





MOTOR INDUSTRIES CO. LTD.

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Cover page:

The manufacture and export of PF33, a high pressure single cylinder pump, was taken up in 2002. More than a quarter million units of this pump have since been exported to Europe. PF33, a high pressure single cylinder fuel injection pump with an integral pump body designed to withstand high injection pressure, finds application in the new generation direct engines viz., tractors, farm equipment, stationary engines etc.

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Contents

	Page				
About MICO and Bosch	2				
Board of Directors, Committees, etc.					
25 years of Bosch ABS					
Financials at a glance					
Report of the Directors					
Annexure to the Report of the Directors					
Report and Certificate on Corporate Governance					
Management Discussion and Analysis Report					
Report of the Auditors to the Members	31				
Balance Sheet	34				
Profit and Loss Account	35				
Schedules to Balance Sheet	36				
Schedules to Profit and Loss Account	44				
Notes on Accounts	47				
Cash Flow Statement	59				
Balance Sheet Abstract	60				
Subsidiary Company	62				
Shareholder Information	66				
Attendance Slip and Proxy	69				

About MICO

MICO is a subsidiary of Robert Bosch GmbH, Germany. Founded in 1951, MICO pioneered the manufacture of automotive spark plugs and diesel fuel injection equipment in India. With access to the international technology of Bosch, conscious commitment to quality and around 10,000 employees, MICO is the largest manufacturer of diesel fuel injection equipment in the country and one of the world's largest. In addition, MICO businesses include industrial equipment, auto-electrical, gear pumps for tractor applications, electric power tools, packaging machines, security technology products and Blaupunkt car multimedia systems.

Partnering MICO in its quest for quality are its suppliers, including those in the small-scale sector. An all-India network of over 4,000 authorised representations ensures widespread availability of both products and after-sales services.

About Bosch

The name of Bosch is closely associated with the automotive industry. But Bosch is not just famous for auto technology products like gasoline, diesel and chassis systems and car electronics. Bosch also supplies many other products and services: industrial technology, power tools, security solutions, broadband networks, automation and packaging technology products, household appliances etc., to name only a few. Bosch is active on every continent and has subsidiaries and associated companies in more than 50 countries. Bosch operates 249 manufacturing locations worldwide, of which 185 are located outside Germany in Europe, North and South America, Africa, Asia and Australia. At the beginning of 2004, the Bosch Group employed around 232,000 people worldwide.



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Board of Directors, Committees, etc.

Directors

H. Zimmerer, Chairman
Dr. J.J. Irani
Dr. G. Krueger
Dr. B. Bohr *
D.S. Parekh ≠
Dr. A. Hieronimus, ☆
Managing Director
M. Lakshminarayan,
Joint Managing Director
V.K. Viswanathan,
Joint Managing Director

Company Secretary B.S. Iyer

Auditors

S.R. Batliboi & Co.

Bankers

State Bank of India Canara Bank Citibank, N.A. Deutsche Bank AG

Registered Office

Hosur Road Adugodi Bangalore-560 030

Stock Exchanges (where the shares of the Company are listed)

The Stock Exchange, Mumbai Phiroze Jeejeebhoy Towers Dalal Street Mumbai-400 001

National Stock Exchange of India Limited Exchange Plaza Bandra-Kurla Complex Bandra (E) Mumbai-400 051



Audit Committee D.S. Parekh, Chairman ¥ H. Zimmerer Dr. G. Krueger

Shareholders'/Investors' Grievance Committee

H. Zimmerer, *Chairman* D.S. Parekh ♥ Dr. A. Hieronimus ☆ V. K. Viswanathan

Remuneration Committee

H. Zimmerer Dr. J. J. Irani Dr. G. Krueger

Investment Committee

D.S. Parekh ♥ Dr. J. J. Irani Dr. A. Hieronimus ☆ V.K. Viswanathan

Property Committee

H. Zimmerer D.S. Parekh ♣ M. Lakshminarayan V.K. Viswanathan•

Share Transfer Committee

Dr. J. J. Irani Dr. G. Krueger ° Dr. A. Hieronimus ☆ V.K. Viswanathan

Registrar & Transfer Agent

Alpha Systems Private Limited No. 30, Ramana Residency 4th Cross, Sampige Road Malleswaram Bangalore-560 003

* F. Fehrenbach (upto 30.06.03) Dr. B. Bohr (from 01.07.03) ✤ Y.H. Malegam (upto 31.12.03)
 D.S. Parekh (from 01.01.04) ☆ A. Nobis

 (upto 30.04.03)
 Dr. A. Hieronimus
 (from 01.09.03)

A. Nobis (upto 30.04.03) V.K. Viswanathan (from 18.09.03) Y.H. Malegam (upto 31.12.03)
 Dr. G. Krueger (from 01.01.04)

A core component of driving safety for motor vehicles is celebrating its 25th anniversary: the Antilock Braking System (ABS). It took a large number of engineers many years to develop and test this brake control system. Before ABS was introduced, control of steering under emergency braking was not possible, and tyres suffered enormously. The antilock system first produced by Bosch in 1978 prevents the wheels from locking, leaving the vehicle under control and allowing the driver to steer around obstacles. Braking distance is also reduced in most cases. The increasing use of ABS in motor vehicles is a major contribution to safety on the roads.

ABS - a long journey for an old idea

People had been wondering how to prevent wheels from locking since the beginning of the 20th century – not only on cars but also on railway vehicles and even on airplanes. As early as 1936, Bosch had registered a patent for a "mechanism to prevent locking of the wheels of a motor vehicle". All the earlier designs shared the same faults: they were too complicated and therefore too prone to failure, and they worked too slowly. It was not until digital technology became available in the '70s that a reliable ABS could be developed.

Bosch subsidiary, Teldix started working on the project in 1964 and within two years development engineers had already managed to reduce the braking distance on test vehicles. Steerability and cornering stability were

25 years of ABS - drawings of various generations of ABS.



also retained. Based on these early models, the engineers were able to design a system which for the very first time was controlled entirely by electronics. The basic structure of this new design - named ABS 1 - is still to be found in nearly all antilock braking systems. But the reliability and durability of the electronic control unit with its roughly 1000 analog components and the safety switches then used were not yet good enough for volume production - both of these had to be improved. The advent of digital technology and integrated control circuits finally allowed the number of electronic components to be reduced to 140 in total. After 14 long years of development, everything was finally in place in 1978: the second generation of Bosch's ABS - ABS 2 began to be fitted as optional equipment, at first in Mercedes-Benz's 'S'-class cars and shortly afterwards in BMW's 7-series limousines.

ABS – how it works

Then as now, the hydraulic unit remains the central component of an ABS. Each of the four wheels has a speed sensor, which measures the rotational speed of the wheel. This information is monitored by an electronic control unit, which opens and closes the magnetic valves at the right time. If a wheel is about to lock under heavy braking, the system continues to reduce the hydraulic pressure on that wheel alone until the threat of locking is past. Once the wheel is turning freely again, the hydraulic pressure is increased. This





Braking on a wet road: cars easily speed out of control when cornering without ABS.



increase and release of pressure continues until the driver reduces the force on the brake pedal or until the tendency to lock is overcome – if there is more grip on the road surface, for instance. Depending on the particular system, there is a certain amount of feed-back movement at the brake pedal.

ABS - system improvements and additional functions

During the succeeding years, developers concentrated on simplifying the system. In 1989, Bosch's engineers succeeded in attaching a hybrid control unit directly to the hydraulic modulator. This allowed them to dispense with both the wiring harness linking the control unit and the hydraulic modulator and the vulnerable plug-in connectors, and significantly reduce the overall weight of this ABS 2E generation. Using new solenoid valves, Bosch engineers created generation 5.0 in 1993 and in subsequent years versions 5.3 and 5.7. The main features were once again, a significantly reduced weight and additional functions such as electronically distributed brake pressure, which replaced the mechanical brake pressure reduction mechanism on the rear axle.

ABS 8 – the current generation – first appeared in 2001. It has a modular design, which allows the various degrees of complexity of the brake control system – ABS, TCS and ESP – to be manufactured in very similar ways. This makes it possible to optimize synergies in development and manufacture. All the systems currently produced by Bosch are manufactured to the same quality standards, regardless of where in the world they are actually produced. The majority of ABS are manufactured as close as possible to the customer being supplied – no matter whether that is in Germany, France, the USA, Korea or Japan.

With increasing technical progress, the range and number of functions also increases. In 1987, for example, Bosch began series production for passenger cars of the ABS-based Traction Control System (TCS) which prevents wheel spin. TCS helps to improve acceleration on smooth or slippery surfaces and also increases

In 1978, Bosch was the first manufacturer worldwide to go into series production with the antilock braking systems for passenger cars. Meanwhile, OEMs equip nearly 70% of all new cars with this safety system.



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stability by reducing engine power when corners are taken too fast. The Electronic Stability Program (ESP) – the most advanced brake control system in the world – was launched by Bosch in 1995 as a world first. It improves stability not only under braking and acceleration, but in every driving situation. If there is a risk of the vehicle going into a skid, ESP reduces engine power and simultaneously provides braking pressure to individual wheels – offering a significant increase in driving safety.

ABS – from 'optional extra' to 'fitted as standard'

The successive technical improvements have meant that

ABS 8: The new series generation 8 by Bosch serves as universal basis for brake control systems with ABS, TCS and ESP functions.



ABS has been providing greater safety in more and more vehicles since the start of production. Through the '80s, annual sales of ABS grew slowly. In 1986, Bosch delivered its millionth antilock braking system to its customers. During the '90s, ABS finally began to be fitted to mediumsized and compact cars. Sales figures grew from year to year: by 1999, Bosch alone had sold a cumulative total of 50 million systems. Soon – at least in Europe – every new car will have ABS: according to a self committment of the European car manufacturers' association, every car sold in Europe from mid-2004 onwards will be fitted as standard with the ABS safety system.

ABS 2: The first electronically controlled antilock braking system.







25 years of Bosch ABS - milestones of development:

1936:

Bosch registers a patent for a "mechanism to prevent locking of the wheels of a motor vehicle".

1970:

ABS 1 models perform all required functions; but reliability of the control unit is not yet adequate.

1978:

First fitting of ABS 2 as option at Mercedes-Benz and shortly thereafter at BMW.

1981:

100,000th ABS supplied; ABS now also in commercial vehicles.

1985:

Bosch ABS fitted for the first time in U.S. vehicles.

1986:

One million Bosch ABS delivered.

1987:

Production of traction control system for passenger cars starts.

1989:

With the ABS 2E, the control unit is attached directly to the hydraulic unit.

1992:

10 million ABS from Bosch.

1993:

Start of production of ABS 5.0 from Bosch.

1995:

Production of Bosch ABS 5.3 starts (with attached micro-hybrid control unit); production start of the Electronic Stability Program.

1998:

Bosch begins volume production of ABS 5.7

1999:

50 million Bosch ABS.

2001:

Bosch ABS version 8 launched.

2003:

25 years of series production of Bosch ABS

Financials at a glance



	(Rs. M									Million)
******	2003	2002	2001	2000	1999	1998	1997	1996	1995	1994
Sales	18979	15507	14513	14927	13647	11932	12494	10647	8465	6556
Of which export sales	3256	2490	1928	1998	1779	1921	1906	1417	964	781
Profit before taxation	3836	2005	1290	1434	1698	1158	1405	1242	1158	839
Less : Provision for tax	1400	664	450	600	640	450	600	690	COO	470
on income	1480	004	4/3	622	640 1050	459	602	633	632	470
Profit after taxation	2350	1341	817	812	1058	699	803	609	526	369
Add : Other adjustments (Net of tax)	-	-	-	309	-	-	-		-	-
Profit before appropriation	2350	1341	817	1121	1058	699	803	609	526	369
Appropriations :					• .					
Debenture redemption	· -	-	7.5	-		-	-,			• 10
reserve										
Capital redemption reserve		20	20	20	-					-
Capital reserve	-	-	3	-	5	30	1	5	56	79
Interim dividend (%)	-	10 (3)	-	-	-	-	-	-	-	-
Dividend	208	128	99	106	99	84	99	91	84	76
(%)	(65)	(40)	(31)	(31)	(26)	(22)	(26)	(24)	(22)	(20)
Tax on dividend	27	-	10	11	11	8	10	9	1 -	•
Tax on dividend written back	-	-10	-	-	-	-	-	-	-	
Tax on dividend for 2002	16	-	-	-	-	-	-	-	·	-
General reserve	1700	900	685	984	943	577	693	504	386	204
Balance carried forward	399	293	-	-	-	-	-	-	-	, . -
Total	2350	1341	817	1121	1058	699	803	609	526	369
Paid - up Capital	321	321	341	361	381	381	381	381	381	381
Reserves	8833	6734	6001	4863	4673	3725	3119	2425	1916	1474
Net worth	9154	7055	6342	5224	5054	4106	3500	2806	2297	1855
Gross block	14392	14263	13699	13179	12046	10775	9650	7515	6039	4883
Net block	1927	2290	2463	· 2711	2926	2812	2852	2083	1653	1264 -
Additions to Gross block	680	940	1133	1327	1538	1373	2199	1542	1227	771
Earnings per share (EPS) (Rs.)	733	416*	240*	305*@	278	184	[.] 211	158	138	96

* Based on weighted average of the number of shares.

@ Adjusted EPS for change in inventory valuation : Rs. 178.

Previous years figures have been recast/regrouped wherever necessary.

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