S K Dynamics P. Ltd.

FY02-03 Annual Report
A quick glance in SKD history

S K Dynamics P. Ltd.
www.skdynamics.com

SK Dynamics P. Ltd.

R&D Unit since 1992

Commercial R&D Company Approved by DSIR, Ministry of Science & Technology India.

COMPANY PROFILE

SKD is extensively engaged in Research and Development activities including prototypes manufacturing. In essence, SKD develops Technology and transfers the same. It is equipped with most modern facilities and powered by team of over 60 members including Software developers, CAD Professionals, Design engineers, Marketing Professionals and other technical/ non technical staff, to achieve all round excellence in quality of work with constant development. The core strength of the company is quality and commitment in the development of new technologies to ensure state of art products. It enjoys the reputation of a dependable technology driven company maintaining leading edge technology for its products.

SKD has immense potential for R&D in Motors and Motor controls, Digital Signal Processing & Processors, Image processing, Embedded software, Microprocessor and Micro-controllers, Power Electronics, Electromechanical Engineering, FPGA, Analog and Digital Electronics, System Engineering, Operation Support, Prototype manufacturing capability & Product Engineering

SKD is strategic partner to Analog Devices, Inc. in the area of Motor Control since the past 10 years.

SKD has developed unique Motor Control Technology and supplied the same to ADI. Two US patents are to the credit of CEO/ SKD in the area of Motor Control, assignee being ADI.

Over Two million household appliances in USA, Japan, Europe and China are using SKD Motor Embedded Motor Control Solutions. These are products such as Washing Machines, Refrigerators, Air Conditioners, Electric Bikes manufactured by Frigdaire – USA, Sharp – Japan, Huening – China, Eltronic – Italy respectively. Very recently SKD has assisted in Design-Win at Invensys-Tecumseh, Brazil in midst of very tough competition.

In Fiscal Year 2001-2002, SKD was honored with 3 prestigious awards from the DSIR (National Award), Engineering Export Promotion Council and Electronic & Computer Software Export Promotion Council respectively for best/ praise worthy export of Technology and services in Motor Control.

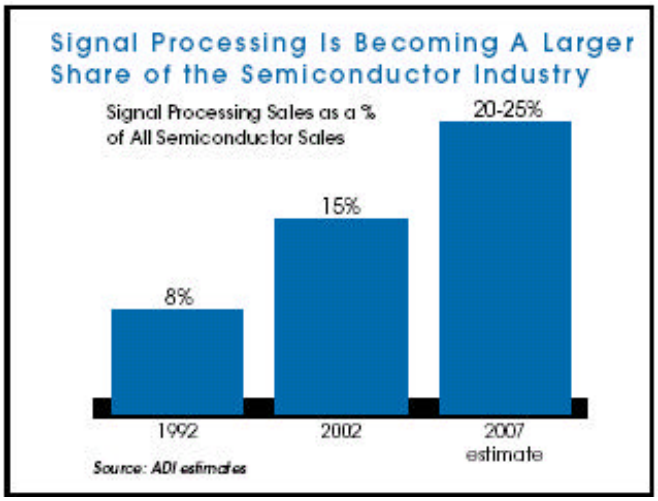
Besides Motor Control, CEO/ SKD has a past history of various developments in area of Instrumentation, Transducers and Vibration Testing. SKD has also contributed to Physics in terms of a prototype called ‘Gravity Motor’ which exhibited weight changes and two breakthrough experiments viz. Laser Deflection Experiment and Stone Impact Experiment.

SKD is slowly working on unmanned and single seater VTOL vehicle.

This document contains forward-looking statements that are based on current expectations, estimates and projections about the industries in which SKD operates, management’s belief and assumptions made by management. These statements are not guarantees of future performance and involves risk, uncertainties and assumptions.

LOOKING to the FUTURE

As we emerge from the severe downturn of 2001 and 2002, there has been a fundamental change in the outlook for semiconductor products going forward. Devices today are increasingly becoming intelligent and autonomous. Examples include washing machines, mobile phones, audio/ video systems, automobiles etc. the intelligence of these devices resides in what are called embedded systems. Embedded systems are combinations of hardware and software that are mounted on compact electronic circuit boards integrated into the device. SKD has been working on embedded systems from a past decade and look forward to enhance there capabilities in this field along with the other projects in hand. as it has been revealed that embedded software market offers a huge opportunity for Indian software vendors.



RESEARCH FOCUS: SKD LOOKS FORWARD to WORK on MULTIMEDIA, IMAGE & AUDIO PROCESSING

There exists a tremendous potential to enhance Multimedia, Audio and Image processing software/ Hardware. The development of very fast, inexpensive digital signal processors (DSPs) has made it possible to Implement video and image processing algorithms in software which allows our customers to adapt quickly to evolving standards and new functional requirements without hardware changes.

SKD is now focussing on the development of products like Network (Ethernet) camera, Embedded PC, Digital VCR and Machine vision. SKD is presently implementing them using the BLACKfin family as BLACKfin today is one of the high speed, high performance and lowest-power DSP in its class. It has been designed for speeds above 500 MHZ and is power optimized for portable applications. The BLACKfin core is just 2.5 mm squared but in this small space ADI has achieved 20 times the performance just a few years ago.

NEW PRODUCT PROGRAMS FOCUS in FY 03-04

1. To launch single phase, 200V AC Induction motors (ACIM) upto 375 watts and there drives which can be conveniently used for any motor.

2. Work on 2199 family vibration controller.

3. Work on Renewable Energy Technologies (RETs) and launch 500 watt power generator which can simply generate electricity from seawaves and river water flow, with much less environmental impact.

4. To launch 12V, 375 watts BLDC motors. As rapid technological innovations have spurred the demand for battery operated highly reliable and compact motors which are not available in India market.

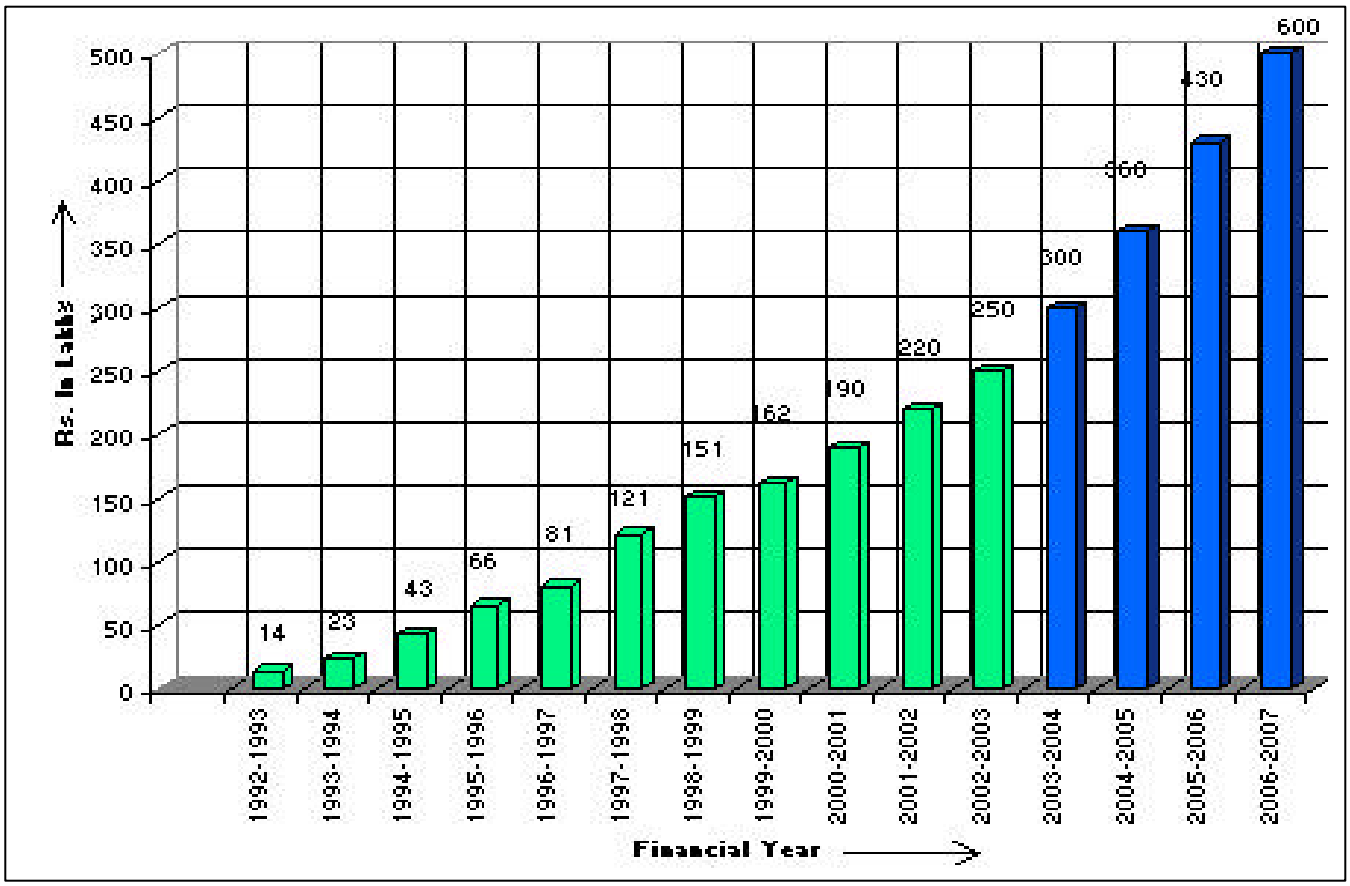
5. To carry through the R&D on the Electric three wheeler vehicle project

FINANCIAL DATA for the FY 2002-03

The total receipts during this year has been Rs. 25 Million (500K USD). The Share Capital is worth Rs. 4 Million (80K USD)

SK Dynamics P. Ltd.

TURNOVER CHART of the PAST TEN YEARS and FUTURE PROJECTIONS



SKD FINANCIAL GROWTH

SKD was established in 1992 and grew steadily as an organization. After being a partner in an Engineering firm for several years, CEO Rakesh Goel laid the foundation stone of SKD in 1992 with a pure motive of pursuing R&D and developing Technologies in the area of Electromechanical, Gravitation and Avionics supported by Digital Signal Processing and Power Electronics.

SKD started with few clients in a small way and developed instrumentation and transducers for them to become self-sufficient.

SKD and Analog Devices

Strategic Partnership for Technology Export

The strategic partnership with Analog Devices., Inc. was entered into 1994 in the area of Motor Control when ADI realized the potential of a Design House in SKD. Since then SKD has been catering to the technical needs of ADI clients world over in the area of Motor Control and complete System Engineering.

Technology supported for different Motors and Controls

- **Permanent Magnet Synchronous Motor (PMSM)**
- **Induction Motor (ACIM)**
- **Switched Reluctance Motor (SRM)**
- **Brushless DC Motor (BLDC)**
- **Geared PMS Motor**

(DSP Controllers, built on ADI's DSPs for all of the above motors)

SKD has been training engineers from abroad at their works in Roorkee from time to time and our engineer even visits ADI clients to train them at their site.

Quarterly Funding from ADI has been the main support for SKD and this has been increasing by a decent amount every year.

All ADI chips having SKD Embedded Control sold in the market calls for royalty to SKD over each part sold.

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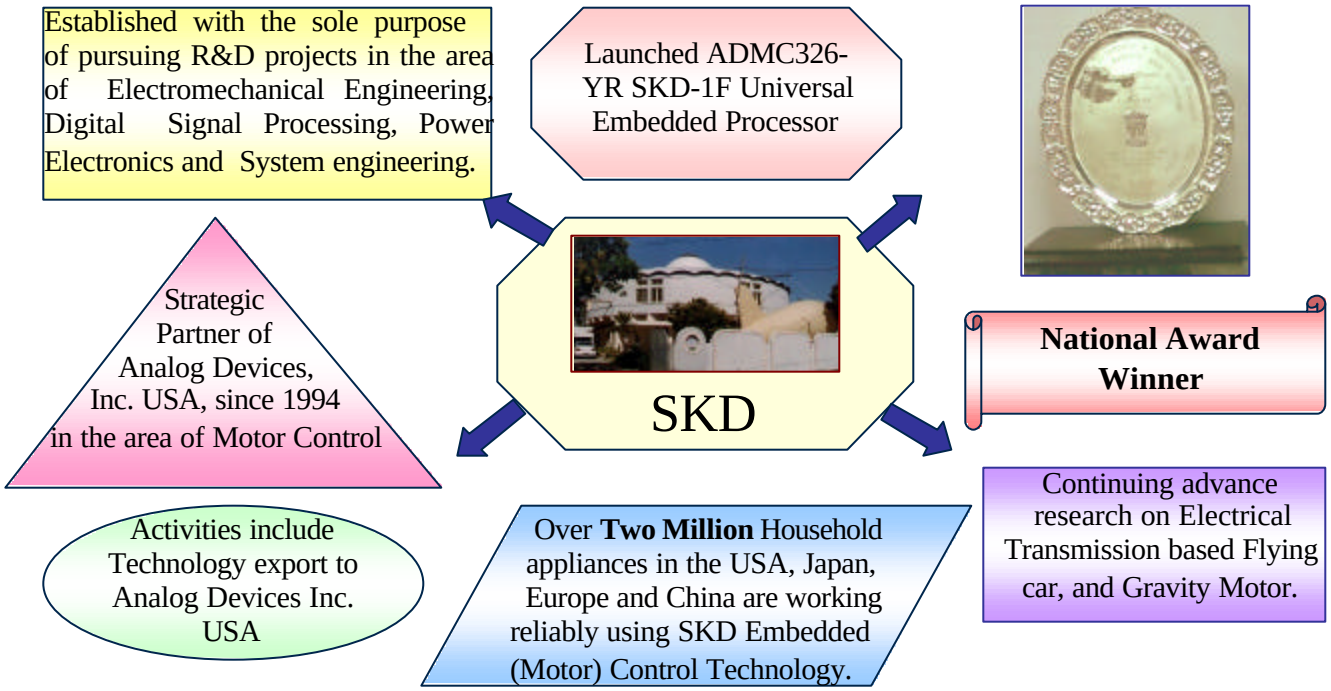
ABOUT SK DYNAMICS P. LTD.



SKD is a Commercial R&D company with capability to manufacture prototypes. SKD is strategic partner to Analog Devices, Inc. since past several years.

SKD excels in research, design and development of new technologies in the field of Electronics and Electromechanical Engineering with stress on multiple-disciplines. In the past, SKD has provided technological solutions on various motor controls, vibration control systems, DSP applications to Private Industries, Government of India and Indian Military. SKD is competent to modify and upgrade existing products/ processes with that which is state-of-the-art.

Core Competence

SKD has core competence in Digital Signal Processing, Electromechanical Engineering, Embedded (& Motor) Control, Digital & Analog & Power Electronics, FPGA, System Engineering and Product Engineering

Infrastructure

SKD is a small-scale industry having its registered office and works at B5 & B6, Industrial Estate, Roorkee, 247667.

SKD is spread over an area 35,000 sq. ft. of which built up is 20,000 sq. feet covered area (distributed as 12,000 sq. ft in Ground floor and 8000 sq. ft in first floor).The Plant & Machinery is worth Rs. 6.5 Million and the Land & Building is worth Rs. 3.5 Million.

SKD has well defined divisions viz. Design, Assembly, Prototype Manufacturing, Electronics, Mechanical, Testing, Accounts, Stores & Purchase and Marketing. A Fundamental Research Lab has been dedicated for work on Gravity and experiments on unknown Physics. The Stores & Purchase are actively engaged in import of Processors, Power Devices and Magnets, which are continuously required in the area of Motors and Control.

Employees

Possessing 28 years of rich Industrial Research experience CEO and MD Rakesh Goel, B.E. (Electronics and Communication) effectively leads a team of over 60 employees including 14 Engineers/ Junior Engineers.

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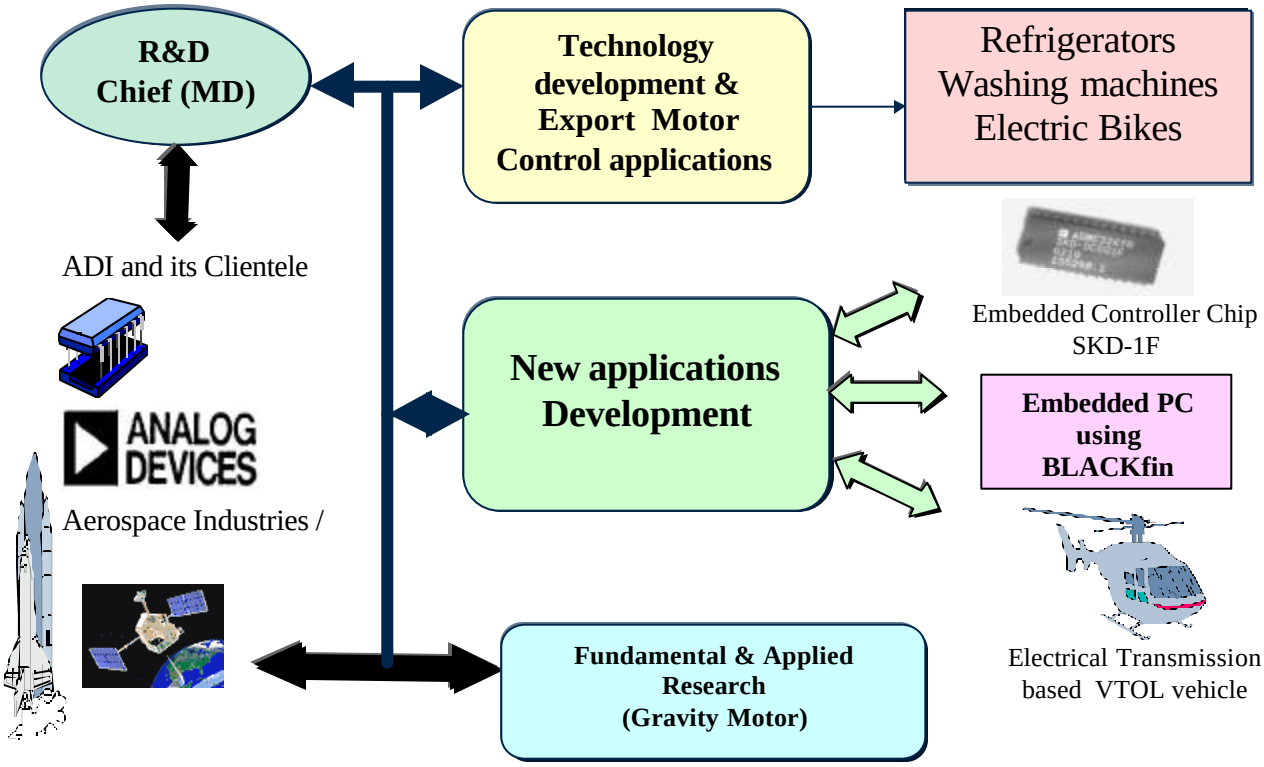
SPECTRUM of R&D ACTIVITIES



PATENTS :

1. Control System for PMSM US Patent 5,635,810 [Granted]
2. Improved Gate Driver Circuit and Hysteresis Circuit Therefor US Patent 5,675,276 [Granted]
3. Geared Permanent Magnet Synchronous Motor (India, Application No. 1884/cal/96) [Pending]
4. Electronic Compass (India, Application No. 1011/cal/98) [Pending]
5. Gravity Motor (August 3, 2000) [Pending]
6. Electrical Transmission based Flying Car (October 19, 2000) [Pending]

REGISTRATIONS:

SKD is registered with

1. Department of Scientific and Industrial Research, Ministry of Science and Technology
2. Confederation of Indian Industry
3. Electronics and Computer Software Export Promotion Council
4. Engineering Export Promotion Council
5. National Small Scale Industries Corporation

SK Dynamics P. Ltd.

AWARDS and ACKNOWLEDGEMENTS

From ESC

From NSIC

From DSIR

From ADI

From EEPC

ACHIEVEMENTS OF SKD IN FY 2002 – 03

1. ADMC326 and 341 based 2-Phase ACIM VSD (With Vector Control) for Invensys & Tecumseh- Brazil.
2. Inverter Technology:

   12V,560W Push Pull Clipped Sine Wave Inverter

   12V,560W Full Bridge Sine Wave Inverter

   24V,750W Full Bridge Sine Wave Inverter
3. 3-Phase, 0.5Hp VSD for ACIM

   3-Phase, 0.5Hp VSD for PMSM

   2-Phase, 180W VSD for ACIM
4. Refinement of experiments on Magnetism [(I) Stone Impact and (II) Laser Deflection] achieved, sustaining improved results.
5. Class-D type Public Addressing Audio Amplifier
6. ADSP-21990 based Class-D Amplifier
7. Developed 12V, 1/4 HP, BLDC Motors
8. Implemented motors for Flying car Prototype P5 and Prototype P6, developing single seater and unmanned Flying Car

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PRODUCTS OF SKD

1992: DSP based Random Vibration Controller

1993: Microphone Testing Equipment

1994: ADSP 2100 based Motor Control

1995:
1. DSP plus FPGA based Sensorless PMSM Control
2. Contribution in world's first Motor Control Processor Design (ADMC315)

1997:
1. Gun Control for 155 mm Field Howitzer Gun
2. Electric Bicycle
3. Switched Reluctance Motor Control12V, 90W, 61 mm Dia PMSM with Control 12V, 30W, 38 mm Dia PMSM with Control
4. Stable Platform and Electronic Compass

1998:
1. ACIM Slip Compensation control for washing machine
2. ACIM vector control

1999: Completion of Washing Machine Control

2000:
1. Air Conditioner Control (Indoor: PMSM Sensorless Control; Outdoor: vector Control)
2. Gravity Motor Breakthrough (first weight change experienced)

2001:
1. Motor and Control for Avionics Application (High Performance and Light Weight motors for Electrical Transmission based VTOL vehicle)
2. 62 X 390 mm Compact Electronic Submersible Pump (3 inches)
3. Permanent Magnet Synchronous Motors (PMSM) and its VSD : Sensorless and Single Sensor Control
4. AC Induction Motor : Single Sensor Control
5. Brushless DC Motor : Three sensors control
6. Stepper Motor Control
7. 12V, 15W, 28 mm Dia PMSM with Control
8. Chopper Drive
9. Geared PMS Motor

ONGOING PROJECTS at SKD

1. Work on High Speed DSP BLACKfin family for signal processing applications viz. Network (Ethernet) Camera, Digital VCR, Machine vision, Embedded PC etc. (ongoing)
2. Development of Gravity Motor for space application. (still working from our own resources at slow pace)
3. Development of unmanned and single seater Flying Car. (still working from our own resources at slow pace)
4. Developing High Performance BLDC Motors for Electric and Hybrid vehicles, Aerospace and Machine Tool industry.
5. Developing solution in ACIM controls in refrigerator compressors for Invensys & Tecumseh - Brazil.
6. Continuing support to Domestic market applications such as Sine Wave Inverter, PA Amplifier, 2 and 3 phase VSD's, and Audio Visual.

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Achievements

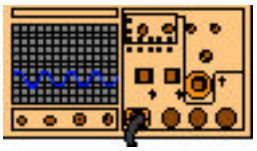
The ADMC326-YR-SKD-1F is a unique innovative IC giving multiple solutions to the user. It is a very versatile processor with built-in Embedded Drivers for Motor Control/ Non-Motor/ UPS/ Inverter applications.

Salient Features:

- Embedded Control Technology
- Easy Instruction set yet very powerful
- Multifunction Instructions
- ADSP 2171 code compatible
- Write Memory available for user
- Sufficient PM and DM for user initialization
- ADMC326 as core

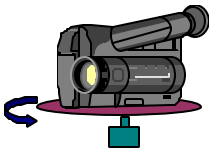
SKD-1F can cater to Motors of types:

- PMS type, Single Sensor
- PMS type, Sensorless
- Brushless DC Motor, 3 sensors
- AC Induction, Tacho
- AC Induction, Tacholess
- Switched reluctance
- Stepper



Digital Scope

Refrigerators, Washing machines & House appliances

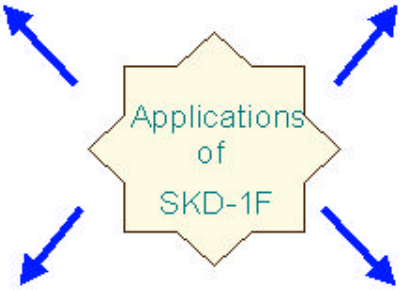


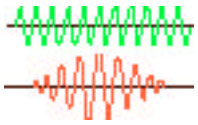
Rotary Table

Motorized Door

Car AC Fan

Robotics

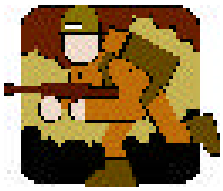




Power Analyzer

AudioVisual

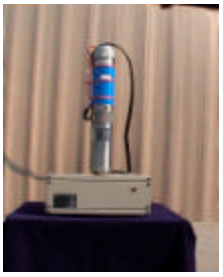
Audio Amplifier



Motors for MIL applications

Domestic & other Fans

Products Launched by SKD in Domestic Market (Based on SKD-1F)



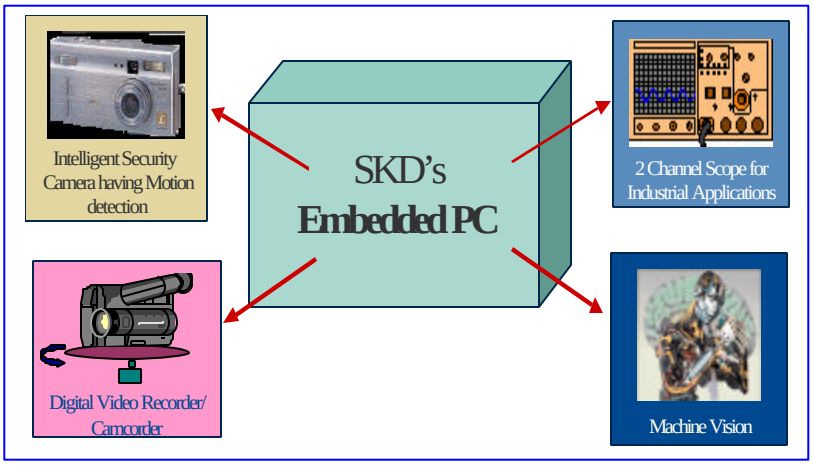
3" Compact Electronic Submersible Pump

High Electrical Frequency (375Hz) PMSM Technology, Low starting current

UPS / Inverter

SK Dynamics P. Ltd.

Products on BLACKfin family

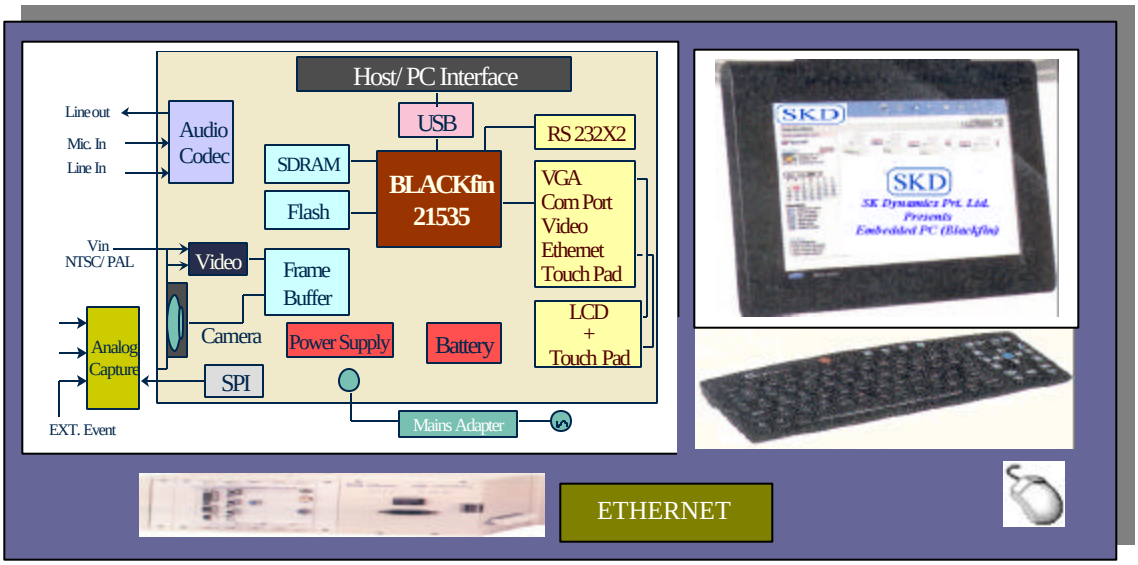


Applications

- Scope with 2 Channels and 10 M samples/ sec speed
- Digital Camcorder because of the built-in lens
- Intelligent EYE for Security systems having LAN connectivity.
- Digital recorder of composite video (TV programs etc.)

SKD is presently engaged in developing Embedded Personal Computer (EPC) using ADI's BLACKfin Processor, which is an extremely powerful Processor finding applications requiring high speed and high memory. 4 GB of memory is viewed as a single unified address space having 300 MHz high performance, great advantage to hold much Embedded code. The EPC has an edge over the conventional PC and is an excellent platform for very fast selling applications.

System Configuration of the Embedded PC (BLACKfin)



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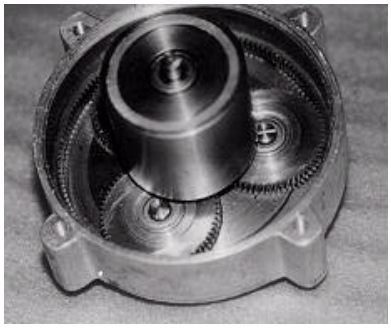
Motors and Controls



Geared PMS Motor

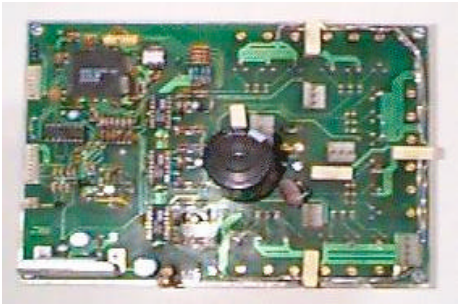
Motors with Electronic Drives

General Range of Motors

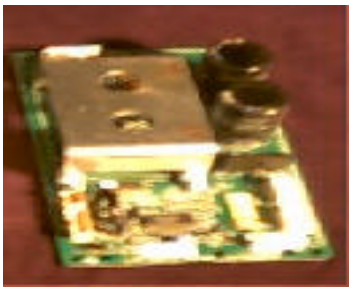
1. Capacity: 2 W to 9 HP
2. No. of Poles: 2 to 100
3. No. of Phases: 2, 3, 4
4. Type: DC / ACIM / PMSM / BLDC / Stepper
5. Configuration: Outer Stator / Outer Rotor / HUB /Inertia
6. Weight to Power Ratio: up to 1 Kg/ HP
7. Type of Gearbox: Internal / External /None

General Range of Controllers

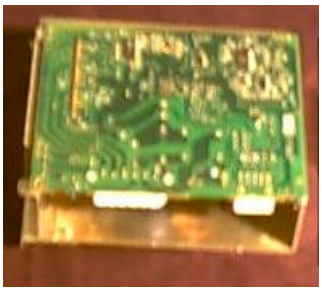
1. Control Dynamics: Two Quadrant / Four Quadrant
2. Breaking: Regenerative / Dissipative
3. Electrical Frequency: up to 1000 Hz
4. Interface: Analog, Digital (TTL), & Communication
5. Control Parameters: Velocity, Acceleration,& Position
6. Control Technique: Sensorless / 1 or 3 Sensor(s)
7. Multi-Drive Control: 1 to 62 Drives from 1 Master
8. Power Source: 6V to 350V DC, 110V / 220V AC



Variable Speed Drive



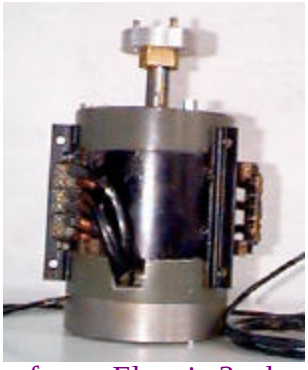
Compressor control Drive



Washing Machine
Motor control Drive

Motor which replaces the engine on a 3 wheeler

Electric 3 Wheeler



Motor for an Electric 3 wheeler

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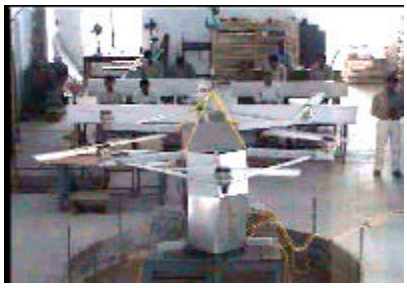
Electrical Transmission Based Flying Car
(VTOL Vehicle)

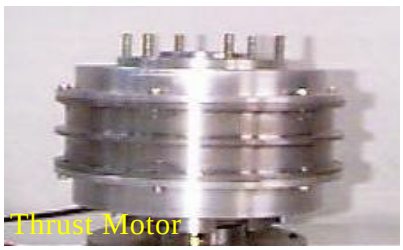

Flying Car Workshop

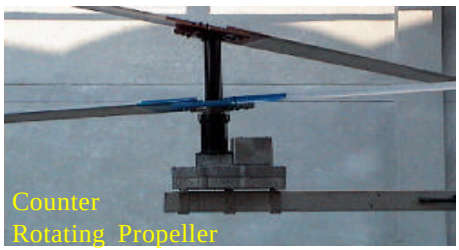

Flying Car Workshop

Flying Car Prototypes




Propeller Under Test


Thrust Motor


Counter Rotating Propeller

Looking for Business partner and slowly working from own resources

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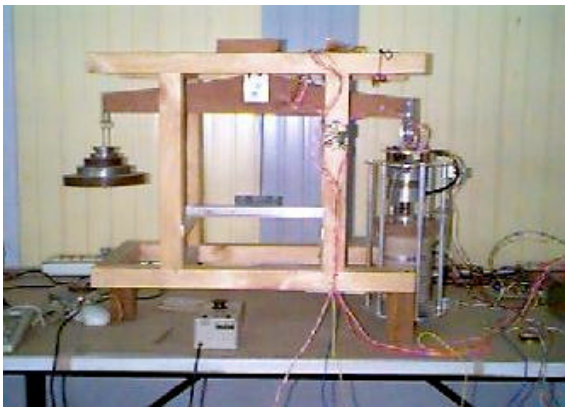
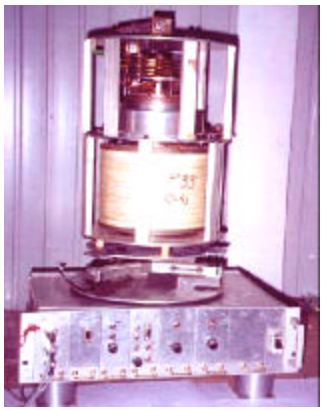
Fundamental Research on Generation of Gravitational Force

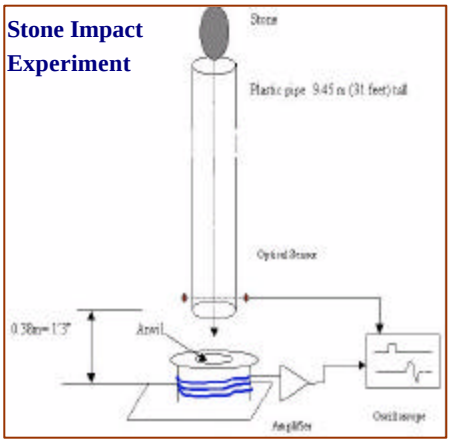




Gravity Motor (right) (on Test Stand, left) : 3 prototypes exhibited
weight change maximum of 14 grams

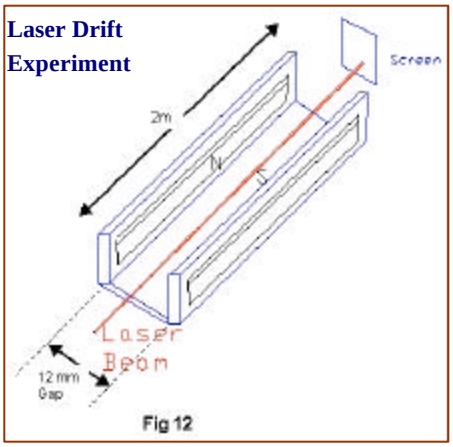
Breakthrough Experiments in the field of Gravity, Magnetism and Inertia

Stone Impact Experiment



'The Stone Impact Experiment' Validates that there is a link between Magnetism and Inertia.

Laser Drift Experiment



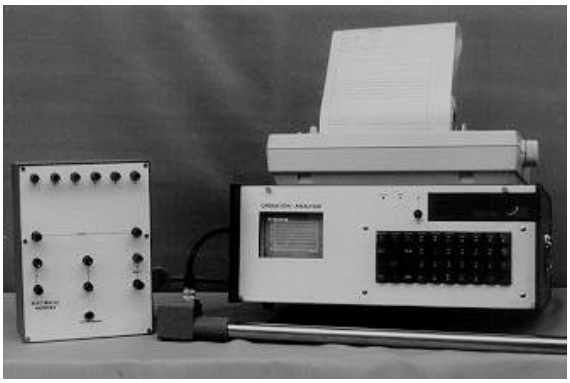
'The Laser Deflection Experiment' Validates that Magnetism is flow of ether or M4.

Past Products

Piezoelectric Accelerometers

Handheld Data Logging Unit

Optical Encoders



Operation Analyzers to test circuit breakers

Data Display Unit for 155 mm Field Howitzer Gun

Vibration Test System

SK Dynamics P. Ltd.

CEO & MD, SKD:

Name: Rakesh Goel

Qualification: Bachelor of Engineering in Electronics & Communication [Gold Medallist] from University of Roorkee, Roorkee, India in 1977

Specialization: Digital Signal Processing, Microprocessors, Power Electronics Mechanical Vibrations, Gravitation and Magnetism

Past Position and Work Profile: Rakesh Goel worked as a Technical Director and Partner in an engineering firm from 1978 to 1992 and developed many Test Equipment and Control Systems. He had a special knack for Electromechanical Engineering supported with Control Hardware and Software and a desire to probe into the Gravitation area even before his engineering.

Present assignment: He established his own company SK Dynamics P. Ltd., a full fledged R&D Organization in 1992 and gave unique motor control solutions to Analog Devices Inc. USA which is still continued. Rakesh Goel is also involved in delivering a prototype of Gravitational Force Generator, which exhibits a weight change.

Paper & Thesis Published:
(i) Flexible Speech/ Audio Coding published in Signal Processing & Communication January 18-20, 1993 Indian Institute of Science, Bangalore, India.
(ii) Generation of Gravitational Force (ICGA-5). Published in proceedings.
(iii) A Method to Calculate the Value of Pi

Membership: (i) Member IEEE
(ii) Society of EMC Engineers
(iii) American Physical Society

Technical Training imparted in: USA, Italy, Japan, China, Brazil and India

Fundamental Research Work and Contribution to Physics: (i) Origin of Gravitation (ii) Origin of Magnetism (iii) Gravity Motor (Generation of Gravitational Force) (iv) Laser Deflection Experiment (v) Stone Impact Experiment (vi) Reconducting Michelson-Morley Experiment in a new way.

DEVELOPMENTS DONE in the PAST by the CEO, SKD

1974: Vibration Meter (1st Commercial Product)

1976:
1. Universal Amplifier
2. Galvanometric Recorder
3. Variable Reluctance Accelerometer
4. Velocity Pickup

1977: Potentiometric Recorder

1979:
1. SCR based variable speed drive for 3 HP DC Motor
2. Galvanometric Rectilinear Recorder

1980:
1. 8080 Learning Kit including monitor
2. Four Channel Master/ Slave recorder for electrologging
3. 40 KgF ED Shaker System for Vibration Testing
4. Seismograph

1982: 300 KgF ED Shaker System

1983: 8085 based Wave Propagation Meter with readout

1984:
1. Vibrosinker for Pile Sinking
2. Strain Gauge based Transducer for Pressure and Load Cell
3. Z80 based Sine Vibration Controller for Vibration Tests

1985:
1. 700 KgF ED Shaker System
2. Eight Channel recorder for Satellite Tracking

1986:
1. Vibrating Wire pore pressure transducer with Z80 based readout
2. Digital multi-channel recorder for Electrologging

1987:
1. Z80 based Ultrasonic Concrete Tester with CRT display
2. Piezoelectric Accelerometers
3. 500 mm radius Centrifuge machine

1988:
1. PC based Operation Analyzer to test circuit breakers
2. Linear Optical Encoders
3. PC based Data Logger for Soil Dynamic Testing
4. Bump Test Machine

1989:
1. 2000 KgF ED Shaker System
2. 12 KVA Amplifier to drive the Shaker

1990:
1. DSP based Sine Vibration Controller
2. 4.5 m radius Centrifuge Machine

1991:
1. Transmission Line Damper Testing Machine with Software
2. DSP based Shock Controller

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