Daimler-Benz Research & Technology
New Strategies for a Global Market

Bose-Einstein Lectures
on
Science, Technology and Environment

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1. Welcome

((Genaue Begrüßung folgt, wenn klar ist, wer namentlich begrüßt werden muß))
First, I thank you very much for the invitation to Delhi.

Satyendra Nath Bose and Albert Einstein, who gave this event its name, stand first of all for outstanding scientific achievements of this century. But they also stand for the long tradition which India and Germany can look back upon in their collaboration in the field of science and research.

In the town of Ulm in southern Germany, where Albert Einstein was born, a statue has been erected in front of the railway station which pays tribute to this tradition. It comes from India. A plaque attached to the statue bears the legend: "Dedicated to the City of Ulm by the Indian people."

Daimler-Benz AG intends to continue this tradition. Tomorrow, we shall officially open our first Research Center in India. This, too, by the way, was "born" in Ulm, where Daimler-Benz has located its research in the field of information technology.

The Daimler-Benz Research Center India is an important element of the offensive launched by Daimler-Benz at the beginning of this decade to internationalize its research activities.

I would like to report to you today about the background, about the strategic plans on which this offensive is based.

2. Daimler-Benz: Fields of Business and Research Activities

But first let me say a few words about the Daimler-Benz Group and its research.

Transport, traffic and services - these are the three strategic orientations of the Daimler-Benz Group. We operate today in 23 business units which can be grouped under the following broad headings:

- Cars
- Commercial vehicles
- Aerospace
- Services

- Rail and
- Microelectronics

A sales volume of over 100 billion DM makes Daimler-Benz the biggest industrial company in Germany and one of the largest in the world. A workforce of 290,000 people worldwide produced an operating profit of 2.4 billion DM in 1996.

The top performer is the vehicle business, which accounts for around three-quarters of group turnover. Last year, sales figures in both the commercial vehicle and the car divisions reached new records in the company's history.

Group Research comprises all the Group's research activities in all its business units. The work of this sector can be summed up under three broad headings:

- Firstly: securing the technological future by means of an innovative Group research function oriented to the Group's business strategies and business units
- Secondly: carrying out group-wide technology management in conjunction with the entrepreneurially independent business units
- And thirdly: guaranteeing the Board's technological expertise.

The main focuses of our research lie in the following spheres:

- Man and Vehicle
- Vehicle Systems
- Methods and Tools
- Drive Systems
- Energy Technology
- Traffic and Traffic Environment
- Microelectronics and Microsystems
- Automation and Drive Systems
- Information Technology
- Production Research and Environment
- Materials
  and
- Social Impacts of Technology

Around 1,500 employees work in these areas at six different locations within Germany.

I cannot go into detail about our research work here, but I would at least like to present two highlights of our research with which we clearly underscored the technological competence and innovative capacity of our enterprise last year.

One is our concept study called "F200 Imagination" for a coupé for "the day after tomorrow."

It combines a great number of innovative systems to enhance safety and comfort.

For example, we have implemented a forward-pointing "drive-by-wire" system in the F200. It allows the driver to control all movements of the car with so-called side-sticks integrated in the interior lining of the doors and the center console. Since it eliminates the conventional operating controls steering wheel and pedals, it opens up completely new opportunities for interior design.

The most conspicuous exterior features are the hydraulic pivoting doors that make for comfortable entry and exit even in tight parking spaces.

The F200 also has special safety features to offer. Should a crash occur, in addition to the familiar side airbags a so-called window-bag unfolds out of the roof frame like a curtain to protect the occupants on both the front and back seats.

With these and a number of other novelties, the F200 contains a wealth of innovations for use in top Mercedes models of the 'day after tomorrow'.

To lay the technical foundations today for the environmentally compatible mobility of tomorrow—that is the maxim of our research work on alternative drives and sources of energy.

We see particular potential in fuel cell drive. It utilizes the advantages stemming from the principle of electric drive and at the same times avoids the drawbacks of a battery-powered electric vehicle.

Last year, we presented the first fuel cell-powered multipurpose vehicle which can operate under everyday conditions. Decisive for this was the intensive research with which we succeeded in increasing the power density of the fuel cells and thus reducing the weight and volume to such an extent that the entire fuel cell system can be accommodated under the rear bench seat.

Only two years ago, in our first test vehicle, the fuel cell system took up almost the entire volume of a van. Today, its size has been reduced to such an extent that six people can travel in the fuel cell-powered people carrier. This demonstrates the dramatic progress made in this period.

3. Challenge of the Global Market

Following this exemplary look at our research activities, I would now like to come to the main subject today, the question of the strategies with which Daimler-Benz Research meets the challenges of the global market.

This question already contains a very essential premise:

Our market is the world market. This is basically a trivial statement. Nevertheless it is more relevant today than every before.

Globalization of economic relations takes place both on the macroeconomic level but also on the level of the enterprise. It is based on a large number of factors and is constantly gaining in dynamics.

Changed political parameters such as the establishment of free trade zones or the political opening and economic liberalization of the former socialist countries have given this trend additional impetus.

But new technologies in the fields of transportation and communication have also had the effect that consumers and companies today have access to an international supply of goods and service practically worldwide.

Production facilities and technical and organizational know-how were reserved to the classic industrial countries up to a few years ago. Today they are available worldwide.

This globalization of supply is accompanied by a rapid growth in the worldwide flows of capital. Investments are made where the markets are and where the prospects for returns are the best.

At the same time, dramatic changes in the economic weighting of various economic regions can be observed. The triangle U.S.A., Japan and Western Europe still dominates the development of the world economy, but all the indications are that it will gradually be superseded by a far more complex structure that also includes the newly industrializing countries of Asia and South America and the reform countries of Eastern Europe.

The idea of developing and producing a product in one place and delivering it to the entire world is no longer practical today.

The needs of customers are becoming more and more differentiated. It consequently becomes increasingly important to offer custom-made products, tailored to the individual and regionally differing desires of customers.

For this purpose, the entire value-added chain of the company must be globally oriented, starting from the area of Research & Development, continuing through purchasing, production and sales, all the way to financing and human resources policy.

4. Globalization in the Daimler-Benz Group

This globalization has a long tradition in the Daimler-Benz group.

Already towards the end of the seventies, our Mercedes-Benz brand was represented with its vehicles in more than 160 countries of the world. No motor vehicle manufacturer has a broader and more efficient worldwide sales and service network than Mercedes-Benz.

The internationalisation of production was first promoted in the Commercial Vehicles Division.

We availed ourselves of the advantages of an interlinked international production system early on to secure ourselves world leadership in the area of trucks over 6 tonnes and buses over 8 tonnes.

As early as the beginning of the fifties we set up our own production plants in Brazil and Argentina.

A further milestone on the way to becoming a global commercial vehicle manufacturer was the construction of an assembly plant here in India together with the Tata group.

In 1981, we acquired the American truck makers Freightliner—a very successful bridgehead in the world's largest market for commercial vehicles, the U.S.A.

Today, Daimler-Benz already produces every second commercial vehicle abroad.

In the passenger car segment, too, in which we operate as premium suppliers of high-quality cars, a change is in the making, from "Made in Germany" to "Made by Daimler-Benz."

The decisive reason for this was not merely the opportunities which we see for our products in the promising markets of Asia and Latin America, but rather the fact that we have decided, within the framework of an extensive product offensive, to expand our traditional range and tap new growth markets and market segments with attractive products.

The new A-class typifies this. Shorter than a compact car, it offers the spaciousness of a medium-sized car, the comfort of a saloon and the practical features of a minivan—while for the first time introducing Mercedes-Benz's exacting safety standards into the subcompact car segment. In addition to being built in Germany, the A-class will also be produced in Brazil.

Further examples are the V-class people carrier, in production in Spain since last year; or the M-class, our new off-road vehicle, for which we built a new factory in Tuscaloosa in the U.S.A. And then there is the Smart, specifically developed for operation in congested urban areas, the two-seater city runabout which will roll off the assembly line in France beginning next year.

But the increasing internationalisation also embraces all other business units of the Group.

Daimler-Benz Aerospace, which houses our activities in the fields of aviation, space, defence and drive systems, makes three quarters of its turnover in international cooperation, for example in Airbus Industries.

Daimler-Benz InterServices, founded in 1990 as a Group service-provider, already has 166 branches in 28 countries today.

The Group subsidiary handling microelectronic products and automotive equipment, Temic, has development, production and sales establishments in 37 countries worldwide.

And our railway offshoot Adtranz, a 50:50 joint venture with Asea Brown Boveri, operates all over the world, from Australia to Asia, Europe to America and Africa.

5. Reasons for Internationalising Industrial Research

Against this backdrop, it is clear that the Research departments of the company too must critically examine whether their structures adequately take into account the changes in the international markets which have already occurred and are expected in future.

Yet when we began, at the beginning of this decade, to deal intensively with the issue of the internationalisation of our research activities, we discovered that this question was often viewed with split feelings around the world.

The internationalisation of research has increased sharply over about the last one-and-a-half decades. In the first half of the eighties, enterprises began supporting their local branches abroad with capacities particularly in the area of adaptive development. The objective was to adapt technologies developed in the parent country to local production and sales requirements.

Since the mid-eighties, there has been a clear trend towards strengthening and expanding the capabilities of foreign R&D. Today, high-calibre research is increasingly carried out also at the foreign locations.

However, the process of internationalisation in the nineties goes hand in hand with an increasingly selective choice of a few R&D locations and a concentration on a few leading centers. Frequently, only one competence center is established worldwide per product Group or field of technology.

These measures can be interpreted as a reaction to a certain "uncontrolled" growth in the eighties. Not only the number of R&D laboratories distributed around the world grew then. The problems grew in parallel: duplication of activities, subcritically equipped institutes and demarcation disputes are just a few of them. At some companies this even led to a recentralization of Research and Development in the home country.

The following quote is taken from a study of the late eighties. I think it expresses vividly and in a nutshell the split feelings of many enterprises: "Globalization of R&D is typically accepted more with resignation than with pleasure ..... In one of our own cases, internationalisation was almost described as an unavoidable nightmare, closer to a marketing gimmick than to an effectively contributing R&D outlet."

Even today, there is still apparently no "magic recipe" for the "right" amount of internationalisation of industrial research. This, at least, is what a survey of 22 renowned globally operating companies indicates, which we conducted last year in Japan, the U.S.A. and Europe. As to the degree of internationalisation, two distinct groups of enterprises crystallize:

Nine of the reference companies concentrate their entire central research at a single location, always in the home market.

Twelve enterprises have distributed their research among several locations, with a definite "home base." The scale of international research activities varies appreciably, though. The research institutes abroad number between one and eight; the number of scientists employed there, between 20 and 1,200. Five of the firms declared their intention to establish one or more additional research facilities abroad.

Apart from the question "how much?", in our benchmarking test we also asked "why?"; that is, what are the motives of companies for investing in the buildup of research capacities outside their home market.

We discovered two major basic strategic patterns, which are confirmed by a current study of Harvard University:

Strategy 1 can be characterized as "market-driven internationalisation."

"Go where the market is." The sales and production departments of large firms have been operating according to this motto for decades. This striving for close spatial proximity to international markets and customers has intensified in the nineties. The industrial research units are adapting themselves to the global tendency to decentralization: as well as on-site support of sales, production and development, the emphasis is on learning in "lead markets" and adapting to local customer needs.

The second main reason for internationalizing research is to establish a presence in the "hot spots" of world technological development.

If one does not want to risk missing out on important knowledge obtained elsewhere in the world due to too narrow an outlook—or unnecessarily repeat the effort to produce the results—one must go right to the 'hot spots' of technological activity. This alone opens up access to the resources, results and talents of the world's best research facilities.

Of both basic strategic patterns equally it can also be said: if the relocation of research work promises advantages in the way of cost, without sacrifices in output and quality, then this is an added motive for corporate management.

6. International Locations of Daimler-Benz Research

So much for the international state of the art. Now to our company:

The Research and Technology Division of Daimler-Benz AG has six sites in Germany. Since 1994 we have added three international sites to them.

The Research and Technology Center founded in Palo Alto in the state of California in the U.S. in 1995 is primarily oriented to the last strategic goal: on-scene presence in the world's technological hubs.

Its location close to Stanford University and Silicon Valley enabled us to build a competence center in the environs of one of the most important hot spots in the field of information technology.

With around 25 employees we do research there on transportation technology, information and communication techniques and microtechnology. At the same time, the center helps the company detect new technological and social trends and thus allows new products to be matched to customer and user needs more speedily and more precisely.

A result of the alternative strategy—research where the market is—are our two research centers in Oregon, U.S.A., and Shanghai.

The research center launched in Shanghai in 1995 is a laboratory run jointly with the Shanghai Institute of Metallurgy. The institute assists our microelectronics subsidiary TEMIC, which, in the course of its internationalisation, has appreciably expanded its presence in China over the last years by founding several joint ventures.

The tasks center around topics from the field of "electronic packaging." This is one of the decisive problem areas in the further development of microelectronics, as a number of the limitations of microelectronics, like volume, weight, cost, reliability, are caused by the packaging.

In addition, a service center was set up whose job is to support ongoing production processes at TEMIC departments, directly and at short notice, by performing analyses and investigating faults.

Integration of the Shanghai Institute in our continuing microelectronics research in Germany is ensured by the strict linking of themes and the regular exchange of Chinese and German scientists.

Since the beginning of last year we have had a "Vehicle Systems Technology Center" in Portland, Oregon. It is located at the site of our U.S. commercial vehicle subsidiary, Freightliner, in order to support the activities of this company in the North American commercial vehicle market. The objective is to ensure the specific conditions of the American market are taken into account in the earliest stage of product development—research.

Currently twelve employees—experts in mechanical science, electronics, information technology and control systems theory—support Freightliner in designing future electronic systems for vehicle diagnosis or driver assistance and adapting advanced tools and methods to purposes of vehicle development. A further focus is Human Factors Engineering: the assessment and optimization of the operation and control of technical systems with regard to the abilities and needs of humans—the customers. These are all topics to which we attach increasingly great importance for vehicle development work of the future.

The Vehicle Systems Technology Center relies in its tasks on close coordination with the vehicle research staff in Germany and with the other worldwide research activities of the Group.

These three institutes alone, in the U.S.A. and China—none is more than two years old—show how up-to-date and fresh our internationalisation efforts are. Still younger, however, is our fourth international research facility, which we shall inaugurate tomorrow in Bangalore: the Daimler-Benz Research Center India.

With this institute we are simultaneously pursuing both strategies mentioned.

Firstly, we see India as a promising country—as one of the hot spots—for research in the area of information technology. In particular, we want to make use for our Group of the great know-how in communications technology, software engineering and mathematics. From this know-how we expect an enormous impetus for fields of the future which are important to our company, such as multimedia, pattern recognition, telematics and manufacturing solutions.

An important component of our concept is a close working relationship with Indian universities and research establishments as well as with the software industry based in this country. For instance we hope to:

- involve scientists from the top Indian institutes in our research projects on a sabbatical basis
- to place research contracts with high-quality local partners and
- to give Indian students an opportunity to work on tasks of our Research Center by commissioning degree dissertations and doctoral theses.

At the same time, with the new institute we want to facilitate entry to new markets and build long-term relationships with the Group subsidiaries in the region, thereby signalling a long-term, partnership-based commitment of our Group to this fast-advancing country.

I hope you will forgive me for keeping this look at our Daimler-Benz Research Center India rather brief, but tomorrow we shall be giving a very detailed presentation to the public.

7. Further Internationalisation Measures of Daimler-Benz Research

But internationalisation of research means more to Daimler-Benz than building research institutes abroad.

To work in the vanguard of research we must simultaneously seek cooperation with a large number of international competence centers. This includes:

- cooperation in projects with key universities worldwide
- strategic alliances both with other enterprises and within international programs
- participation in high-tech venture capital funds
- cooperation with suppliers of research services
- or participation in sponsorship programs.

In all these areas, Daimler-Benz Research is active.

But these are not the only ways in which we are resolutely turning the knowledge generated in the world's "hot spots" to the benefit of our Group.

For example, I must also mention our Technology field offices, our Circle Member Group, and our international auditor network.

First, let me say something about the Technology field offices. The idea arose at the end of the eighties when, in the course of diversification, the Group branched out into new technologies, and an international technological monitoring showed itself to be necessary.

This led, beginning in 1988, to the establishment of Technology field offices in Japan, the CIS and the U.S.A. They consist of small teams of three to five people whose mission can be described like this:

- technology monitoring, meaning observation of core technology fields and identification of changing trends
- preparing the ground for cooperation in research
- building and maintaining networks of experts

The offices also provide services on behalf of the Group, preparing visits, procuring information or performing research.

For the systematic involvement of leading international experts we have additionally created the instrument of the Circle Member Group. This is a circle of currently 25 top scientists from the leading universities of the world, through whom, in the medium term, the Group aims to set up personal ties with important contacts. At the same time, the members of the Circle Member Group provide a continuous overview of international progress in areas of research important to Daimler-Benz.

Also, for external evaluation of our research topics and results, a network of research auditors has been established. It meanwhile comprises 55 of the world's leading scientists and, beyond the original intention, has also developed into a first-rate group of consultants.

7. Challenges

Ladies and Gentlemen:

I think the necessity of strategic internationalisation of Research, oriented to regional market needs and worldwide technological developments, is indisputable for a global player like Daimler-Benz.

We have developed a great deal of dynamism here.

The benefit we hope for will also be great.

However, the demands, too, are great.

I see two essential tasks here:

First, when geographical limits are bridged, cultural distance must be overcome simultaneously. Research facilities distributed across the world or international cooperation only produce a real added benefit if a multicultural climate thrives in them. That does not happen by itself, but must be actively furthered. Daimler-Benz Research therefore supports the described internationalisation schemes with a bundle of personnel-related measures, which include sending German researchers abroad for limited periods, increasing the percentage of foreign employees also at the German locations, and the systematic formation of scientific teams with an international composition.

The second challenge, which results from the increasing importance of worldwide alliances, is the need to make use for this purpose of the opportunities provided by information technology. This applies not only to collaboration in research but extends much farther, encompassing the entire product gestation process, which is becoming more and more complex as product development increasingly takes place within an integrated worldwide system. Daimler-Benz is currently carrying out a test project in which we are using various methods and systems of data, video and audio communication with a view to allowing parallel development of a vehicle at several locations.

The challenges of globalized research are great, but they can be overcome. The route already being taken, there can be no mistake about it, will continue to be followed the world over. I would even say that the internationalisation of industrial research will have to be understood in future as internationalisation of the structures of cooperation, too. Companies can profit from this frontierless cooperation across the entire spectrum—not just in the field of research. And above all, this collaboration will foster mutual understanding between different cultures, to everyone's benefit.

Thank you very much.