“Gandhian Engineering is not just for the poor”

Dr. R. A. Mashelkar speaks to R. Sridhar, IDEAS-RS about his latest passion

October 14, 2008 9:45 am. I arrive at the NCL office in Pune. I have planned to be a little early for my meeting with Dr. R. A. Mashelkar. It will give me time to set up my equipment and get ready for interviewing Dr. Mashelkar.

Just as I get down from my car, Dr. Mashelkar arrives too. His broad smile welcomes me even before his warm greetings. "I decided to come a few minutes early, to finish some work. That way we will not be interrupted during our discussion."

The 90 minute interview turns out to be a lesson in story telling, communicating one's belief and reinforcing one's pride in being an Indian.

I recommend that you spend a few minutes reading his profile, that I have included at the end of the interview. You will agree with me that we are with a living legend and an illustrious son of India.

- R. Sridhar, IDEAS-RS

Interview

RS: How did the Gandhian Engineering concept come about?

DR. Mashelkar: In May this year, the Australian Academy in Canberra conferred on me an honorary fellowship. In the 40 years of their existence this is the first time they were honouring an Indian, that too in the presence of Mr. Carr, their minister for Science & Technology. The Academy asked me to deliver the Academy's "Prestige Innovation Lecture." All the key stakeholders and decision makers like ministers, bureaucrats, businessmen and the other key institutions would be present.

It was clear in my mind that I must deliver something with a unique Indian flavour, yet relevant to them. My family was also traveling with me as we were on a holiday. I was incubating several thoughts in my mind but the right idea was eluding me.

Finally, when we were in Sydney I told my family to leave me alone for about two hours in my hotel room. While they were out,one thing led to another and finally the concept of 'Gandhi to Gandhian Engineering' emerged.

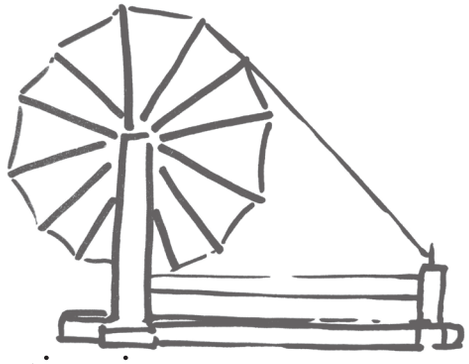
RS: But how did you arrive at this concept?

DR. Mashelkar: It is difficult to describe the exact process. I think it was a matter of making connections, synthesizing several thoughts that were running parallel in the mind. All of those came forth during the two hours and helped me link them cogently to each other to make a case.

RS: So what is Gandhian Engineering? Is it the same as frugal engineering?

DR. Mashelkar: Let me share a presentation with you that I made recently to a bunch of young students in Pune at Tilak Smarak Mandir, organized through Rotary. You need to understand a bit of the context to appreciate what Gandhian Engineering is.

RS: Ok.



DR. Mashelkar: I titled the presentation:
Indian Innovation:
From Gandhi
to Gandhian Engineering.
First, I defined Innovation for them. Innovation is about doing things differently, making a big difference, making impossible possible. I started with Gandhi as an example. What did he do? He took on the might of the

British Empire by mobilizing millions of people. Seemed impossible but he did it. His strategy fulfilled all the criteria of innovation. He did things differently, made a big difference and achieved what everyone considered was impossible. What were his weapons? Ahimsa and Swadeshi!

*RS:*Very interesting.

Dr. Mashelkar: Then I talked about how traditional mindsets become big barriers for innovation.
"Too risky".
"Suppose it fails?"
"Impossible. Never done before"
"Somebody has already tried it."
"Let me play devil's advocate".

All of us are familiar with this line of thinking. While most of us fall victims to this kind of thinking, innovation leaders stand apart with their thinking and action.

RS: What do they do differently?

Dr. Mashelkar: Innovation leaders grow a small idea into a fantastic opportunity. They convert problems into opportunities. They have hindsight, foresight, and

insight. They set Quantum goals. They invest considerable mindshare in future growth and the next big change. They drive discontinuity and encourage risk. They find opportunities where others see nothing.

RS: You must have given some examples too.

*Dr. Mashelkar:*Yes, indeed. Do you know that in the early 20th century when Jamshedji Tata wanted to produce steel, he was ridiculed.

Sir Fredrick Upcot went to the extent of saying "We will eat every pound of steel, if you can produce it". In his mind, it was impossible for an Indian company to produce steel.

Yet the irony is that not only did Tatas produce steel, but in the early 21st century they produced steel in England's backyard – Corus Steel.

RS: Great story.

*Dr. Mashelkar:*And you know this one. When Dhirubhai Ambani said that he wants a phone call to cost the same as a post card, every one laughed.
Yet today, his ambition and dream has changed the game

worldwide. We have the lowest call rates, fastest growing subscriber base, and cheapest mobile handset. And the world is learning from India.

RS: Fascinating

Dr. Mashelkar: As I said, an Innovation leader is one who sees a problem as an opportunity. The story of how Velcro was born is well known. Then I talked about game changers like Michelin tires. Imagine no more tire valves, filling air in the petrol bunks, no more punctures, no more repairs. That is how Michelin changed the game.

RS: Your examples are mind openers.

Dr. Mashelkar: Wait till you hear this one. Can a bicycle ride on water? I can see from your expression that you think it is impossible.

Take a look at this film – Md Saidullah created this amphibious cycle and it was demonstrated in the presence of Dr Abdul Kalam.

You know of Prof. Anil Gupta and his grassroots innovations movement. This now brings me to "Indian Innovation: Gandhi to Gandhian Engineering."

RS: I am still not clear as to what Gandhian Engineering is.

Dr. Mashelkar: I will tell you. First, let me start with an engineering challenge. It has always been about getting more from less. That is what Moore's law is all about. More from less. There was a time a mainframe computer occupied one full room. Today a laptop is even more powerful than the computer which occupied the room. But my discussion is not about that.

It is about price vs performance. Today this Laptop costs $ 2000. Can we make it available for $ 100, without compromising on performance?

RS: Just $100?

Dr. Mashelkar: Yes, $ 100. The issue is not just about getting more from less. If the laptop costs $ 2000 not many can afford it. If you make it available for $100, you can start traversing to the bottom of the pyramid. This way more people can start using the laptop. When you

make products more expensive, they will belong to the few people at the top. When they become less expensive, many more people at the bottom can afford it. If Nano is priced at Rs.10 lakhs then only the guys at the top can have it. However if Nano is priced at Rs 1.00 lakh even people at the bottom can have it. So it is about getting more from less, for more and more people. Then I show that this is not an impossible dream.

By the way, when I talk about the bottom of the pyramid I am not necessarily talking about the 4 billion with less than $2 income per day. I am going beyond that.

RS: You mean we can make laptops at $100?

Dr. Mashelkar: Nicholas Negroponte from MIT had targeted the design of a $100 laptop to reach the poor.

We had already made this in India as part of the New Millennium Indian Technology Leadership Initiative. Vinay Deshpande of Encore, Bangalore and his team have put together Mobilis. In fact Malaysia will produce 1 million Mobilis in the year 2009!

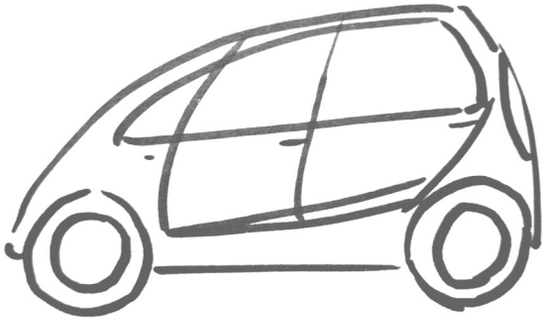
Now let me move on to something else. Take a look at this

matrix. Performance on one axis and price on the other. So here we have the 'have nots' in low price, poor performance and 'Haves' in high price superior performance.

RS: I love this Matrix.

Dr. Mashelkar: It is a powerful one. Normally if the economic condition of the poor improves he moves from a bicycle to a moped. But people have always accepted that this is the reality and you can't do anything about this. It means that I have to settle for poor performance because I cannot afford to pay better.

Then I go back to the definition of an innovator. An innovator is one who looks at something that every one sees, but sees something that no one has seen. Take a look at this picture. All of us have seen the whole family of 4 or 5 riding a two wheeler. We did not see anything beyond that. When Ratan Tata saw it, he saw something no one else saw. He said "This is not on. I want to change this." That is how the 2000$ car was born.



Take a look at this table:

Model	Year	HP	Price
Model T	1908	20	$19,700
Beetle	1956	24	$11,333
Mini	1961	34	$11,777
Tata Motors	2008	33	$2,500

I got this from Tata Motors. In each case here there was a paradigm shift but nothing as drastic as the Nano.

The Indian challenge is that not only do we have to have innovation and passion but also compassion. That is the beauty of the Nano. You know I chair the Marico Innovation Foundation and every year we give awards for innovative products and services. This year we gave Nano a special prize to honour the spirit of Nano, even though the product is not yet in the market.

I said in my speech that "Very soon, your chauffeur will drive to your house in a Nano. You will need to make space in your driveway for your chauffeur's car, but more importantly, you will need to make space in your minds for this transformation." Nano is transformational innovation.

RS: Very powerful. I like the way you have combined compassion with innovation and passion.

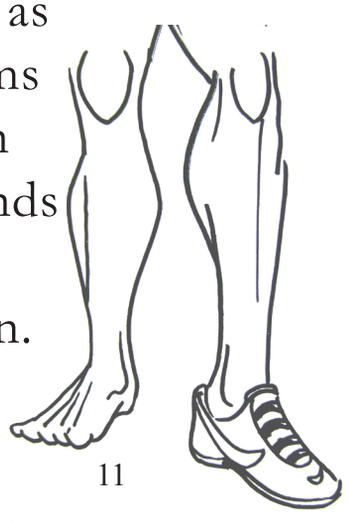
Dr. Mashelkar: That takes me to technologies for the poor. I believe technologies for the poor must be available, accessible, affordable and appropriate.

RS: How do you explain the 4 A's?

Dr. Mashelkar: Here is how. An artificial foot in the US can cost you anywhere between $12,000 to $18,000. Now I have 4 billion people with income less than $2 a day. It will take them 15 years to buy one artificial foot! I then talk about the difference between the American foot and the Indian foot.

RS: Is there a real difference?

Dr. Mashelkar: There is a difference in performance expectations. An Indian foot cannot only be as good as an American foot. It has to be 10 times better in terms of performance. The simple reason is this. An Indian walks barefoot an American does not. An Indian stands in the paddy field the whole day. The American does not. An Indian climbs a tree but does not climb down.



Instead, he jumps down, while the American climbs down. So, the stress that the Indian foot has to undergo is incredible. Now the challenge here is to make $12,000 foot affordable at $30 and make it 10 times better in terms of performance. This is changing the paradigm. Then I show them the video of this man with the Jaipur foot.Usually I ask the audience "How many of you can run 1 km in 4 minutes and 30 seconds? Not one hand goes up. But the man with the Jaipur foot demonstrates that he can."

RS: This is incredible.

Dr. Mashelkar: This is Gandhian Engineering. Getting More from Less for More and More.

RS: I am beginning to understand this now.

Dr. Mashelkar: The challenge for Indian innovators is to look at the stars with their feet firmly on the ground. Whether it is the Indian Space Mission, or Chandraayan, drinking water for the nation, we have to look at the stars with our feet on the ground. It is this spirit that has helped us to produce Param Supercomputers developed by Dr. Bhatkar in C-DAC in the times of technology denial. And

now we are trying to move from Teraflops to Petaflops. EKA developed by CRL of Tatas in Pune is the world's 7th fastest computer now! It is incredible – this computer was developed at a cost of less than 100 million dollars in a lab of 80 people.

RS: But this does not seem like Gandhian Engineering. Eka will be used by an exclusive few. Can you give me another example, where lives of millions will be touched by our computers?

Dr. Mashelkar: Take the issue of literacy. We have 200 million illiterates. Illiteracy is reducing at 1.3% per annum. This will take around 20 years to clear the backlog. Can we do this in 5 years? Can we do it in less than 2$ per person?

RS: Seems insurmountable.

Dr. Mashelkar: But look at what F C Kohli of TCS and his team achieved. They created a computer based literacy programme. A programme, based on theories of cognition, language and communication. They then emphasized on words rather than alphabets.

RS: That I thought was a brilliant insight.

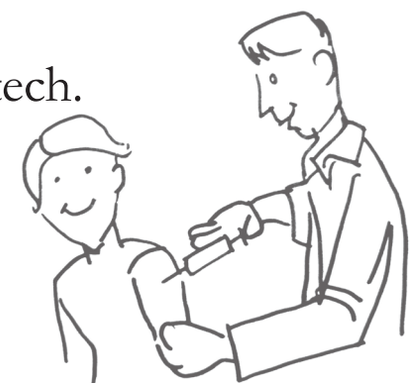
Dr. Mashelkar: Yes indeed. If we can recognise about 550 to 600 words, then we can read a newspaper. They used this to create an incredible solution. Today an illiterate woman can start reading in 6-8 weeks. The cost is $2.5 per person. Today an illiterate lady from Medak district, who became literate through this programme, is confident enough to look at her child's progress report and refuses to sign it if the child is not doing well. This is Gandhian Engineering in action. Let me move on to something else.

Let us take a look at medicines. Look at this table

	10 years ago	Today
Cost of development	$250 million	$1.5 billion
Time taken	10 years	15 years
New Chemical entities	40	30

In effect, we are getting less molecules from more time and more cost. So only few will benefit from this. Whereas what we want, is more molecules from less time and less money, so that far more and more people can benefit. That is the challenge. That is what people like Lupin have been doing. But it is already happening in India.

Now look at Dr Varaprasada Reddy of Shantha Biotech.



Internationally Hepatitis vaccine costs Rs 800 per dose. Shatha Biotech has brought it down to Rs 34 per dose. As a result 50% of global immunization programme uses it. Dr Reddy is indeed a Gandhian Engineer worth emulating.

RS: So how can we produce more such people?

Dr. Mashelkar: That is the precise question. We should not depend on one Saifuddin or one Dr Reddy. How can we get more and more people to come together to practise Gandhian Engineering?

It is at this point that I introduce Global Research Alliance of which I am privileged to be the President. It is an alliance where various scientific institutions and scientists have come together: CSIRO - Australia, CSIR - India, CSIR - South Africa, FhG - Germany, TNO - Netherlands, VTT - Finland, SIRIM - Malaysia, DTI - Denmark, and Battelle - USA.

Last year we signed what is called the Pretoria Declaration towards this cause of coming together and collaborating together. Ambition: More from less, for More and More.

Look at the Power of this global alliance. 60000 scientists from 5 continents. Diversity. Scientific credibility.

Collective mandate: Science for Solution. Technology for Transformation. Innovation for Impact

Thousands of scientists have come together to unearth the mystery of the earth. You know for example, the Large Hadron Proton Collider is funded and built in collaboration with over 10,000 scientists and engineers from over 100 countries, as well as hundreds of universities and laboratories. Some thing unheard of before.

RS: That is incredible. I am sure every one thought it would be impossible.

Dr. Mashelkar: That is the point. We have to galvanise the scientists around the world to come together to solve the problems of the world. The other concept I talk about is: "It is not National Laboratory but the nation itself is the laboratory." Here is an interesting example. Matrix Life Sciences has taken up the license for this new innovative product. It is developed by an ordinary grass root innovator from a village. The only condition is that the product packaging carries the photograph of the innovator. It has never been done before, perhaps it is the first time in the world. Any one who sees it might feel 'if his picture can appear, so can mine'. This in itself is an innovation. There is a number that innovators can call.

RS: Is that working?

Dr. Mashelkar: Of course it is working. I was at IIM Ahmedabad for a board meeting the other day and my colleagues from National Innovation Foundation told me about the number of calls they have been receiving. In my view, this is also Gandhian Engineering – Getting More from Less, for More and More. Here it is an advertising innovation.

RS: Interesting!

*Dr. Mashelkar:*Take a look at what Gandhi said. "Earth provides enough to satisfy every man's need, but not every man's greed" That is all about getting more from less. He also said: "I would prize every invention of Science made for the benefit for all". That is for more and more.

RS: I have never looked at it this way. I am sure most people have not seen it this way either

Dr. Mashelkar: This is not an ordinary quotation from Gandhi. IT defines a philosophy for the world to look at.

On January 9, 2007 Lord Martin Reese, President of the Royal Society, delivered the Blackett Memorial Lecture

under the auspices of the Indian National academy.

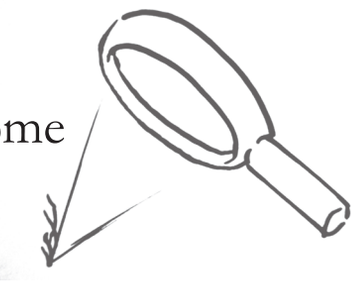
He raised a very pertinent question about several global issues. "The Last Century: Will the Civilisation Survive the 21st century?" His concerns were Climate Change, Global Warming, Stratospheric Ozone Layer Depletion, Ravaging of biodiversity by modern society and others. The world has to now come together to tackle many of these issues.

RS: How is that possible?

Dr. Mashelkar: I will come to that later. Instead let me tell you about a life changing incident from my childhood.

When I was a small kid I studied in a school called Union School. I can never forget Principal Bhave, who was also my physics teacher. One day he took us out to an open area, focused the rays of the sun through a lens to a sharp point on paper till it started burning.

He said this "If you have focus you can achieve anything." I took away two lessons from it. One was Focus and the other was the power of science.



Do you know how this story came out? I was doing some

consulting work for Unilever. I think it was in 1993 that they interviewed me for their magazine. The lady who conducted the interview did a fantastic job and made me talk about things that were buried in my mind. Like this story of Principal Bhave for instance. She managed to unearth this story of the lens experiment. Once out she made it an independent box in the article. Then I talk about Convex Lens Leadership.

RS: What is convex lens leadership? This is new.

Dr. Mashelkar: You know the theory that parallel lines never meet, right. But a convex lens actually makes them meet. Similarly, in a divided society a leader brings people together. Like how Gandhi did, because of his focus and his shared vision. So, what we need today is convex lens leadership, but what we see more often is concave lens leadership that seems to divide people. Under a convex lens leadership even people who are not together normally, come together.

Again achieving something seemingly impossible for the benefit of more and more people.

When I ended my lecture in Australia, I said

"If you feel Gandhian Engineering is for poor people of the world, I am sorry, you are mistaken. It is as important for you guys, as it is for India and other poor countries; because the fact is that non-renewable resources are vanishing fast."

Oil may last for just another 30 or 40 years. The world is getting poorer in resources. How we find alternative resources, is going to be an issue. Sustainable development is what everyone has been talking about. That is why a car like Nano is not just for India but it is for the whole world.

I am the President of the Institute of Chemical Engineering, UK. As my last act I handed over awards to two great people. One was Sir David King an eminent scientist, who was UK Government's principal scientific advisor. The other was Lord Nicholas Stern an extraordinary economist. Both of them have done great work on climate change. King on the science of climate change and Stern on the trade and economics. In their acceptance speeches both of them mentioned the Nano, as a great symbol for the beginning of the 21st century. And Nano is a perfect example of Gandhian Engineering.

What it boils down to is this. We had so far focused on more from less etc. to improve our competitiveness. To

increase top line and bottom line you improved the product in such a way that you spend less on capital, took it faster to market etc. You also added functionalities to a product like mobile – blackberry, video, camera etc. You did all this to increase market share.

From there we now shift to an ambition which says 'I want to create more from less, so that more and more people of the world can benefit from it. Whether it is a Rs 1 lakh car or Rs.1 diaper or Rs. 1 sanitary napkin.'

Five months ago I addressed the American Chamber of Commerce. The person who came to take me to the talk was a senior manager from a leading multinational in the FMCG business. He said 'Sir, you have been talking about more from less etc. We have created a Rs 2 Sanitary Napkin, which even a housemaid can have. What is interesting is that this is in demand in the US.'

I said "The performance level of that must have been consistent. Just because she is a poor woman she is not going to have less of menstrual fluid. She is going to have the same performance requirements as any other lady. Your performance has to be as good as expensive napkins."

He said "Yes. We see that the US market is picking this up really fast". I told him "When you develop a product for the rich, the poor will not be able to buy it. When you develop a good product for the poor, even the rich will start using it. They will come in their Mercedes and take it home." The whole world has to get tuned to Gandhian Engineering. I think the time is right for this. People are getting more and more sensitive to such things. This must lead to life style changes as well. By the way,that does not mean becoming more frugal.

On October 2nd I was reading an article about what today's youngsters feel about Gandhi and his thoughts and philosophy. There was this girl from senior school who said "I don't know where Gandhian philosophy is applicable today. He asked us to sacrifice. He led a kind of a miserly life with less comforts etc. We cannot do that today."

I do not think that is what Gandhi had meant. He only said live the way you can afford. Even Gandhi would be happy if more and more people are given more comforts within affordable costs. He is not asking them to suffer. Gandhi has to be re-interpreted.

RS: We have to help people see him differently.

Dr. Mashelkar: Yes.

RS: How have people responded to the concept so far?

Dr. Mashelkar: I have had the most extraordinary experiences when I speak about Gandhian Engineering. It ignites people's imagination. The students in Pune were excited, as indeed were my audiences in South Africa.

Let me tell you about an extraordinary meeting I attended in New York sometime ago. It was for promoting Global Indigenous Knowledge and Partnership. There were ten of us, seven former heads of state, one Noble Laureate, one former head of world bank and myself. In a particular context I mentioned Gandhian Engineering over dinner. It was a formal dinner. One of them Mary Robinson, was sitting right opposite me at the other end of the table. When I talked about Gandhian Engineering, she got up from her seat, went across to fetch her purse, came straight to me and wrote down what I had just said.

Every time I talk about it, it seems to touch a chord and weave some magic. Some how or the other it is touching a chord everywhere. It is now a question of how we communicate it well, so that the message reaches the right

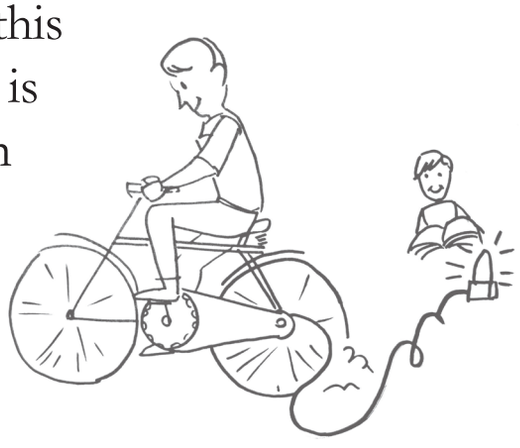
people and is understood.

RS: So how do you take this forward? Who is going to take responsibility? Is it with scientists like you – it is limiting to call you a scientist – or should it be the government or the media?

Dr. Mashelkar: Let me deal with some fundamentals first. The other day I went to Pabal village to see an experiment conducted by a young engineer called Ashish Gawde. His background is interesting. He is C K Prahlad's student, has an MBA and was working with Ford at Detroit, USA. He is one of the leading experts in hybrid cars. He left all that and came back saying 'enough of making money with MNCs. I want to do something for the poor people of India. He now has a mission: bringing light into the homes of the poor in the small villages. What he does is that a bicyle is pedaled and through and an ultra capacitor connected to an LED enough light is generated. Four minutes of peddling the cycle provides four hours of light.

RS: Four minutes of peddling generates four hours of light!

Dr. Mashelkar: Yes. I went to see this, because this can be revolutionary. Today the ultra capacitor is expensive at $50. That has to be brought down



to $5. LED prices are going down any way. The idea is that the child should be able to study rather than just sleep at night. He is driven by this vision of the child being able to study because there is proper light. To me this is Gandhian Engineering. My mind went to the spinning of the charkha and the spinning of the cycle wheel!

What are people talking about? They are not talking about 10,000 MW plants. They are talking about decentralized power, generated locally. If you remember Gandhi's original philosophy was production, trade and consumption getting localized. Somehow or the other people are coming to this conclusion again.

They are saying that they want good performance at prices that the poor can afford. It is not about stripping features just because it is for the poor.

At Pabal village there is a Vigyanashram. It was founded by a Dr. Kalbag and it has a different methodology of teaching at Vigyanashram. I met Dr. Kalbag in 1978 during one of my visits to Hindustan Lever, where I had gone to give a talk. He was the Director of R&D at that time. He told me then that he was going to leave and go to the village to teach concepts of science to young children. His

son Prakash who was in the US is now at the village. Dr Kalbag's wife too is there, the whole family is committed to this. They introduced me to a young student, probably about 8 years old. That boy spoke about how it required nearly 120 litres of water to produce one kilogram of vegetables and how it was not sustainable! Can you believe this? At such a young age they are taught the idea of what it takes to produce something; it is embedded in their minds. You and I were never taught to think this way. That is where Gandhian Engineering will begin. The heart of it is sustainability. Greed cannot support sustainability.

RS: How do we get more Ashish Gawdes?

Dr. Mashelkar: Gawde and Anil Gupta are exceptions. Today Anil Gupta has a number of committed engineer MBAs who work for a pittance. The question is how do we increase the population of such committed people?

Passion is what drives them. They have a way of looking at issues. Ratan Tata is an example. He saw the same thing that all of us have seen. But he was moved enough to say "how can we help these people travel under all weather conditions with comfort dignity and safety". Every one thought he was a dreamer but he found a passionate young

Girish Wagh and his team from Tata Motors to take up the challenge. Today Nano is a reality. A six footer like me can sit comfortably in front.

RS: I understand the role of the passionate individual. I am keen to understand what you think are the roles of the government, academics and industrialists like the Ratan Tatas and Mukesh Ambanis of the world?

Dr. Mashelkar: Firt let me start with the Government. Planning commission should not be just talking about inclusive growth as a title in the cover page of their document. Gandhian Engineering should be at the core of their thinking and planning. Not only that, they must promote Gandhian Engineering. This means putting Vitamin M – funding the effort with money. Proper directed funding towards Gandhian Engineering. Creating grand challenges across the country. Say this product costs Rs 20,000 do it in Rs 1,000. Get the best brains involved.

That is what we did in the New Millennium Technology Leadership Initiative. Cost of PC then was Rs. 70,000. I said "can we bring it down to Rs 10,000?" It was not unconditional funding but money is returned only if the project was successfully accomplished. Today the market will decide whether Intel, Nicholas Negroponte of one

laptop per child fame or our product will succeed. The possibility of this is realized.
Similarly this is how the corporates should look at in terms of challenges.

RS: Is there an opportunity in IITs? For instance should there be a course only for Gandhian Engineering?

Dr. Mashelkar: Absolutely. What engineering is going to be important in the future? Not mechanical, electrical, electronic or civil engineering. It is going to be Gandhian Engineering because it combines everything. There should be chairs for Gandhian Engineering. I honestly believe that Gandhian Engineering needs special attention and focus.

RS: What about media? They have hardly written about this.

Dr. Mashelkar: That's because I have hardly spoken about this in the public domain. Even the talk at the Tilak Smarak Mandir was a closed door Rotary affair. I have not spoken in public platforms about this in India.

RS: May be you should write a book.

Dr. Mashelkar: In fact if one were to re-look at Gandhi's

works/quotes and re-interpret them in today's context and extract new meaning, it will be of great value.

RS: So that the young girl who that Gandhi's thoughts were not relevant will find new meaning in it.

Dr. Mashelkar: I begin by saying that we must embed the right values like what they did for the child at Vigyanashram in Pabal village. If he knows what resources it takes to produce anything, he will never throw away anything.

RS: It is a new way to interpret costs and price.

Dr. Mashelkar: Absolutely. You should start looking at the resource. Treat each resource as a valuable resource. If we look at water like that, can you imagine how a child will start looking at water as a resource? Will he ever waste it or keep the tap running while brushing his teeth? In my judgment, what is happening is that we are not appealing to the right senses. There has to be a new way in which we must communicate these concepts.

RS: Tell me more.

Dr. Mashelkar: If you start telling people that it is good to

do this, or it is logical to do so or it is pious to do so or it is the right moral thing to do so, it does not seem to click.

There has to be something beyond that. They must understand the consequence of not doing it as well. For example, if you do not do so you are affecting your own life, your future and the future of your fellow human beings. Then the impact is different. So when I say More from Less for More and More, I do not mean the 4 billion people present today in the world getting less than $2 per day. I am talking about our children, grand children, great grand children – our future generations as well.

Like somebody said we come to this earth and stay here on a lease for 60, 70, 80 years depending on His wish. Then we go away. We do something during that period. If I am a Newton or Edison or Faraday I do something to help humanity. If I am a Hitler I do something else and go away. The question is do I contribute something or just consume and go away.

Looking at the future if every young man gets a feeling that I am doing this for my family, family of my family and my future generation, it will make a huge difference. Once you start embedding these values it will make a difference. The teaching, the learning, the curricula – everything must be

embedded with this grand philosophy.

In the corporate world they do it to meet competitive pressures. But can we enlarge it do it for a bigger cause?

Perhaps even marketing may be redefined and brand equity might be measured differently. You know the Nirma story was not just about being cheaper. They consumed less power, less of everything. That was the big story – if I was in their shoes that is the story I would have told.

Today we have recycled paper. Shoes made of recycled material. Organic farming. All these efforts are commendable.

RS: Who would you target to become a catalyst in this effort? The child, the mother or the teacher? Who can accelerate this change?

Dr. Mashelkar: It has to be a combination of all three. It has to work in tandem. You know in the last four months, ever since I spoke about this the first time, it has been growing in relevance and meaning. It has been embedded in jargon like Optimisation. Theory like rejects should be 0%. In a way the concept may not be new.

But here we are talking about a paradigm shift.

That is why recycling, reprocessing technologies will become major technologies. We have so much of abundance today. When we live in a space of abundance recycling, reprocessing etc assume little relevance or significance. In times of scarcity it is so important. That is why I like what C K Prahlad said the other day. He talked about aspiration and resource. He said your aspiration has to be always higher than the resource. When you become more and more rich in resources, your aspirations start falling. That takes you on a downhill trip. Therefore, even a company that is resource rich, has to behave as if it is resource poor and keep its aspirations high. This again will come into the ambit of Gandhian Engineering.

RS: It is driven by discontent, but not greed.

Dr. Mashelkar: Divine discontent is a good way of looking at it. There is so much to do.

RS: Thank you Sir. It has been an enlightening discussion.

Dr. Mashelkar: I truly enjoyed talking about it. This discussion has triggered so many new thoughts in my mind, even as we were speaking.

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Please turn over to read Dr Mashelkar's inspiring profile

R.A. Mashelkar, F.R.S.

Dr. R.A. Mashelkar, CSIR Bhatnagar Fellow, is presently also the President of Global Research Alliance, a network of publicly funded R&D institutes from Asia-Pacific, Europe and USA with over 60,000 scientists.

Dr. Mashelkar served as the Director General of Council of Scientific and Industrial Research (CSIR), with thirty-eight laboratories and about 20,000 employees for over eleven years. He was also the President of Indian National Science Academy and President of Institution of Chemical Engineers (UK).

Deeply connected with the innovation movement in India, Dr. Mashelkar is currently the Chairman of National Innovation Foundation, Marico Innovation Foundation, Thermax Innovation Council and Reliance Innovation Council.

Dr. Mashelkar is only the third Indian engineer to have been elected (1998) as Fellow of Royal Society (FRS), London in the twentieth century. He was elected Foreign Associate of National Academy of Science (USA) in 2005, only the 8th

Indian since 1863 to be so elected. He is the first Indian to have been elected as the Foreign Fellow of Australian Technological Science and Engineering Academy (2008). He was elected Foreign Fellow of US National Academy of Engineering (2003), Fellow of Royal Academy of Engineering, U.K. (1996), and Fellow of World Academy of Art & Science, USA (2000).

Dr. Mashelkar is on the Board of Directors of several reputed companies such as Reliance Industries Ltd., Tata Motors Ltd., Hindustan Unilever Ltd., GeneMedix Life Sciences Ltd., Indigene Pharmaceutifcals Ltd., ICICI Knowledge Park, Thermax Ltd., Piramal Life Sciences Ltd., and KPIT Cummins Infosystems Ltd. He is a member of the Scientific Advisory Boards of the Microsoft (USA), Microsoft (India), VTT (Finland), etc., besides being Strategic Advisor to Alcoa (USA)..

Twenty-six universities have honoured him with honorary doctorates, which include Universities of London, Salford, Pretoria, Wisconsin and Delhi.

In August 1997, Business India named Dr. Mashelkar as being among the 50 path-breakers in the post- Independent India. In 1998, Dr. Mashelkar won the JRD Tata Corporate

Leadership Award, the first scientist to win it. In June, 1999, Business India did a cover story on Dr. Mashelkar as "CEO OF CSIR Inc.", a dream that he himself had articulated, when he took over as DG, CSIR in July 1995. On 16 November 2005, he received the Business Week (USA) award of 'Stars of Asia' at the hands of George Bush (Sr.), the former President of USA. He was the first Asian Scientist to receive it.

When Dr. Mashelkar took over as the Director General of CSIR, he enunciated "CSIR 2001: Vision & Strategy". This was a bold attempt to draw out a corporate like R&D and business plan for a publicly funded R&D institution. This initiative has transformed CSIR into a user focused, performance driven and accountable organization. This process of transformation has been recently heralded as one of the ten most significant achievements of Indian Science and Technology in the twentieth century.

Dr. Mashelkar has been propagating a culture of innovation and balanced intellectual property rights regime for over a decade. It was through his sustained and visionary campaign that growing awareness of Intellectual Property Rights (IPR) has dawned on Indian academics, researches and corporates. He spearheaded the successful challenge to the

US patent on the use of turmeric for wound healing and also the patent on Basmati rice. These landmark cases have set up new paradigms in the protection of India's traditional knowledge base, besides leading to the setting up of India's first Traditional Knowledge Digital Library. In turn, at an international level, this has led to the initiation of the change of the International Patent Classification System to give traditional knowledge its rightful place. As Chairman of the Standing Committee on Information Technology of World Intellectual Property Organization (WIPO), as a member of the International Intellectual Property Rights Commission of UK Government and as Vice Chairman on Commission in Intellectual Property Rights, Innovation and Public Health (CIPIH) set up by World Health Organization (WHO), he brought new perspectives on the issue of IPR and the developing world concerns.

In the post-liberalized India, Dr. Mashelkar has played a critical role in shaping India's S&T policies. He was a member of the Scientific Advisory Council to the Prime Minister and also of the Scientific Advisory Committee to the Cabinet set up by successive governments. He has chaired twelve high powered committees set up to look into diverse issues of higher education, national auto fuel policy, overhauling the Indian drug regulatory system, dealing with the menace

of spurious drugs, reforming Indian agriculture research system, etc. He has been a much sought after consultant for restructuring the publicly funded R&D institutions around the world; his contributions in South Africa, Indonesia and Croatia have been particularly notable.

Dr. Mashelkar has won over 50 awards and medals, which include S.S. Bhatnagar Prize (1982), Pandit Jawaharlal Nehru Technology Award (1991), G.D. Birla Scientific Research Award (1993), Material Scientist of Year Award (2000), IMC Juran Quality Medal (2002), HRD Excellence Award (2002), Lal Bahadur Shastri National Award for Excellence in Public Administration and Management Sciences (2002), World Federation of Engineering Organizations (WFEO) Medal of Engineering Excellence by WFEO, Paris (2003), Lifetime Achievement Award by Indian Science Congress (2004), the Science medal by the Academy of Science for the Developing World (2005), Ashutosh Mookherjee Memorial Award by Indian Science Congress (2005), etc.

The President of India honoured Dr. Mashelkar with Padmashri (1991) and with Padmabhushan (2000), which are two of the highest civilian honours in recognition of his contribution to nation building.