power cut

Somu wants to go to school. He came out of the house and realised that he has forgotten socks. He has 3 pairs of white socks, 5 pairs of blue socks, 4 pairs of black socks. When he goes inside in search of socks there was no light and everything was dark due to power cut. Tell him how many minimum socks he has to pick to get one perfect pair.



*We are what our thoughts have made us; so take care about what you think. Words are secondary. Thoughts live; they travel far*

Are you looking for vocabulary app? if

YES then your search ends here. Let's introduce the Vocab24 (#1 Vocabulary Builder App), which is best English vocabulary Builder app that will help you to learn new vocabulary words. There are four way to learn vocabulary as following: - 1) Read Newspaper Editorials 2) Learn Daily 10 New Words 3) Daily Vocabulary Quiz 4) Learn English in a Smart Way



# FUN ZONE

### Multiplication of two three digit numbers

$$175 \times 157 = ?$$

Let me explain this rule by taking examples

Step 1: Multiply  $(5 \times 7) = 35$  (note down 5 carry 3)

Step 2: Then do cross multiplication  $(7 \times 7 + 5 \times 5 + 3(\text{add carry})) = 77$  (note down 7 and carry 7)

Step 3: Again  $(1 \times 7 + 1 \times 5 + 7 \times 5 + 7(\text{add carry})) = 54$  (note down 4 carry 5)

Step 4: do cross multiplication and add carry  $(1 \times 5 + 1 \times 7 + 5(\text{add carry})) = 17$  (note down 7 carry 1)

Step 5: Again  $(1 \times 1 + 1) = 2$ , note down  
And finally the result we get **27475**

What is the difference between pipe and a tube?

**A. Pipe :** Pipes are measured and sold with the inner diameter. These are used to transport fluids like water, oil, gas etc.

**Tube :** Tubes are measured and sold with outer diameter. These are generally used for structural purposes.

### Find the figure



Each of the symbols is based on a common symbol that you see everyday. They all have something in common and constitute to a group. Reflect on that for a few moments, and you'll probably get the answer.

### Sweet Shop

Vijay works in a sweet shop.

He is obese.

His height is 6ft. 2in.

His waist is 47in.

He wears shoes size 10.

He has a wife & 2 sons.

What does he weigh?



Answers:  
Annoying power cut - 4 socks  
Sweet shop - Sweets  
Find the figure-6 and its reflection





DEPARTMENT OF MECHANICAL ENGINEERING  
R. V. R. & J. C.  
COLLEGE OF ENGINEERING  
(AUTONOMOUS)  
CHANDRAMOULIPURAM  
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