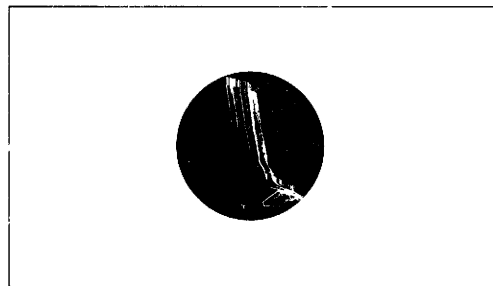


**EC - JAPAN CONSUMER ELECTRONICS  
PARTS & COMPONENTS PROGRAMME**

***PRINTED CIRCUIT BOARD PROJECT***

***MISSION REPORT***

***4th-19th JUNE 1993***



**A PILOT PROGRAMME TO DEVELOP COMPETITIVE SUBCONTRACTING  
FOR THE CONSUMER ELECTRONICS INDUSTRY**

**MANAGED BY  
INTERNATIONAL CO-OPERATION EUROPE LIMITED  
TREVES CENTRE  
45, RUE DE TREVES  
1040 BRUSSELS  
BELGIUM**

## **ACKNOWLEDGEMENT**

- *International Co-operation Europe Limited wishes to acknowledge the support of the Japanese Ministry of International Trade and Industry and of the European Commission, DG III and DG XXIII.*
  
- *This report was compiled by Mr. Brian Haken, Executive Director of the Printed Circuit Interconnection Federation, U.K., EECA - PCB representative and advisor to the supplier delegation.*
  
- *This Programme is managed by International Co-operation Europe Limited Trèves Centre, 45 Rue de Trèves, 1040 Brussels, Belgium on behalf of the European Association of Consumer Electronics Manufacturers and the Electronic Industries Association of Japan.*

# CONTENTS

	<i>PAGE N°</i>
<b>I. SUMMARY OF CONCLUSIONS</b>	<b>4</b>
<b>II. PCB PROJECT - OBJECTIVES &amp; METHODOLOGY</b>	<b>5</b>
<b>III. SCOPE OF THE MISSION AND ITEMS OF SPECIFIC INTEREST</b>	<b>6</b>
<b>IV. MISSION REPORT</b>	<b>9</b>
<b>(a) JPCA Symposium</b>	<b>9</b>
<b>(b) JPCA Exhibition</b>	<b>10</b>
<b>(c) Summary of EC - Japan Similarities and Differences</b>	<b>11</b>
<b>(d) EC - Japan Similarities</b>	<b>12</b>
<b>(e) EC - Japan Differences</b>	<b>13</b>
<b>(f) The true cost of ownership to User OEM's</b>	<b>18</b>
<b>V. SPEECHES PRESENTED BY THE EUROPEAN DELEGATION AT THE CONCLUSION OF THE MISSION - 17 JUNE, 1993</b>	<b>19</b>
<b>VI. MISSION DE-BRIEFING</b>	<b>51</b>
<b>VII. JAPANESE COMPANIES VISITED</b>	<b>52</b>
<b>VIII. MISSION PARTICIPANTS</b>	<b>53</b>
<b>IX. PRESS RELEASE BY THE EC COMMISSION</b>	<b>56</b>
<b>X. VISIT OF JAPANESE EXPERTS TO EUROPE</b>	<b>57</b>
<b>XI. PHOTOGRAPHS</b>	<b>58</b>

## I. SUMMARY OF CONCLUSIONS

The EC Printed Circuit Board mission delegates are of the opinion that the two week visit to Japan was a great success. Understanding the differences in culture and the way Japanese companies, financial institutions and government support operates, have given us an insight into the reasons for Japan's industrial success.

The visit reinforced the fact that countries can learn from each other, but what Europe should not do is try to copy all that is Japanese, this is neither desirable nor possible, our cultures are too far apart to be successful.

Europe's PCB industry has changed dramatically over the past 5 years. It can now offer a competitive quality service to its customers, but, as stated earlier we must learn from other countries like Japan when given the opportunity.

Our aim should be to adopt and modify Japanese ideas and concepts that could be beneficial to Europe, for example, the uncompromising investment in quality relevant processes and programmes, taking into account the relationships between Employer/Employee and Customer/Supplier.

The European PCB delegates agreed that they would welcome the opportunity to spend a period of say six months, working in a Japanese circuit factory to study first hand the attitudes and driving forces in the context of the management of a totally committed work force and determine to what extent a European workforce with its significantly different culture and mentality, might be encouraged along similar lines.

Process capability must be very high, all potential areas for improvement must be continually under scrutiny.

We are not just operating in a European market, it is global, where only companies that can compete with the best in the world will have a secure future.

The overall message from the mission is that:

**PRODUCT RELIABILITY AND PRICE ARE THE KEY SUCCESS FACTORS.**

## II. PCB PROJECT - OBJECTIVES & METHODOLOGY

### (a) PROJECT OBJECTIVES

To improve the competitiveness of the European Single Sided PCB Industry, especially small and medium sized enterprises - suppliers to the European Consumer Electronics Industry.

This pilot project was at the request of the European based consumer OEM's, i.e. producers of TV's and similar technology products. Their concern is based on the difficulty experienced in purchasing single-sided, paper based PCBs, in terms of PRICE and QUALITY, within Europe.

### (b) PROJECT METHODOLOGY

To enable this problem to be investigated and resolved it was agreed that the PCB project would comprise of the following elements:

- Identification of industry strengths and weaknesses
- Identification of priority areas for improvement
- Initial audit of participants
- Mission to Japan
- Visit of Japanese experts to PCB suppliers in Europe
- Joint user/supplier seminar
- Follow-up audit to determine results

Comparisons would be drawn between European and Japanese PCB manufacturers. Similarities and differences in manufacturing technologies, customer/supplier and employer/employee relationships, quality issues etc. would be ascertained and evaluated.

In order to evaluate the success or otherwise of the project, it was agreed that participating European PCB manufacturers would be audited before the mission and audited again one year after the mission. Upon completion of the project, conclusions could then be drawn as to the ability of European PCB manufacturers to compete with Japanese suppliers.

### III. SCOPE OF THE MISSION AND ITEMS OF SPECIFIC INTEREST

#### (a) SCOPE OF THE MISSION

Following discussions between the Electronic Industries Association of Japan, the European Association of Consumer Electronics Manufacturers and the European PCB manufacturers, it was agreed that the mission to Japan (i.e. company visits) should concentrate on the following types of companies:

- **First Priority**
  - PCB manufacturers producing volume consumer
    - (a) Single-sided PCBs
    - (b) Double-sided non pth PCBs
  - Laminate Suppliers
  - Manufacturers of Punch Tools, Precision Machinery, Measurement Equipment
  
- **Second Priority**
  - PCB manufacturers producing volume consumer
    - (a) Double-sided and Multilayer PCBs
    - (b) Flexible and flexirigid PCBs
  - Original Equipment Manufacturers (PCBs user companies):
  - Companies producing consumer electronics (e.g. TV, Video, Camcorders, Personal Communicators, etc.).

#### (b) ITEMS OF SPECIFIC INTEREST

European PCB manufacturers identified the following items to focus on during the visit to Japan. These are listed under two separate headings:

1. SPECIFIC (to the immediate problem i.e. single sided printed circuit boards)
2. GENERAL (items of common interest)

## Specific

\* SCREEN PRINTING:

Design, manufacture and use of screen stencils for fine line definition PCBs.

\* PUNCH TOOLS:

Design, construction, materials, power press control, hit rates, hole clearance procedures, expected life of tools and refurbishment.

\* PRODUCTION TECHNIQUES:

Production - control, testing, yields

\* LAMINATE:

Specification of laminate, control of wastage, disposal of scrap. The raw PCB laminate is a major cost element in the production of PCBs. What materials are available or in the process of development?

## General

\* CONSUMER INDUSTRY FUTURE REQUIREMENTS:

To gain an understanding of the future needs of OEMs, in terms of design requirements including materials finishes and assembly techniques.

\* DESIGNING FOR LOW COST PRODUCTS I.E. fit for the purpose:

The relationship between the OEM and the PCB manufacturer. Influencing the design with respect to material selection and designing for manufacture.

\* PRODUCTION APPROVALS:

Manufacture: approved to customer, world specification, or both.

\* QUALITY:

Method of controlling quality towards achieving zero defects.

\* STATE OF THE ART EQUIPMENT:

To process PCBs during manufacture e.g. engineering, production and test.

\* TIME OF MARKET IMPROVEMENTS:

Time for sample production, general lead times and "Peak Demand" management.

\* **MASS PRODUCTION VERSUS FLEXIBILITY:**

Order cancellation or variation in terms of delivery schedules before and after commencement of production.

\* **CUSTOMER ORDER COMMITMENT:**

Material resource planning, fixed schedule period.

\* **PAYMENT TERMS:**

The time taken from receipt of goods to invoice payment. Payment of production tools in advance of goods delivered. The average time taken to pay invoices from receipt of goods by both the customer and supplier.

\* **ENVIRONMENTAL CONTROLS:**

Government legislation on the use of CFC's and other listed chemicals. Recycling: laminate, finished PCBs, assembled PCBs, packing material. The true cost of environmental legislation.

\* **CUSTOMER/SUPPLIER PARTNERSHIPS:**

Joint sharing of risks and rewards, involvement through design, process development and project schedules.

\* **MANAGEMENT/EMPLOYEE INVOLVEMENT:**

Through participation in company decision making e.g. Quality programs and on-going improvements.

\* **TRAINING:**

Skills and education, technology, management and quality, based on continuous improvement.

\* **COMPANY AND OPERATIONAL ORGANISATION:**

Structure of hierarchical and functional management, quality organisation.

\* **INDUSTRY SUPPORT:**

Supportive association with universities, ministries, financial institutions and training bodies etc.



## IV. MISSION REPORT

It should be noted that the report and conclusions drawn are based on a brief two week visit to Japan. During which time we visited a total of 9 companies (see Section VII). Of these only 4 factories manufactured PCB's. These facts should be borne in mind when reading this report.

### (a) JPCA SYMPOSIUM

The symposium was entitled "INTERNATIONAL CO-OPERATION IN THE PRINTED CIRCUIT INDUSTRY" a very appropriate theme for our visit. International Co-operation is the only way forward for the PCB industry, which is the corner stone of world electronics and cannot be allowed to fail. However, it is very necessary that changes must take place if it is to succeed in becoming more **cost effective**, more **flexible** and more **international**.

The papers presented were of high calibre, with each speaker reinforcing the need for global collaboration.

Japan, Korea, and Hong Kong are under no illusion that it is becoming increasingly difficult to manufacture competitively, except for the highest technologies, and that in the future more manufacture will be progressively moved offshore, partly to reduce cost, but also to move closer to the customer.

Such is the level of automation in printed circuit production that a large proportion of the cost is purely in the equipment, but in the consumer electronics assembly industry this is not so, automation has not yet reached the point where the overall operation is no longer labour intensive. The assembly operation will still move to the low labour cost areas, accompanied by the printed circuit manufacturers.

Dr. Tadahioo Sekemoto, NEC, presenting the final feature speech highlighted, that as the electronics industry progresses into the 21st century the printed circuit board will still play a major role in world electronic products, but changes will be necessary. Superfine line technology will force the way we process printed circuit boards to change. The substrate i.e: the base laminate, will need to be much thinner, whilst retaining strength and flexibility. For changes of this magnitude a tremendous amount of investment in research and development must be made. Countries who do not follow this line will be left behind as we enter the year 2000.

**(b) JPCA EXHIBITION**

The European PCB mission to Japan was taken very seriously by the Japanese. Before the exhibition was opened our mission was welcomed to the show, and all were informed of the close collaboration that was taking place between Japan and the EC.

JETRO were on hand to film our delegation as it toured the exhibition. The show is predominately Japanese which might not be apparent to the outside world. This was clearly evident when asking for brochures and catalogues other than in the Japanese language. The JPCA show was very much on the theme of automation. Automation is the name of the game with every operation becoming de-skilled and people pushed further away from the work process. The recession seems to have taken it's toll on the show with fewer exhibitors than previous years.

**(c) EC/JAPAN SUMMARY OF SIMILARITIES AND DIFFERENCES**

**□ SIMILARITIES:**

Technology  
PCB Manufacturing Equipment  
PCB Processes  
Quality  
Environment

**□ DIFFERENCES:**

Investment  
Automation  
Scale of Operation  
Employee Commitment  
Dependency: Supplier to Consumer  
Quality Assurance  
Standardisation  
Long Term Relationships  
Total Production Maintenance (TPM)  
Research and Development  
Design Authority

**(d) EC/JAPAN SIMILARITIES**

**TECHNOLOGY, MANUFACTURING EQUIPMENT AND PROCESSES**

Europe's perception of Japanese technology being far in advance of our own, is untrue.

During our brief visit to a selection of leading Japanese companies we did not find any significant differences.

Manufacturing in Japan is carried out using very similar, and in some cases, the same machines, process and materials.

The trends are very similar, however the more advanced technologies are already introduced to a much higher degree than in Europe, for example in the PCB companies visited:-

- We saw a high degree of fine line technology used in production. As many as 50% of PCBs were produced with track widths and spacing of 150microns. Tracks widths of <150 microns present a technology edge which is not fully under control both in Europe and Japan.
- The use of silver paste for through-hole plating on double-sided PCB's. To date only a few manufacturers are able to control this method of production.
- Photo-optical processes with liquid resists for finer structures (roller coating or ED method). This process is used to protect holes with minimal radical copper during etching, which have been panel plated. An electrophoretic method is used to apply solder resists (ED method by ITABASHI).

This process has been tried and evaluated in Europe, but to date licences have not been granted, and in addition the special machines designed for this purpose are not available in Europe.

- In Japan Cu-passivation (preflux) has replaced hot AIR SOLDER LEVELLING to protect solder joint surfaces. Unlike Europe, Japanese companies use this method for double sided surface mount technology PCB's with several solder processes (without halogenated flux agents).

**QUALITY**

- The quality of PCB's supplied to the customer in Japan is exactly the same as in Europe. At one time a small percentage of rejects was acceptable by the customer, this is no longer true, today the name of the game is ZERO DEFECTS.

A major factor in achieving zero defects to the customer is the companies own internal reject rate. If this is not under control the effect on manufacturing costs can be catastrophic, resulting in:- NOT BEING COMPETITIVE and or NOT BEING PROFITABLE, both represent disaster.

It was noted that the Japanese companies employ a high labour count to carry out final inspection to ensure rejects are not passed onto the customer.

As one of our industrialists clearly stated, "In reality we should substitute the word TECHNOLOGY for INVESTMENT as this is the true technology difference."

## ENVIRONMENT

For many years, the environment has been abused. World political pressure is being placed on all eastern countries to acknowledge the importance of the environment. The EC has taken a very strong attitude by legislating for the protection of our environment. This legislation costs European PCB manufacturers as much as 8 % of annual sales turnover and is rising year by year. In the companies visited we saw very firm control of environmental issues backed up by strict regulations, with effective effluent treatment facilities and CFC and chlorinated hydrocarbon eliminating programmes in place. Granted we only saw the high end of the industry; but we presume that the rest of the industry is regulated to the same high standards.

## (c) EC/JAPAN DIFFERENCES

### INVESTMENT:

All of the factories visited highlighted the amount of emphasis placed on automation, which clearly reduces the number of employees whilst improving quality. This can only be achieved by considerable investment. The Japanese companies appear to borrow money at preferential interest rates over a long period, whereas European companies borrow at rates 3-4% above basic bank lending rate over a very short period. This allows Japanese companies to apply long term business planning, which is a proven strategy for growth and prosperity.

### AUTOMATION:

All Japanese companies visited displayed a high level of automation far more than European companies. This is partly due to the high volume orders available from their customers which in turn allows for automation. As discussed under investment, automation is perceived by all the industrialised world as an essential element in reducing labour costs, improving production yields and increasing profits.

CMK have taken this attitude to an extreme degree by fully automating their entire production facility. During our tour it was very difficult to spot production workers. There was one exception however, FINAL INSPECTION which is carried out visually by factory inspectors on 100% of PCB's produced, the reason being to guarantee zero defects to the customer. This applied to all PCB companies visited.

Aside from the near total automation, the two remarkable features of Japanese production lines are precision and repeatability of PIN-LESS optical registration systems, and the extent to which SILK SCREEN printing has been optimised to enable the high yield mass production of fine-line (150 micron) print and etch circuits. And the technical details of the screen preparation were one of the areas jealously guarded and not open to discussion.

## SCALE OF OPERATION:

This was seen by the European industrialists as one of the major differences affecting the European companies' competitiveness. The largest manufacturer in Japan is 5 to 6 times larger in size than the largest PCB company in Europe. The average Japanese company is much larger than the average European company. Japan appears to have taken the path of restructuring its PCB industry, already this has resulted in reducing the number of companies, thereby addressing the scale of operation.

It allows companies to concentrate on high volume orders, thus reducing set-up times and improving production yields.

Restructuring is taking place in Europe. The problem is, it is not planned. It is by default as companies have fallen prey to the longest recession in recent history.

The main thrust of EECA-PCB will be to make the EC Commission and Parliament aware of Europe's PCB industry and the role it plays in the success of Europe's overall electronics industry, highlighting, such items as, the scale of operation and making suggestions as to how the problem can be addressed.

## EMPLOYEE COMMITMENT:

Human resource management is greatly affected by the culture of each country. As a result of Japan's history and tradition, the integration of the entire work force is far more intensive. This has led to very definable differences in corporate structures when compared with Europe:-

- Indirect labour, i.e: management, has been thinned down resulting in more focused lean management teams.  
NB: This practice has now begun in some companies in Europe.
- Team work is actively encouraged by top management in all aspects of manufacture. All departments from quotation costing to final inspection are encouraged to understand each others needs and problems. This results in a higher degree of commitment among employees.
- Training programmes are frequent, and constantly updated, resulting in higher standards and professional skills. We noted that each shop floor worker was capable of handling at least 3 separate work stations.
- It is common practice for Japanese employees to stay in the same company for their entire working life, thereby identifying themselves with the company and its products.
- Flexible shift systems , i.e. 7 working days: 5 days with 40 hours per week plus 2 days off.  
NB: weekends are not considered.

- Two shift operation with 3 hours off between shifts allows either shift to carry out essential maintenance and cover capacity peaks. The company employees working additional hours appears to be a matter of course in Japan.
- Absenteeism due to sickness etc. is about 2% which is considerably lower than in Europe.

#### DEPENDENCY: SUPPLIER TO CUSTOMER

It was very evident that the Japanese electronics industry and MITI identify the PCB as a component of STRATEGIC IMPORTANCE to the future success of Japan. Very close links exist between customer and supplier, this was clearly demonstrated during our factory visits. On each occasion we were accompanied by the suppliers main customer. In Japan it appears to be the norm for customers to concentrate their PCB demands on one or two suppliers. Very often , a specific part number will be purchased from just one supplier. This very close relationship allows both risks and rewards to be shared. To minimise the risks the customer often holds a share in the companies with whom they have substantial business. The opposite tends to apply in Europe, where it is perceived that a large dependency is undesired. There is no doubt that spreading the risks benefits both supplier and customer.

#### QUALITY ASSURANCE

Staff motivation in all plants visited was very high, the emphasis on teamwork was very apparent particularly with respect to improving processes. The main thrust of quality improvement has over the years been attacked by teams of production workers looking at opportunities in their area to improve either the process, the method, the maintenance, the cleanliness, etc, in order to reach a zero defect level of their product to the customer.

This very high level of reliability of the process has raised the level of capability of each stage so that the quality reliability of the product falls well within the limits of the process. This self-generates a delivered quality standard of high reliability. Europe however has utilised quality operating systems, eg. ISO 9000, to create the operating instruction and procedures which providing you work accordingly, then the quality should be good. We saw that the companies we visited in Japan were now undertaking quality operating systems which in conjunction with their normal cultural approach to improvement should complement very well.

Many European companies have already consolidated Q.A. Systems and now need to introduce these 'nut and bolt' improvement processes at shop floor level. Along with shop floor accountability the Europeans will need to adopt some of the other values such as pride in his company and job, if equivalent standards are to be achieved.

To be successful, Europe needs to take a similar approach to that of the companies we have visited. Managers spend far more time on staff motivation, providing money and resources to respond to ideas that are being generated by the improvement teams. This higher level of involvement by the entire workforce is fundamental if Europe is to achieve the levels set by the Japanese companies visited.

## STANDARDISATION

It does appear that the Japanese apply a common philosophy throughout their PCB industry, with customers, PCB suppliers, laminate suppliers and designers working to a common goal to produce cost effective, quality, competitive products.

A very good example can be seen with the LAMINATE supplies. A major COST factor in the manufacture of SINGLE-SIDED consumer PCB's is the base laminate, in fact it makes up in excess of 50% of the works cost. The Japanese common philosophy has ensured that the sheet size of laminate supplied to PCB companies (2 sizes only) has dimensions that complement the end product size thus ensuring a minimum of waste material. In Europe we have as many as seven different sizes none of which coincide with the requirements of the PCB consumer. This is undoubtedly influenced by the fact that the DESIGN AUTHORITY for Japanese consumer products rests in Japan NOT in Europe.

## LONG TERM RELATIONSHIPS

During the mission to Japan the European industrialists were very aware of the very close relationship that exists between the Japanese PCB industry and its national bodies.

For any industry to be successful it requires a working understanding with its national bodies. Japan appears to have this understanding with the financial institutions supporting the manufacturing industry with long-term loans. During the mission our escorts from MITI, EIAJ and JETRO showed themselves to be well informed on the PCB industry

## TOTAL PRODUCTION MAINTENANCE: (TPM)

The same Japanese common philosophy of working together was clearly seen when looking at TPM. Each process is controlled by a team of workers. For example, machine breakdowns are rare. This is due to regular preventative maintenance by the process operators, who are encouraged to look at ways of improving the efficiency and reducing the likelihood of breakdowns.

When a breakdown does occur there is a set procedure to overcome the problem, starting from the machine process operator, moving up to the production supervisor. Specialists are only brought in when the problem can not be solved. For example, in the case of a major machine part breakdown, in Europe we tend to employ specialist maintenance engineers dedicated to repairs, which adds to the costs.



## RESEARCH AND DEVELOPMENT

It was interesting to note the amount of effort and investment directed towards research and development. All of the major manufacturers in Europe have their own process and product development teams, but in many cases these are working mostly to improve the existing process rather than on fundamental new developments. It is often the material and chemical process manufacturers, working in co-operation with the multinational electronics, computer and telecommunications corporations, who generate the new technology and this is later made generally available as proprietary materials and processes. The research and development cost is thus recovered from all of the eventual users as part of the purchase price of the proprietary product. Perhaps European manufactures should adopt this practice instead of relying totally on suppliers.

From the European viewpoint we would welcome the opportunity to develop further contact between European suppliers and Japanese research and development departments.

## DESIGN AUTHORITY

Design is the single factor that has the greatest effect on the cost effectiveness of PCB manufacture . If the PCB company can have an influence on the design at the early stages it ensures that the design is suitable for manufacture . This results in competitive prices from the PCB manufacturer to his customers

The majority of Japanese companies in Europe do not have design authority, this still resides in Japan . For European suppliers to be competitive they must be given access to personnel with design authority. The logistics of how this can be achieved need to be addressed.

### **(f) The True Cost of Ownership to User OEM's**

To enable true cost comparisons to be drawn when purchasing PCB's in Europe and Japan we must compare apples with apples . In other words, we must take into account the true cost of ownership not just the PCB purchase price . To do so we must consider the cost implications of the following :-

- \* Work in progress and stock in transit . The work in progress will be very similar, but , the stock on the high seas is equivalent to 6-8 weeks which is the shipment period from Japan to Europe .
- \* This equates to 10-12 weeks of product in progress and shipment .
- \* The resultant effect is :-
  - you cannot operate " JUST IN TIME " ( JIT )
  - you cannot make instant modifications .
  - you will be invoiced from shipment date .
- \* You will be exposed to currency instability , i.e. exposure to foreign exchange fluctuations .
- \* You will incur import tariff , shipping and insurance costs , which can vary without notice.

These are the factors that make up the TRUE COST OF OWNERSHIP. It is worth looking at one particular element i.e. PCB's in progress and shipment. As discussed, work in progress will be very similar on average 3-4 weeks, however shipment adds a further 6-8 weeks which is not so in Europe. The effect this has on the ability to make modifications in response to customer demands, can be dramatic. All consumer OEM's find it necessary to make modifications, when they occur response is all important, the ideal situation being for modifications to coincide with the PCB's manufacturing cycle, which in Europe is 3-4 weeks, whereas in Japan you must add 6-8 weeks shipment. If the modification is paramount the user must modify the PCB's himself, this cost which can be substantial must form part of the cost of ownership.

**IF THE TRUE COST OF OWNERSHIP IS TAKEN INTO ACCOUNT EUROPEAN PCB PRICES ARE VERY COMPETITIVE WITH JAPANESE.**

**V. PRINTED CIRCUIT BOARD MISSION TO JAPAN**  
**4-19 JUNE 1993**

\*\*\*\*\*

**SPEECHES PRESENTED AT THE**  
**GENERAL MEETING HELD IN THE CAPITOL TOKYU HOTEL**  
**TOKYO, 17 JUNE 1993**

\*\*\*\*\*

***EC - JAPAN CONSUMER ELECETRONICS***  
***PARTS AND COMPONENTS PROGRAMME***

## CONTENTS

<b>INTRODUCTION</b>	<b>Page</b>	<b>HUMAN RESOURCE MANAGEMENT</b>	<b>Page</b>
<p>Mr. Mogens LINDBERG JENSEN MÜLLER PRINT Jorgen R. Müller A/S Postboks 29 Holtug DK-4660 Store Geddinge Denmark</p>	21	<p>Mr. Matthias UNGER PHILIPS Leiterplatten GmbH Ebentalerstrasse 140 A-9020 Klagenfurt Austria</p>	35
<b>MISSION OVERVIEW</b>		<b>ACHIEVING HIGH QUALITY</b>	
<p>Mr. Brian HAKEN P.C.I.F. Romano House 399-401 Strand London WC2R 0LT U.K.</p>	23	<p>Mr. Rainer HARTEL SCHWEIZER Electronic AG Einsteinstrasse 10 D-7230 Schramberg Germany</p>	39
<b>TECHNOLOGY - PAPER 1</b>		<b>IMPROVING THE RELATIONSHIP BETWEEN SUPPLIERS AND USERS</b>	
<p>Mr. Carlo PETERS CISEL S.R.L. Via della Stazione 50 60022 Castelfidardo Italy</p>	26	<p>Mr. Manfred HUMMEL HUMMEL Leiterplattentechnik Mittlere Kanalstrasse 21 D-8500 Nürnberg Germany</p>	42
<b>TECHNOLOGY - PAPER 2</b>		<b>USERS PERSPECTIVE</b>	
<p>Mr. Peter STARKEY FORWARD CIRCUITS Ltd Hedging Lane Dosthill Tamworth Staffordshire B77 5HH U.K.</p>	31	<p>Mr. Klaus WANGERIN SONY EUROPA GmbH Stuttgarter Strasse 106 W-7012 Fellbach Germany</p>	45
 		<p>Mr. Gerard NAUWELAERTS E.A.C.E.M. Rue d'Arlon 69-71 B-1040 BRUSSELS Belgium</p>	48

**EC-PCB MISSION '93**

**GENERAL MEETING, 17 JUNE 1993**

**"INTRODUCTION"**

**Speech delivered by:**

Mr. Mogens LINDBERG JENSEN  
MÜLLER PRINT  
Jorgen R. Müller A/S  
Postboks 29  
Holtug  
DK-4660 STORE HEDDINGE  
Denmark

Mr. Chairman, ladies and gentlemen - good morning.

Thank you, Mr. Chairman for your kind introduction.

The first steps towards the program of which this mission is a part was taken two years ago. Dedicated work by dedicated individuals made it possible to launch a so called pilot mission a year later.

The group I am representing - the PCB suppliers - is happy to participate in this second mission in the program. We are pleased to have been given the opportunity to meet and make personal acquaintance with our colleagues in the electronics industry in Japan.

Ladies and gentlemen, I can assure you it was with great expectations we arrived to Japan last week. Many of us - including myself - for the first time. We have been received with generous hospitality and friendliness for which we thank you very much.

As early as in 1985 an American professor in economics, Dr. Ravi Batra, published his book "The great depression of 1990". He predicted a worldwide recession from which we will not recover until 1996.

Reluctantly we have to admit that so far his prediction has come true.

Each of us present today play a little but important role in the process of recovery. In our daily operations we tend to work within boundaries whether commercial, geographical or psychological boundaries.

By co-operation across these boundaries we can amplify our efforts and hopefully contribute to an early recovery from the recession.

This mission is a giant leap in that direction.

We are grateful to the:

- companies we visited;
- Electronic Industries Association of Japan;
- Japan Printed Circuit Association;
- European Association of Consumer Electronic Manufacturers;
- Ministry of International Trade and Industry, and
- the European Commission

for supporting this program.

Members of our group will later today present some of our findings during the mission.

I cannot end my introductory remarks without mentioning how glad we are to have witnessed a historic event - The Royal Wedding. Personally, coming from Denmark, a more than one thousand year old kingdom, I understand the importance of this event and I congratulate you on this highlight in the history of Japan.

Thank you for your attention.

**EC-PCB MISSION '93**  
**GENERAL MEETING, 17 JUNE 1993**

**"MISSION OVERVIEW"**

**Speech delivered by:** Mr. Brian HAKEN  
P.C.I.F.  
Romano House  
399-401 Strand  
London WC2R 0LT  
U.K.

Good afternoon ladies and gentlemen, Minasan Kon-Nichiwa.

My name is Brian Haken representing EECA-PCB, the European Electronics Component Manufacturers Association, on this occasion representing the European Printed Circuit Board Industry in Europe.

The Mission is made up of 23 industrialists, 19 delegates from 15 printed circuit board manufacturers, 4 delegates from 4 user OEMs: Philips, Blaupunkt, Nokia and Sony.

The PCB has never attained its rightful place in the electronics industry. It has always been the poor relation. I am pleased to note in Japan, the printed circuit board is treated as a component of strategic importance to the electronics industry, in fact on the same level as the semiconductor.

Electronics is the largest growth industry in the world, with Europe the largest potential market. It therefore follows the printed circuit board is a major world-wide industry. The world market for printed circuit boards is 18 billion ECUs (2250 billion YEN).

World-wide production is as follows:

Japan	-	28%
USA	-	27%
Europe	-	20%
Asia	-	16%
Other countries	-	9%

This clearly indicates therefore 4 major players in the world.

It is worth noting the size of the world printed circuit board industry in comparison with the semi-conductor industry - 18 billion ECUs (2250 billion YEN) compared to 38 billion ECUs (4750 billion YEN). In other words the PCB industry is approximately half the size of the semi-conductor industry.

The printed circuit board needs to maintain its global importance. This is greatly assisted by events such as the EC PCB Mission to Japan, which has taken place over the last two weeks. It has enabled European and Japanese companies to exchange information, learning from each other, which helps to break-down barriers and assist the development of the printed circuit board. I therefore offer my heartfelt thanks to EIAJ (Electronics Industry Association of Japan), JPCA (Japanese Printed Circuit Association) in association with EACEM (European Association of Consumer Electronics Manufacturers), and for the support of MITI (Ministry for International Trade and Industry) and CEC (Commission of the European Communities).

Without the collaboration of these bodies this very successful Mission would not have been possible. EECA-PCB thank you.

The Japanese people and companies visited have extended the hand of friendship. We have been given a tremendous welcome, with companies being very open when asked in-depth questions on all aspects of their companies, from process to finance.

The object of the visits was to try and determine the similarities and differences between European and Japanese companies. Our findings will be highlighted in the presentations to follow. There will be six presentations covering: Technology, User/Supplier Relationships, Quality, Human Resources and the final presentation on the Users Perspective of the Mission. The presentations will be followed by a question and answer session when the Mission delegates will be only too pleased to answer any questions you may have.

I would like to congratulate the JPCA for a very informative and enjoyable symposium. In particular it was very interesting to note the comments by Dr. Tadahiro Sekimoto in his presentation entitled "Perspectives on the Electronics Industry toward the 21st Century". He gave an overview of NEC's view of the changes that may take place towards the 21st century. We were very pleased to note that the printed circuit board will still play a prominent role in future electronic products, although it will have to change. 21st century electronic products will require "Super Fine Line Technology" which will dictate a change in how we process printed circuit boards in the 20th century. It will require investment in research and development. Dr. Sekimoto also highlighted that the printed circuit board substrate, that is the laminate, will need to be much thinner whilst retaining strength and flexibility. It therefore follows that changes in not only the printed circuit board, but also the raw material, chemicals and equipment supply industry will have to take place. Dr. Sekimoto certainly gave us food for thought.

The JPCA show allowed European suppliers to view what is new in Japan enabling comparisons to be drawn with Europe. Many Europeans visit the JPCA show each year.

It was most assuring to see the support that MITI and EIAJ give to the printed circuit board industry, it clearly highlights the importance the printed circuit board plays in the Japanese electronics industry.



We were greatly impressed by the JPCA, who made visitors and exhibitors aware of the EC PCB Mission and its important role. The evening reception added the "icing to the cake" with leading personalities from MITI, EIAJ and the JPCA giving speeches acknowledging the EC Printed Circuit Board Mission, and the Japanese printed circuit industry.

## Conclusions

I sincerely hope that our presentations will clearly identify our initial findings in Japan.

The EC Printed Circuit Board Mission delegates are of the opinion that our two week visit to Japanese companies has been a great success. We have exchanged information and have a greater understanding of Japanese culture and the way your very excellent companies operate. We have been greatly impressed by many features of Japanese companies. I will mention just five:

- employee-employer commitment;
- manufacture, based on continuous improvement;
- attention to detail;
- supplier-customer relationship, and
- support from government.

We congratulate you.

JPCA and EIAJ have offered to send Japanese experts to visit the European printed circuit board companies from this Mission, to assist us in the quest for excellence. We have identified two areas where Japanese experts would be of great assistance.

### 1. Technology

biased towards:      screen stencil - design manufacture printing process  
                                 punch tool      - design and manufacture

### 2. Management

biased towards:      quality systems  
                                 training  
                                 TPM  
                                 Kaizen etc.  
                                 continuous improvement  
                                 people management

We look forward to Japanese experts visiting our factories.

Once again we offer our sincere thanks for a truly memorable and successful visit. We look forward to continuing relationships with our Japanese colleagues and friends.

Thank you.

**EC-PCB MISSION '93**

**GENERAL MEETING, 17 JUNE 1993**

**"TECHNOLOGY"  
PAPER 1**

**Speech delivered by:**

Mr. Carlo PETERS  
CISEL S.R.L.  
Via della Stazione 50  
60022 CASTELFIDARDO  
Italy

**Paper prepared with  
the assistance of:**

Mr. Hermann HIRT  
THOMSON TV-PCB Germany GmbH  
Postfach 1363  
D-7730 VS-VILLINGEN  
Germany

Mr. Karl RUHLAND  
METALEX  
Östliche 132  
D-7530 PFORZHEIM  
Germany

Mr. Peter STARKEY  
FORWARD CIRCUITS LIMITED  
Hedging Lane  
Dosthill  
Tamworth  
Staffordshire B77 5HH  
U.K.

Chairman, ladies and gentlemen.

The subject we address is "Technology in PCB".

First of all, please let me take the opportunity being the first spokesman in this presentation of the EC PCB Mission of PCB fabricators to express our sincere thanks for giving us this chance to visit all these Japanese companies of high technology. Companies who are leaders, not only in their domestic markets, but who have also acquired a very well known "renomee" abroad. This already makes our visit to Japan and our efforts to prepare this EC PCB Mission worthwhile.

It was good to see and feel that not only we were welcome, but also that all our visits were very well prepared by all Japanese hosts. It is obvious that at the end of these two weeks you expect from us some feedback on our impressions of all those products, processes and production companies we could look at, admire and analyse with the positively critical eye of professionals. In fact, we did not come as tourists (although we were travelling quite a bit) but we came as possible customers or as possible competitors and of course as supplier members of this EC PCB Mission, having as our goal three main points:

- to understand better the Japanese market requirements;
- to adapt ourselves more to those requirements, and
- last but not least, to see how Japanese PCB fabricators are organised, structured, equipped and how they implement and monitor quality rules etc.

On most of those points we got a quite complete view, also because of your willingness to respond openly on nearly every single question. We realise that some of our questions were a little bit nasty for you as well and obviously we can appreciate the fact that you also do have some confidentialities or final processing secrets. For your openness, thank you very much.

Please allow me to make at this stage a comparison with another high technology application. This comparison will help you to understand better the meaning of what will be said afterwards. Most of you have seen or followed "Formula One" car racing on television (some of you maybe are big fans of this high-tech sports event). If we start from the engines point of view, we can see there are not many different suppliers of engines. They work very closely together with the body manufacturer so that very often it is looked at as a fully-integrated part. A lot of training, modification and fine tuning is being done together to finally obtain the optimal result with only one goal: "being the best in the next race". Looking into this challenging event, we see that some of those engines are supplied by for example, Honda, Renault, Ford or Ferrari:

- all these powerful parts are supplied by companies which have a very high degree of technology in-house.
- these high-tech parts have all a very comparable power output (see training results and qualification rounds)
- if you kick down the accelerator, they all cause an increase of your heart beat and admiration.

However, how come that although they all have very similar characteristics, one type can win four or five consecutive races?

Is this due to:

- more financial possibilities or support which allows for more investment?
- the racer who takes more risks in the curves?
- a better integration and position in the body? A better streamline of this body?
- a faster and/or more efficient pit stops?
- changing at the right moment from rain tyres to slicks?
- to better fine-tuning of all above items with constant monitoring and feed-back, followed by good planned corrective actions?

Outside of the team we will not know the answer but we only see that it is again him who first passes the so long looked for "chequered flag". Important remark: The second car arrived this time within one and a half seconds after the first: He is catching up. Is he going to win next time thanks to his Kaizen plan? Come and see next time in .....

What does this have to do with our Mission you will ask or for a PCB-type industry?

Basically, all above questions or situations are equally applicable to our industry (all those items will be highlighted by next speakers).

The PCB certainly is a high-tech part, even more, it is a strategic part which has become the basis for so many applications in so many different sectors, that we, without any contradiction, can state that there would be no electronic parts functioning if there would not be printed circuit boards as support or interconnection. It really has become a strategic part which has nothing to do anymore with the dirty, smelling and nasty behaving dark piece of strange paper of the sixties.

To produce professionally this always more challenging high-tech product at tighter tolerances, a very strong financial structure needs to exist within the company itself or, some important financial support from outside needs to be obtained to facilitate this large start-up investment and to constantly upgrade towards newer and more up-to-date equipment.

The market we are in is very competitive so it requires constant cost reductions. The first item to focus on is raw material costs. Then optimise investment utilisation as there are: 1) plant layout and product process flow to reduce work in process and 2) adapt and maintain well the investments in equipment to respond to tighter tolerances without having to invest again at high interest rates. Reduce indirect labour costs to increase added value and sales per head (cut away the curves).

Integration is getting more and more a must. On the one hand work closely together with the suppliers in a form of co-development or co-makship to get him involved as well in R&D costs sharing. On the other hand, set-up a close relationship with customers to get the possibility of co-designer and thus create more customer affection in partnership. This automatically reduces the quantity of suppliers per item and also the quantity of customers and creates more customer-dependency.

The pit-stops and their efficiency relate to the human resource management activities:

- hire good skilled people to obtain a strong staff and organisation;
- train well the operators on the shop floor. Teach them to work in teams, and

- employ close and human personnel management practices to obtain maximum involvement, dedication and motivation.

The change of tyres can be compared to the planning activities: to obtain efficient utilisation of the investment, you need to do a good production planning. Planning however means more:

- do you carry out strategic planning towards the future?
- do you have a realistic and achievable business plan?

It allows for anticipation and fast reaction to the ever changing market requirements.

Quality control and assurance has become not only a must, it also is a real tool in cost reduction and a basic factor for reliability in all aspects:

- reliability towards your own customer,
- reliability of machines and lines is a key factor for automatisisation.

ISO-9000 has been introduced throughout the whole world to set norms and specifications. However with the "Kaizen" thinking you are able to add more to the specifications. You involve the people more by motivating them to set new goals to be achieved and look constantly for improvement.

Monitoring and fine-tuning of all processes to assure you get more out of your machines, your people and investment is finally maybe a less important looking item. However, the secret of successful business is sometimes influenced by a combination of different business functions.

I would now like to consider raw material availability, type and development in Japan versus Europe. In Europe we see a tendency towards forming of strong groups with a reduction in the number of suppliers. This has resulted in the following:

- European laminate suppliers are rationalising productions so we have now more specialist suppliers with larger scale volumes. The positive effect is that due to this larger scale, you may produce much more efficiently, reduce costs, get longer periods with same type of materials. All this allows for economies of scale and lower prices.
- The downside to this of course is that some facilities may have to close with consequent loss of employment. However, I think that the positive aspect far outweighs the negative one since the over capacity will shrink and due to higher efficiency and returns, those companies will be more healthy and able to re-invest to support PCB manufacturers in the long term.
- In Europe there is only one laminator who at the same moment has PCB fabrication activities. In Japan this is more common. This certainly is an advantage since close links here is the key to development.
- Looking towards the future requirement on laminates, we see that Japan and Europe head for the same characteristics. We need higher stability in all three axes. Higher TG. We all search for a solution for the CAF Phenomenon (Conductive Anodic Filament Growth). Low and stable dielectric constant and loss factor and this over a wide range of frequencies temperature and humidity. All this is needed for high frequency applications, for example satellite transmission for telecommunication and TV transmission. These are also needed for applications with high speed data transmission.

- It is interesting to note that in both markets more or less the same products are marketed apart from the mid-range. While in Europe a lot of CEM-1 is used, we see here in Japan more XPC and CEM-3 being used.
- Regarding development we see that some companies have up to 7-8 new materials simultaneously in development while in Europe there is more likely only 2-3 different ones.
- One basic difference between our two markets for laminates is the high volume in full additive laminate. Obviously a key-point here is the vertical integration of supplier and user which means that for the supplier the investment was possible since the customer was assured and the volume certainly acceptable, thus allowing the investment to be worthwhile. Such a situation in Europe is not available most probably because of royalties which need to be paid, and which might frighten people to carry-out the investment if no customer can be assured beforehand. However this technology might be of interest for fineline technology.

For other raw materials we see more or less the same pattern: the availability is equal in both markets except for some speciality products.

In conclusion, you can gather from what is said that Japan has some advantages over Europe as far as raw materials are concerned, due mainly to:

- higher capital investment;
- closer co-operation or integration between user/supplier;
- scale or volume;
- better production efficiency by monitoring and Kaizen.

However both Japan and Europe are heading towards the same direction. So it is in our mutual interest to share information and technology and where possible improve transparency to safeguard both our domestic products and markets.

Thank you.

**EC-PCB MISSION '93**

**GENERAL MEETING, 17 JUNE 1993**

**"TECHNOLOGY"  
PAPER 2**

**Speech delivered by:**

Mr. Peter STARKEY  
FORWARD CIRCUITS LIMITED  
Hedging Lane  
Dosthill  
Tamworth  
Staffordshire B77 5HH  
U.K.

**Paper prepared with  
the assistance of:**

Mr. Hermann HIRT  
THOMSON TV-PCB Germany GmbH  
Postfach 1363  
D-7730 VS-VILLINGEN  
Germany

Mr. Karl RUHLAND  
METALEX  
Östliche 132  
D-7530 PFORZHEIM  
Germany

Mr. Carlo PETERS  
CISEL S.R.L.  
Via della Stazione 50  
60022 CASTELFIDARDO  
Italy

Chairman, ladies and gentlemen. Thank you and good afternoon.

Our very grateful thanks for enabling our party of printed circuit specialists to visit your country, your conference, your exhibition, several of your factories, and for this opportunity to report to you our observations.

Obviously, these two weeks have been a period of intense activity and we have been given a glimpse of so many things that it is not easy to draw a meaningful perspective. However, after each day, we have compared and discussed our individual impressions within the group so that we have gained as balanced a view as possible of the printed circuit board manufacturing situation in Japan, using our combined experiences in Europe as the point of reference.

I am pleased to speak on behalf of the group on the subject of technology, to supplement the comments already made by Mr. Peters.

And I am pleased to reassure you that, for the most part, comparable technology exists in Europe, although we may learn some lessons from Japan as to how best to employ this technology in the manufacturing situation.

### Equipment Technology

On the subject of the equipment, it is true to say that in many instances, European or American equipment is available to us which compares favourably with the equivalent Japanese equipment in performance and reliability.

However there are certain areas where the Japanese equipment technology has perhaps a five-year lead in development. And we suggest that one of the driving forces for the development of new equipment in Japan is the market opportunity which is characteristic of the economic culture which encourages long-term investment. Unfortunately, we in Europe are obliged to accept that our financial investors are seeking the shorter-term return and this places some constraint upon our long-term planning.

However, it is our experience that Japanese manufacturers of particular world-leading equipment are prepared to make this equipment available in the European market, even if we have to come to Japan to find them. The JPCA show has been a good opportunity for us to see the state of the art in equipment, and to make contact with the suppliers we might otherwise never have met. Indeed, several of our group have placed orders for some of your excellent equipment during the JPCA show.

Therefore, provided that we can attract the right financial support, we in Europe will be able to acquire the same level of equipment technology as in Japan (even though my English pound will today buy only about 150 YEN).

### Process Integration

We have been very interested to see the extent to which you have integrated and automated your production lines, and also the very high standard of maintenance and cleanliness of the equipment. This high level of process integration enables very effective straight-line production and, as we have seen leads to very short time in manufacture with the minimum of work-in-progress. It is clear to us that these features contribute to your excellent efficiency and flexibility of production. The set-up time to change to different jobs are impressively short. It is unfortunate that our schedule did not permit us to witness the engineering, tooling-up and preparation before manufacture of new designs, although we must conclude from our observation of the work in production that the pre-production operation is carried out with meticulous precision.



### Pinless Registration

It appears that there is extensive use of pinless registration systems. Although we have seen examples using edge-location, it is clear that the predominant system for high-precision work is optical alignment. This, together with extremely accurate mechanical transfer systems, enables very close tolerances of pattern registration to be achieved. We are seeing an increasing application of this type of registration system in Europe and, indeed, several members of our party already have gained considerable experience of this technique in their own manufacturing plants.

### Screen Printing

We are impressed by the way we have seen the screen-printing process developed and optimised to the point where it can be used with confidence at high yield in mass production at the 150 micron line and space level. Although the leading manufacturers in Europe can achieve this resolution, many shops would be obliged to employ photo-mechanical techniques to achieve acceptable yield.

It has been explained to us that special computer-aided techniques are used to anticipate pattern distortion in the printing operation and to make adjustment and compensation of the stencil image. Also we have seen on-line measurement of the datum dimensions of the print. The inks which we have seen in use are the same as, or equivalent to, those we use in Europe. Also the chemicals used for etching and stripping are similar. On the subject of chemicals, it is pleasing to see that your industry has the same environmental awareness that we have in Europe, and that process effluent is purified to low levels of contamination.

We have seen the automation of handling extended to include the punching operation and also the electrical testing, but the final inspection still relies on the human eye. And I personally find it comforting that the manufacturing operation has not yet been totally de-humanised!

We are interested to note the extensive use of bare-copper finishes for solderable features, and it is evident that there has been very close co-operation between the circuit manufacturer and the customer to develop methods of chemical passivation and prefluxing to satisfy the very critical performance requirements of the assembly process which may involve three reflow operations. In Europe we have to meet similar specifications for surface-mount assembly, and we believe that it is true to say that in the area of solder resist and solderable finish technology, the Europeans and the Japanese are following the same direction.

### Research and Development

Mr. Peters has already spoken of advanced materials and processes. We are interested to note the amount of effort and investment directed towards research and development. All of the major manufacturers in Europe have their own process and product development teams, but in many cases these are working mostly to improve the existing process rather than to make fundamental new developments. It is often the material and chemical process manufacturers, working in co-operation with the multinational electronics, computer and telecommunications corporations, who generate the new technology and this is later made generally available as proprietary materials and processes. The research and development cost is thus recovered from all of the eventual users as part of the purchase price of the proprietary product. Maybe the better way to go is for the manufacturers to make their own developments without relying

totally on suppliers. From the European viewpoint we would welcome the opportunity to develop further contact between European suppliers and Japanese research and development departments.

### Conclusion

So, we have seen that in the actual technology, and also in the opportunity to have access to the technology, there is no big difference between the state of the art in Japan, and that which exists in the leading printed circuit manufacturers in Europe, many of whom are represented in the Mission.

There can be no argument but that the degree to which the technology has been applied and optimised in the printed circuit board manufacturing process by the leading Japanese companies which we have visited considerably exceeds what has been generally achieved in Europe. And perhaps some of the principal reasons for this include the Japanese financial culture supporting long-term investment, and the market opportunity provided by the domestic electronics industry.

But probably the most significant factor is the pride and commitment of people at all levels within the organisation, and their willingness to cooperate and communicate in the quest for continuous improvement in every aspect of the business.

May I reassure you that the same pride and commitment exists in European companies, and whilst it has now been organised and directed towards the same objective, it needs increased focus in order to secure the future of our industry.

Thank you for your attention.

**EC-PCB MISSION '93**

**GENERAL MEETING, 17 JUNE 1993**

**"HUMAN RESOURCE MANAGEMENT"**

**Speech delivered by:**

Mr. Matthias UNGER  
PHILIPS Leiterplatten GmbH  
Ebentalerstrasse 140  
A-9020 KLAGENFURT  
Austria

**Paper prepared with  
the assistance of:**

Mr. Philippe SIMON  
Mr. André MARINOT  
SIFELMET  
37/39 Boulevard Beaumarchais  
F-75003 PARIS  
France

Chairman, ladies and gentlemen.

On behalf of the group, I wish to speak about human resource management.

My intention is not only to give you a feed-back of what we have experienced in Japan, but to also give you some information about the present situation and developments in Europe.

As you can imagine, it is not possible to discuss all aspects of human resource management today. Therefore I will concentrate on the following four topics:

- Communication structure;
- Employer/employee commitment;
- Working conditions, and
- Training.

The facts and figures I would like to give you about Europe and Japan are not based on scientific investigations, but on the personal know-how and experiences of the members of my group.

## **SITUATION IN EUROPE**

Let's start with the situation in Europe.

### Communication Structure

Historically, many companies have been organised from the president via top management, middle management, supervisors down to the operators. So you can imagine, that the information flow down to the operators was as a result of too many filters rather poor and consequently the involvement and motivation of the employees was also poor. On top of that there was a strong separation between different departments. Many companies have recognised the need to improve communication, and as a result a lot of actions are running to improve the communication structure. Actions like:

- Introduction of lean management, that means removing layers;
- Installation of working groups with members out of different departments;
- Training in communication especially for the middle management;
- Frequent meetings between top management and staff.

### Employer/Employee Commitment

In Europe the level of commitment is not so strong on both sides. It is normal for instance for a worker to change company two or three times. This can even have a positive impact on the career of a person. On the other hand, no company guarantees you life-time employment. Companies are trying to improve their relationship to their employees by creating a corporate identity and by making management development plans for young high-skilled employees.

### Working Conditions

In general, the average European employee works between 36 to 37.5 hours per week and 220 to 240 days a year depending on the country in which he lives. In the PCB business, 3 shift production, 5 days a week is standard. Some companies in Europe are already working 7 days a week in order to have a higher utilisation of their equipment. The absenteeism rate is between 5 to 10 percent. Overtime is restricted by law and very expensive. For example, for overtime on Sunday, companies have to pay allowances of up to 100 percent. That is the reason why companies are very reluctant to allow their employees to work overtime.

The average yearly income of an operator lies between 3 to 4 million YEN, depending on the country where he lives. The yearly income consists of 12 to 14 monthly salaries. Normally one gets one additional salary before holidays and one before Christmas. But that is not a bonus system. These additional payments are based on agreements between worker councils and employers. Bonus systems for operators are uncommon in Europe. But many companies are planning to make operators' salaries more flexible, and subject to an individual's performance.

### Training

Training of employees is becoming more and more important for companies. In some European countries, for example France, you have to spend by law at least 1.5 percent of your salary

costs for training. Many companies have introduced a yearly training plan per employee. Main emphasis is placed on operator training. The target is to improve their flexibility, productivity, customer orientation and their sense of urgency regarding quality.

## SITUATION IN JAPAN

Now I would like to present to you our impressions of the situation in Japan in relation to these four topics.

### Communication Structure

Although the organisation of Japanese companies seems to be rather complicated, the information flow and the involvement of employees is better organised than in Europe. Boundaries between different departments are rather low. Teamwork is prevalent. A section head in a Japanese firm spends a great deal of time nurturing personal relationships, cultivating consensus and developing co-operative effort among the members of the group. There is an extended meeting culture in Japanese companies which also contributes in a positive way to the communication structure. A lot of responsibilities are transferred to the employee.

### Employer/Employee Commitment

We think that the Japanese tend to place a higher value on close loyalty to one's employer and the commitment by the company is mutual, especially in big companies. We learned for example that Japanese companies offer company flats or houses, leisure time facilities etc. to their employees. Staff motivation also appeared to be high, with staff suggestion schemes generating more suggestions than experienced in Europe.

Job hoppers tend to be regarded as "losers" in Japan. But on the other hand, young employees especially, do not hesitate to quit their jobs if they have found a better challenge.

### Working Conditions

Japanese work normally 5 days and about 40 hours per week. 3 shift production is standard. But we have got the impression that working overtime is normal if not obligatory in Japan and that there are no restrictions by the government. The absenteeism rate is about 2 percent, much lower than in Europe. The operator earns roughly 300,000 to 350,000 YEN a month. All employees receive a bonus of approximately 50 percent of their yearly salary, paid twice a year. The basis for a bonus is the overall situation of the company regarding profit etc. Sometimes also the individual performance of an employee is taken into account.

### Training

Training seems to be very well organised in Japan and appeared to be carried out in-house to a much larger extent than is practiced in Europe, where direct recruitment of qualified engineers and management staff is more common. The progress per employee is recorded and visible for everyone. Training also appeared to be more of an on-going, continuous process to realise the full potential of staff rather than merely the attainment of the necessary qualifications for a particular job.

## **CONCLUSION**

Before I finish my presentation, I would like to draw a short conclusion.

In Europe and Japan, professional human resource management will be one of the key factors for success in the future. The linkage between human resource management and quality is very obvious. In Japan the generally efficient use of human resources was impressive and the priority afforded education, training, team-work, motivation and developing a strong identification of staff with their company was particularly striking.

Thank you very much for your attendance and on behalf of the group I thank you for your hospitality in Japan.

**EC-PCB MISSION '93**

**GENERAL MEETING, 17 JUNE 1993**

**"ACHIEVING HIGH QUALITY"**

**Speech delivered by:**

Mr. Rainer HARTEL  
SCHWEIZER Electronic AG  
Einsteinstrasse 10  
D-7230 SCHRAMBERG  
Germany

**Paper prepared with  
the assistance of:**

Mr. Bernd FREESE  
BLAUPUNKT BOSCH Telecom  
Robert-Bosch Strasse 200  
D-3200 HILDESHEIM  
Germany

Good afternoon.

My name is Rainer Hartel and on behalf of the European Printed Circuit Board Mission , I will present to you our findings during this mission in respect to quality related issues.

In Europe as well as in Japan, customers are demanding high quality products and services. The ultimate goal is the zero defect product. Achieving high quality levels depends on various factors - we concentrated on the following:

- automation
- process technology
- process control
- employee commitment towards quality.

## Automation

Let us look first at the automation factor. We have been looking for:

- equipment with the latest technology;
- at the level of automation, and
- at the working condition of the equipment installed.

On the equipment side, we found no significant difference between Japanese and European companies. While, in Japan there are more machines with optical registration systems in place, European companies are investing heavily in this technology.

A significant difference does exist however between manufacturers in Japan and Europe in relation to the level of automation. We have seen a high level of interlinking between various machines and processes, with the result that these companies achieve a low level of work in progress and short through-put times. The potential of having defects due to improper material handling like for example scratches and finger prints is significantly reduced.

All the equipment we have seen was in good working condition, guaranteeing minimum breakdown and constant quality output. Japanese companies in general place emphasis on preventive maintenance. Actually, we have seen a total productive maintenance programme in place.

## Process Technology

Let us now pass to the process technology factor. Generally, the processes used in Japan for manufacturing single sided PCBs are basically the same as used in Europe. Obviously, in the Japanese PCB industry there is a high degree of standardisation. For example, in Europe single sided PCB manufacturers offer various types of copper surface coating, such as flux coating, roll-tin coating and hot air levelling. In Japan, this industry mainly concentrates on the flux coating process.

Another example of this standardisation is the variety of materials used. In Europe most single sided PCB shops are using FR2, FR3, CEM1 and FR4 materials. In Japan PCB manufacturers concentrate on one or two types of laminates. This standardisation in Japan is possible due to the close links between the PCB suppliers and their customers. It gives the Japanese PCB industry the chance to have to run a limited number of processes. Being able to concentrate on few processes means becoming expert on these processes and makes it easier for the industry to achieve the quality targets. The close links with their customers allow the local Japanese PCB manufacturers to be involved in the early stage of product design, thus optimising the design to be able to manufacture high quality products to the lowest costs.

## Process Control

Another factor influencing quality is the process control system. In Japan as in Europe we have systems for monitoring:

- incoming materials and services;
- in-process control, and
- outgoing materials and services.



Electrical testing, hole checking and 100% visual inspection prior to shipment are standard in the whole industry. The 100% visual inspection is still done manually. We have not seen any automated optical inspection systems used at Japanese manufacturers of single sided PCBs.

The major differences we found are in the QC system itself. It seems, Japanese companies are not using statistical process control to the extent we use in Europe. In Japan, most PCB manufacturers designed their own quality system. In Europe, companies have to apply a

quality system according to ISO 9000 standards, demanding a high level of process control and documentation. These companies are certified by independent associations and are re-audited

periodically. Japanese companies intending to export to the European Community will have to have their quality systems certified according to ISO 9000 requirements.

### Employee Commitment

Finally let us look on the factor of employee commitment towards quality. In Japan there is a high level of employee participation and a permanent push to perform even better, looking at every small detail.

In recent years European companies looked towards Japan and put a lot of effort in training and education. Emphasis lies on total quality management. This includes programmes for continuous improvement, preventive maintenance schemes, QC circle activities and employee suggestion schemes. The biggest problem in Europe is to get everybody involved in this process. Japanese companies seem to be ahead in this aspect. Receiving 40,000 suggestions over a three year period as we have been told, is still a dream figure for European companies.

### Conclusion

To draw a conclusion, we feel that Japanese and European manufacturers have sophisticated quality systems. The main differences are in the level of standardisation and automation and the level of employees' involvement in activities to improve the quality of products and services.

This concludes our findings on this mission in respect to quality related issues.

Thank you.

**EC-PCB MISSION '93**

**GENERAL MEETING, 17 JUNE 1993**

***"IMPROVING THE RELATIONSHIP BETWEEN  
SUPPLIERS AND USERS"***

**Speech delivered by:**

Mr. Manfred HUMMEL  
HUMMEL Leiterplattentechnik  
Mittlere Kanalstrasse 21  
D-8500 NÜRNBERG  
Germany

**Paper prepared with  
the assistance of:**

Mr. Bruno VISENTIN  
ITALTEL Tecnoelettronica SpA  
via Brocchi  
I-20019 SETTIMO MILANESE (Milano)  
Italy

Mr. Philippe SIMON  
SIFELMET  
37/39 Boulevard Beaumarchais  
F-75003 PARIS  
France

Chairman, ladies and gentlemen.

On behalf of the group, I wish to speak about the relationship between suppliers and users.

**EUROPEAN PERSPECTIVES**

To meet the demanding requirements of today's consumer electronics market and more specifically to respond to the needs of its customers, the European printed circuit board manufacturing industry has over the past five years introduced the following basic processes and controls:

- Introduction of statistical process control methods in order to replace product related controls. This process enabled just in time deliveries to customers, either directly to the customers stock or manufacturing line.
- Implementation of a process quality management and improvement system, to find solutions to each emerging problem at an operating level. We can mention as an example the process quality management and improvement (PQMI) or its equivalent in Japan, Kaizen.
- Introduction of a market driven quality policy (that is quality assessed by the customer) in order to have a feedback from the market or the customer and to get the necessary information in order to anticipate solutions to meet the customer's expressed or real needs.
- Total quality policy to create a fully integrated organisational structure in the internal organisation of the company and in the user-supplier relationship as well. This policy implies that all people involved in each process is continuously trained to even higher levels to pursue personal improvement of the company.

The implementation of the above mentioned processes are still in progress at the present time but have already been implemented to a significant level by a significant number of European companies operating in the printed circuit board industry.

## **JAPANESE EXPERIENCES**

The conditions we have mentioned previously have already been implemented by Japanese companies even earlier and in a deep and systematic way. So we have today a common language in order to compare the operations of European and Japanese companies. The industrial mission itself demonstrates that a fruitful exchange of experiences is in progress and we have the conditions to let both parties to mutually open themselves to further experiences.

This mutual co-operation is the preliminary stage to develop projects and programmes on a common basis, taking into account at the same time, and from the very beginning of each project, the requirements of the users to be put into practice and the manufacturing environments, in order to decrease the risks and the costs to both parties.

The result in an ever-growing integration leading to the creation of a long-term partnership.

## **COMPARISON BETWEEN EUROPE AND JAPAN**

It is clear that in the near future there will be a substantial reduction in the number of suppliers. At the same time the retained suppliers will be enhanced to a closely integrated partnership between user and customer and they will have to grow together.

This impressive change will produce the following effects:

- companies which are not continuously updating themselves to the market situation will disappear.
- many small and medium sized companies will combine together. This will result in a synergy between complementary entities, which will mean that individual suppliers perform as a group.
- the electronics market will become a global market, and each company will act in this global market interacting with all other companies with a common or comparable way of designing, manufacturing, marketing and so on.

A situation with these characteristics will develop in all markets:

- Japan,
- Europe,
- and the rest of the world.

This is why we will strive to implement this trend.

## CONCLUSION

For the future of our industry a good relationship between customer and supplier is essential, and as we have seen and experienced during our visits to various Japanese printed circuit board and machinery manufacturers, it must involve:

- a common agreement on technology;
- discussion about future products, and
- planning of flexible processes by producing a high quality level.

This depends on access to design engineering centres in our own market place.

We are looking forward to the time when we will have the opportunity to talk to design engineers close to our plants and we welcome you when you can expand your operations to include a design engineering department.

**EC-PCB MISSION '93**

**GENERAL MEETING, 17 JUNE 1993**

**"USERS PERSPECTIVE"**

**Speech delivered by:**

Mr. Klaus WANGERIN  
SONY EUROPA GmbH  
Stuttgarter Strasse 106  
W-7012 FELLBACH  
Germany

**Paper prepared with  
the assistance of:**

Mr. H. GEBENDORFER  
NOKIA Electronics Bochum GmbH  
Meesmannstrasse 105  
4630 BOCHUM 1  
Germany

Mr. J. TEULINGS  
PHILIPS PMF International B.V.  
Building SA II-5  
P.O. Box 218  
5600 MD EINDHOVEN  
The Netherlands

Mr. Haga AKIMASA  
BLAUPUNKT WERKE GmbH  
Robert Bosch Strasse 200  
D-3200 HILDESHEIM  
Germany

Mr. Chairman, distinguished guests, ladies and gentlemen.

As the last speaker of the EC PCB Mission I would like to say thanks for the honour to present the users perspective of the mission on behalf of the user representative group. My colleagues have consolidated with me our impressions, experiences and perspectives which now I would like to address in a very brief manner.

For clarification, I would like to mention that the European users at today's conference represent the consumer electronics industry of Europe, consisting of European and Japanese enterprises with manufacturing sites in Europe and represented respectively by EACEM and EIAJ.

Having now experienced over the last 10 days the excellent organisation, the unusual positive contribution of all participants and the kind and warm hospitality of our hosts, we would like first to express our gratitude to the concerned members of MITI, EIAJ and JPCA and last but not least to all the companies which were visited and which have opened their plants so much and to their openness in answering our many questions.

We should also like to thank the EC Commission, which by providing financial assistance made it possible for small and medium enterprises to participate in this mission and made sure that an appropriate organisation to administer the mission exists and that deserves users respect.

In order to understand the users perspective one has to return to the beginning of that project.

European manufacturers of consumer electronic products independent of which origin they belong face tremendous difficulties to allocate substantial PCB orders towards European subcontractors. But there exists a strong common interest to limit the importation of key components. While the reasons may vary, there is a mutual understanding of the necessity to strengthen the EC supplier industry.

That was the reason why in the official programme document these objectives have been settled.

1. For the programme:

- to improve the competitiveness of the component supply infrastructure of the European consumer electronics industry.

2. For the PCB project:

- to improve the competitiveness of the European single-layer PCB industry as suppliers to the European consumer electronics industry.

Following Mr. Masaaki Imai's recommendation in his famous book "Kaizen", the European parts and components (P&C) project which was established by MITI/EIAJ and EC/EACEM took the PDCA (PDCA = Plan, Do, Check, Action) approach for that improvement programme.

Together with EIAJ and JPCA the mission was planned, the European PCB vendor industry was invited to take part and a selected number has gone to Japan and has checked as a group and everybody for himself what differences and similarities could be observed.

Already in Europe the user-side asked the suppliers participating in the PCB mission to check items like management, technology, quality, housekeeping, production, costs and as we just have heard from the various speakers they are in the process already to come to terms about subjects worth to be further improved.

Our user perspective on the mission is that the "A" = Action of PDCA will lead Europe into an extraordinary and intensive improvement programme supported by a scheduled visit of experts from Japan and another workshop in Europe. So that after a reasonable time for introducing the improvement programmes, the PCB industry can present a much higher attraction to the consumer electronic industry than at present. Other industries may benefit as well.

User expectation is that the PCB subcontractors are going to develop measures how to cope with the facts as we have seen, like:

- higher degree of automation
- the human factor
- project management (5S, TPM, Kaizen)
- motivation by bonus and other fringe benefits.

and which certainly result in different delivery performance.

One small concern the users have and that should not be hidden. We consider that the group tour to Japan and the forthcoming visit of experts to Europe offer quite good opportunities to design an improvement programme. However some companies and perhaps especially one or the other of the smaller ones may face difficulties to keep track and would like to receive additional support. In such case we strongly recommend that they contact EECA immediately and they certainly will find a way of solving their problems. Perhaps further contact with EACEM/EIAJ or JPCA may also become necessary.

In favour of the European consumer electronic industry and a strong European vendor base both industries are committed for success and I would like to close my speech by thanking you once again for the very fruitful days, because also the users could learn a lot and please kindly provide us your continuous co-operation.

**EC-PCB MISSION '93**

**GENERAL MEETING, 17 JUNE 1993**

**Speech delivered by:**

Mr. Gerard NAUWELAERTS  
Secretary General  
E.A.C.E.M.  
Rue d'Arlon 69-71  
Bte 8  
B-1040 BRUSSELS  
Belgium

Good morning.

My name is Gerard Nauwelaerts and I am the Secretary-General of EACEM, the European Association of Consumer Electronics Manufacturers.

EACEM represents the common interests of the consumer electronics manufacturing industry in Europe, both European and non-European owned, in a multitude of key areas.

In this EC-Japan Industrial Co-operation Programme, EACEM therefore represents the collective interest of the European and Japanese user society established in the EC.

At the end of this industrial mission, I would like to thank those parties which have made this user-supplier operation possible:

- politically and financially: MITI and the European Commission;
- operationally: our sister association in Japan, EIAJ, and in particular my colleague Takao Negishi;
- administratively and organisationally: International Co-operation Europe Ltd.



Our particular gratitude must however go to the JPCA and its member companies which were found prepared to actively cooperate regardless of and notwithstanding the competitive context in which their co-operation has been sought and obtained. This witnesses an attitude which deserves being fully valued by those who will derive direct benefits from this project as a tangible example of a genuine will to cooperate. I am convinced that Messrs. Endoh and Nagashima have played a capital role in obtaining the JPCA's contribution.

Finally, I wish to thank the Japanese industry and authorities for the high level of attention and presence with which they are honouring this meeting.

The strategic nature of PCBs for the CE manufacturing industry cannot be denied and, as mentioned in the brochure of one of the companies visited this week:

"The printed circuit board is a constant necessity today and through the next generation of consumer electronics products."

In a world where very little is certain for the moment, this seems at least written or, shall I say, "punched in stone".

The most recent news from the US on the rapid development and shaping of the forthcoming era in consumer electronics video interactivity can only emphasise this reality and the potential for much better fortune than users and suppliers enjoy today. As you probably know, the TV set and the telephone set are the first to be dating in this emerging "Z dollar business" as it was described in Newsweek recently. It confirms also the extent to which the traditional consumer electronics environment is likely to change soon.

At crossroads with itself, the consumer electronics industry faces a number of capital and risky options: internal restructuring, technology choices, R&D investments, alliances in hardware product and software development, location and re-location of manufacturing, changes in consumer behaviour and not in the least new environment protection standards. Choices on outsourcing and subcontracting are other key issues which will determine who will be the winners.

Adding the current political, monetary and economic uncertainty in existing and newly emerging markets, no one should wonder why industrial entrenchment and commercial opportunism are the prevailing attitude of the day.

It is a well known business management axiom that every threat always creates a business opportunity for those who are prepared to take the risk. Recent experience shows that going alone may be reckless, whether for big or for small players. Sharing the risk through co-operation is most likely the better strategy today.

Excellence in industrial co-operation through exchange of information is what this EC-Japan Collaborative Programme is all about.

The bedding of industrial co-operation rests essentially on information flows. How to cooperate is a matter for the business people to decide but governments can foster industrial co-operation by providing the tools to facilitate the conditions for the flow of both generic and proprietary technology transfer.

This is what the EC and Japanese authorities have agreed to do. This 2-year programme, MITI's Manufacturing Technology Fellowship Programme and the EC-Japan Industrial Co-operation Center are only a few examples of the tools offered to the industrialists. Are we seeing the first signs of an emerging multilateral industrial policy? Is this a sense of direction towards sustainable growth in global partnership?

This PCB Project and the future possibilities which will soon come about are European user industry-led projects, providing the opportunity to learn from the Japanese co-operation which is offered and to achieve standards of excellence which often achieve more than the possession of proprietary know-how and technology. Having the opportunity is one thing, seizing the opportunity is a choice. Of course we have not yet reached the stage of sharp measurement but the early conclusions hold encouraging signs.

May I end by thanking our PCB suppliers for taking this opportunity and by wishing that this EC-Japan Co-operative Programme will pave the way towards the creation of a permanent Industrial Co-operation and Training Centre in Europe which was proposed for consideration in Brussels at the mentioned seminar of 25 March last.

Thank you for your attention.

**VI**

**MISSION DE-BRIEFING**

**1. Media**

JETRO, whose responsibility is to promote Japanese trade world-wide were in attendance throughout the visit. A film crew covered our entire visit culminating in interviewing Mr. Brian Haken on his views of the EC PCB project success. We were informed that this documentary would be used to both promote Japan's trade and show its willingness to work with the EC.

**2. Press**

Mr. Brian Haken, was interviewed by the NIHON KEIZAI SHIMBUN - the Japanese equivalent of the *Financial Times* on the success of the Mission. A press statement was also released by the EC Delegation in Tokyo (see IX).

**3. Briefing of Member States**

Mr. Brian Haken and Mr. Galway Johnson debriefed the EC member states on the success of the mission. Member states were made aware of the importance of the European PCB industry. Electronics is the largest growth industry world-wide, and Europe is the largest potential market. It therefore follows that Europe's electronic industry is of major importance to the financial success of Europe. MITI have acknowledged the strategic importance of the Japanese PCB industry to the overall success of their electronics industry. EC member states were also urged to acknowledge this fact with respect to the European PCB industry.

## VII. JAPANESE COMPANIES VISITED

Each factory visit comprised of a welcome and introductory session, followed by a guided plant tour with simultaneous translation via a radio "deaf aid", followed by an open question and answer session.

In many cases we were able to enjoy the Japanese "bento" box lunch between plant tour and the discussion; certain members of the group developed a noticeable enthusiasm for this meal based on a well balanced combination of Japanese cuisine, which sustained the visitors throughout the day. Each visit was followed by a debriefing session on the return coach journey discussing what had been seen in terms of similarities and differences.

### *a) PCB MANUFACTURERS*

ITABASHI SEIKI Co Ltd  
 HITACHI AIC Inc  
 CMK Corporation, Kiban Centre  
 CMK Corporation, Gunma Factory

### *b) PCB SUPPLIERS*

HITACHI CHEMICAL Co Ltd - Laminate

### *c) PCB EQUIPMENT MANUFACTURERS*

ORC Manufacturing Co Ltd	-	Exposure
HITACHI SEIKO Ltd	-	Drilling
ONO SOKKI Co Ltd	-	Exposure & Screen Printing

### *d) PCB ASSEMBLY (OEM)*

SONY BONSON Corporation

### *e) PCB PIERCE & BLANK TOOL MAKERS*

DAIWA Circuit Module Inc.

The European industrialists were separated into two groups A & B. Both groups were escorted by EIAJ officials together with the major customer of the company being visited.

## VIII. MISSION PARTICIPANTS

### EUROPEAN COMMUNITY (EC):

- E.A.C.E.M. - European Association of Consumer Electronics Manufacturers
- E.E.C.A. - European Electronic Component Manufacturers Association

### JAPAN:

- E.I.A.J. - Electronic Industries Association of Japan
- J.P.C.A. - Japan Printed Circuit Association
- J.E.T.R.O. - Japan External Trade Organisation

### SPONSORS:

- C.E.C. - Commission of the European Communities, DG III & DG XXIII
- M.I.T.I. - Ministry of International Trade and Industry

### PROJECT MANAGEMENT:

- I.C.E.L. - International Co-operation Europe Limited

**Printed Circuit Board Manufacturers**

<b>NAME</b>	<b>TITLE</b>	<b>COMPANY</b>
Mr. Mogens LINDBERG JENSEN	General Manager	Müller Print
Mr. Brian HAKEN	Executive Director	PCIF, EECA-PCB
Mr. Bernd FREESE	Plant Manager Sub. PCB	Blaupunkt Bosch Telecom
Mr. Peter STARKEY	Managing Director	Forward Circuits
Mr. Georges MARTIN	Chairman/President	Socimet
Mr. Gerhard RÖSCH	Factory Manager	Grundig AG CTV Prod.
Mr. Manfred HUMMEL	Owner/Managing Dir.	Hummel
Mr. Bruno VISENTIN	Marketing Manager	Italtel
Mr. Rainer HARTEL	Director	Schweizer
Mr. Karl RUHLAND	Operations Manager	Metalex
Mr. Matthias UNGER	General Manager	Philips
Mr. Antonio RODRIGUEZ ARAGON	General Manager	Eurocir S.A.
Mr. Luis SANCHEZ QUERO	Technical Manager	Eurocir S.A.
Mr. Barry EDWARDS	Managing Director	Philips Printed Circuits
Mr. Wil KREGTING	Business Unit Manager	Philips C.E.
Mr. Philippe SIMON	Chairman	Sifelmet
Mr. André MARINOT	Executive Director	Sifelmet
Mr. Hermann HIRT	Manager/PCB Plant	Thomson TV
Mr. H. KOJIMA	Technical Support	Thomson TV PCB
Mr. Carlo PETERS	International Sales Manager	Cisel S.R.L.

**Consumer Electronic Manufacturers**

Mr. Hubert GEBENDORFER	Production Manager	Nokia
Mr. Jos TEULINGS	Purchasing Manager	Philips International B.V.
Mr. Hideki NAKAJIMA	Purchasing Manager	Blaupunkt-Werke Gmbh
Mr. Klaus WANGERIN	General Manager Eur. Procurement Div.	Sony

**Other Participants**

<i>NAME</i>	<i>TITLE</i>	<i>COMPANY</i>
Mr. Gerard NAUWELAERTS	Secretary General	E.A.C.E.M.
Mr. Takao NEGISHI	Director Europe	E.I.A.J.
Mr. Galway JOHNSON	Head of Division	CEC - DG III
Mr. William DEE	Administrator	CEC - DG III
Mr. Theodoros KALLIANOS	Head of Sector	CEC - DG XXIII
Mr. Thierry PAELINCK	Administrator	CEC - DG XXIII
Mr. Dennis HARVEY	Project Chairman	I.C.E.L.
Mr. Thomas KENNEDY	Project Advisor	I.C.E.L.
Mr. Thomas BOURKE	Project Administrator	I.C.E.L.

BN 11/93

17 JUNE 1993



# EC BACKGROUND NOTE

PRESS AND INFORMATION SERVICE, EC DELEGATION / Europa House, 9-15 Sanban-cho, Chiyoda-ku, Tokyo, 102 Japan  
 駐日EC委員会代表部広報部/〒102 東京都千代田区三番町9-15 ヨーロッパハウス Tel. (03)239-0441 / Fax. (03)239-9337

## FURTHER SUCCESS FOR EC/JAPAN CONSUMER ELECTRONICS COOPERATION

European printed circuit board (PCB) manufacturers have today completed a successful two week mission to Japan under the EC/Japan consumer electronics cooperation programme to develop competitive subcontracting and component supply in Europe.

The programme is an initiative of the two industry federations who represent most of the consumer electronics manufacturers, the European Association of Consumer Electronics Manufacturers (EACEM) and the Electronic Industries Association of Japan (EIAJ). The two component user federations cooperated closely with the component manufacturers' federations in Europe and Japan, the European Electronic Component Association (EECA) and the Japan Printed Circuit Association (JPCA) in order to realise the project.

Fifteen European PCB manufacturers participated in the mission, visiting Japanese PCB makers, equipment and raw material suppliers, as well as the JPCA show held in Tokyo from 7-10 June. The European delegation discussed the Japanese PCB industry with their counterparts in the JPCA, as well as with European and Japanese component users in the consumer electronics industry. It is hoped that a Japanese mission of industry experts may visit Europe later in the year.

One of the European PCB spokesmen, Brian Haken, Executive Director of the UK Printed Circuit Industry Federation and a founder member of EECA, said:

"This mission has provided a valuable opportunity for European PCB manufacturers to assess the industry in Japan, and we are confident that the project as a whole will contribute significantly to the further strengthening of the European component supply industry."

The EC/Japan industry-led project is being sponsored by the European Commission and the Japanese Ministry of International Trade and Industry (MITI). European participants have benefitted from support under the European Community pilot programme to develop competitive subcontracting for the consumer electronics industry. The pilot programme, which has a budget of 3 million Ecu (approximately ¥ 400 million) for the period 1993-94, is part of the Commission's Enterprise Policy Initiative for subcontracting. Much of the support provided targets small and medium enterprises (SMEs).

The pilot programme was formally launched at a conference in Brussels in March following the first successful project for plastic component suppliers, which took place during 1992. Since then, EACEM and EIAJ have appointed a full-time project administrator in Brussels to support the working groups. Further discussions are planned for July to discuss future programme activities.

\* \* \* \* \*



## X. VISIT OF JAPANESE EXPERTS TO EUROPE

At the request of the European PCB manufacturers, the Japan Printed Circuit Association and Electronic Industry Association of Japan has offered to send Japanese experts to visit the European PCB companies involved in the mission, to assist in the quest for manufacturing excellence .

The areas that have been identified by the European PCB manufacturers fall into two categories under the headings TECHNOLOGY AND MANAGEMENT.

### a) Technology

**SCREENING:** to identify and understand the Japanese screening process from design to print, especially when applied to Fine Line Technology

i.e: *Stencil Manufacture:* Materials, Mesh Count, Mesh tension  
*Screen Printing:* Inks used, Print Rate, Snap Distances

**PUNCH TOOL DESIGN AND MANUFACTURE:**

- \* Materials used, life span of tools, refurbishment programme
- \* Types of power press used, tool daylight ( i.e. the distance between the 2 halves of the tool when the press opens ), hit rates and punch debris removal from tools etc.

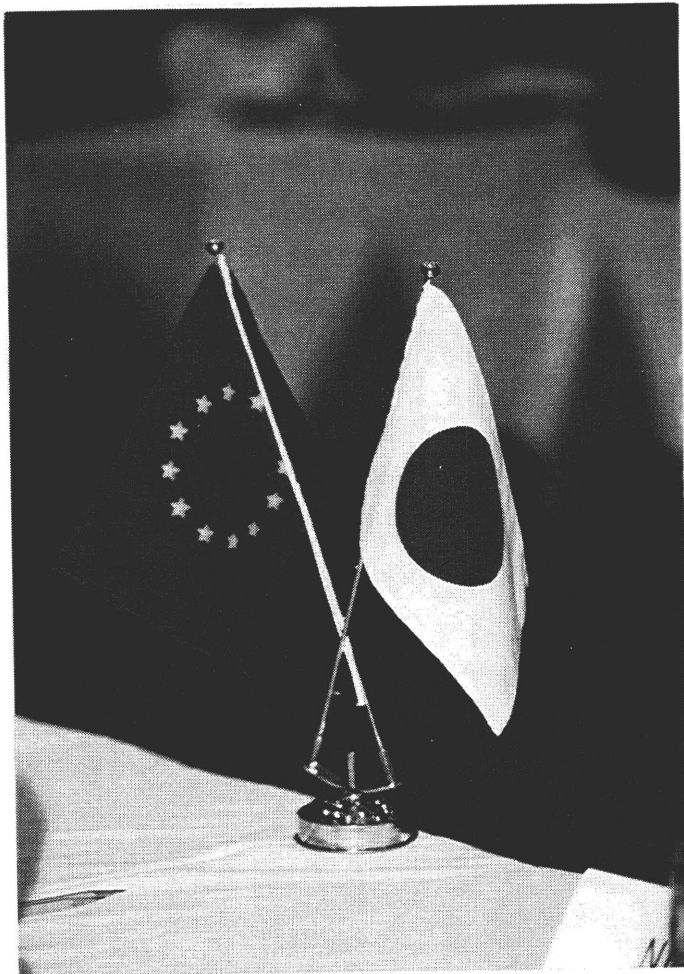
### b) Management

We were especially impressed with the various management techniques and philosophies employed by the Japanese companies visited to achieve total quality control. We would in particular wish to learn more about :

- TPM;
- Kaizen, 5S etc.;
- quality systems;
- training;
- continuous improvement, and
- people management.

## **XI. PHOTOGRAPHS**

- 1 European Delegation
- 2 Mr. G. J. Nauwelaerts Secretary General, E.A.C.E.M.
- 3 Messrs. Kallianos, Paelinck  
Johnson and Dee Commission of the European Communities
- 4-6 Factory visits
- 7 Mr. B. Haken PCIF, EECA-PCB
- 8 Mr. M. Lindberg Jensen Müller Print, Leader Supplier Delegation
- 9 Mr. W. Kregting Philips C.E.
- 10 4th International Symposium on Printed Circuit
- 11 General meeting 17 June 1993
- 12 Mr. C. Peters Cisel, S.R.L.
- 13 Mr. P. Starkey Forward Circuits Limited
- 14 Mr. M. Unger Philips Leiterplatten Austria GmbH
- 15 Mr. R. Hartel Schweizer Electronic AG
- 16 Mr. M. Hummel Hummel Leiterplattentechnik
- 17 Mr. K. Wangerin Sony Europa GmbH

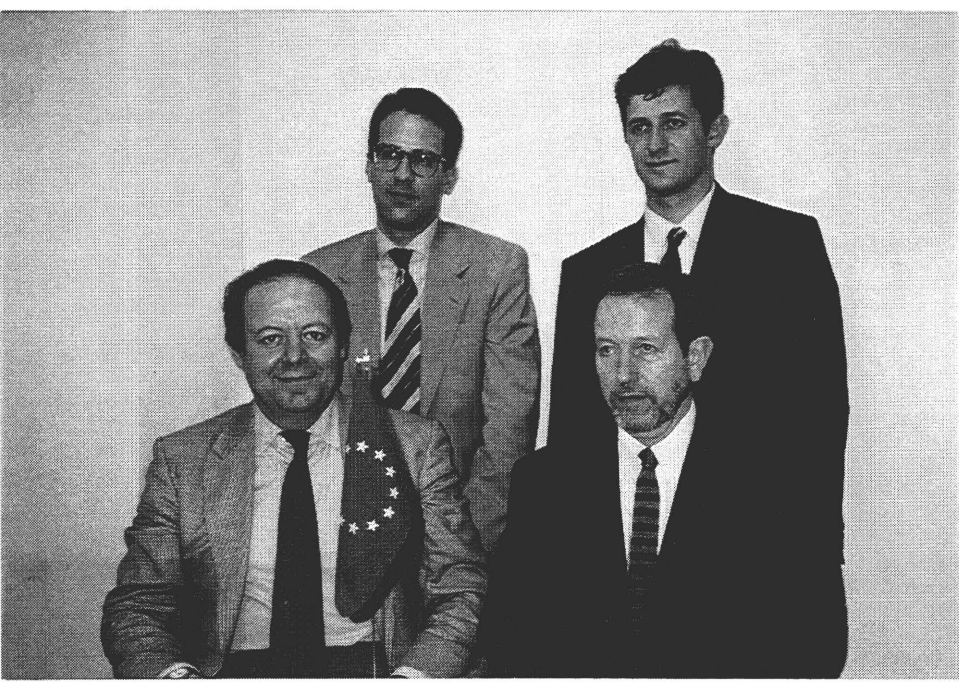




1



2.



3



4



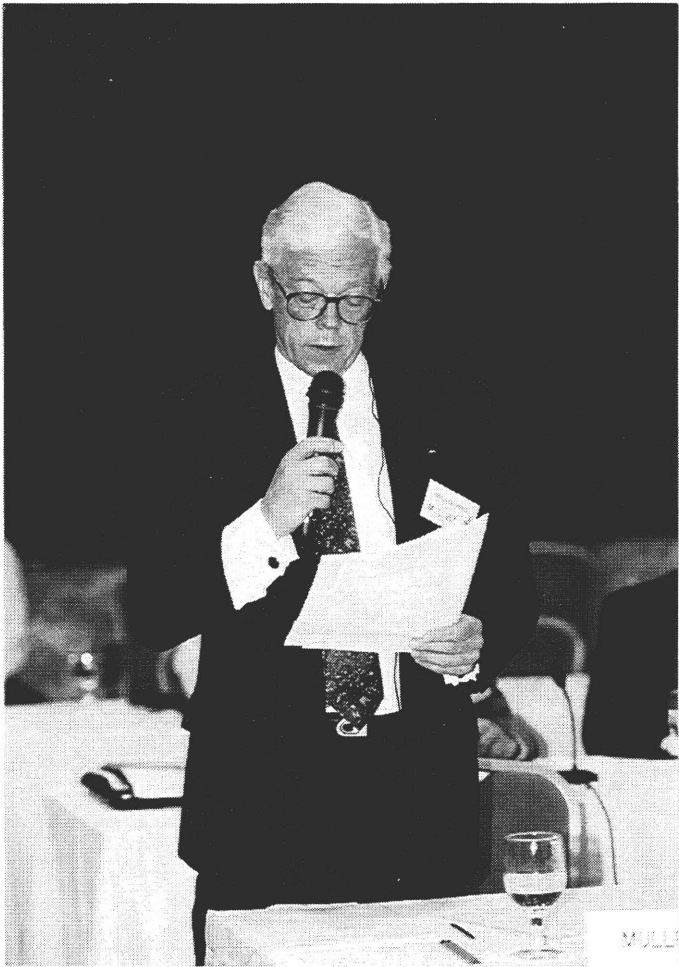
5



6



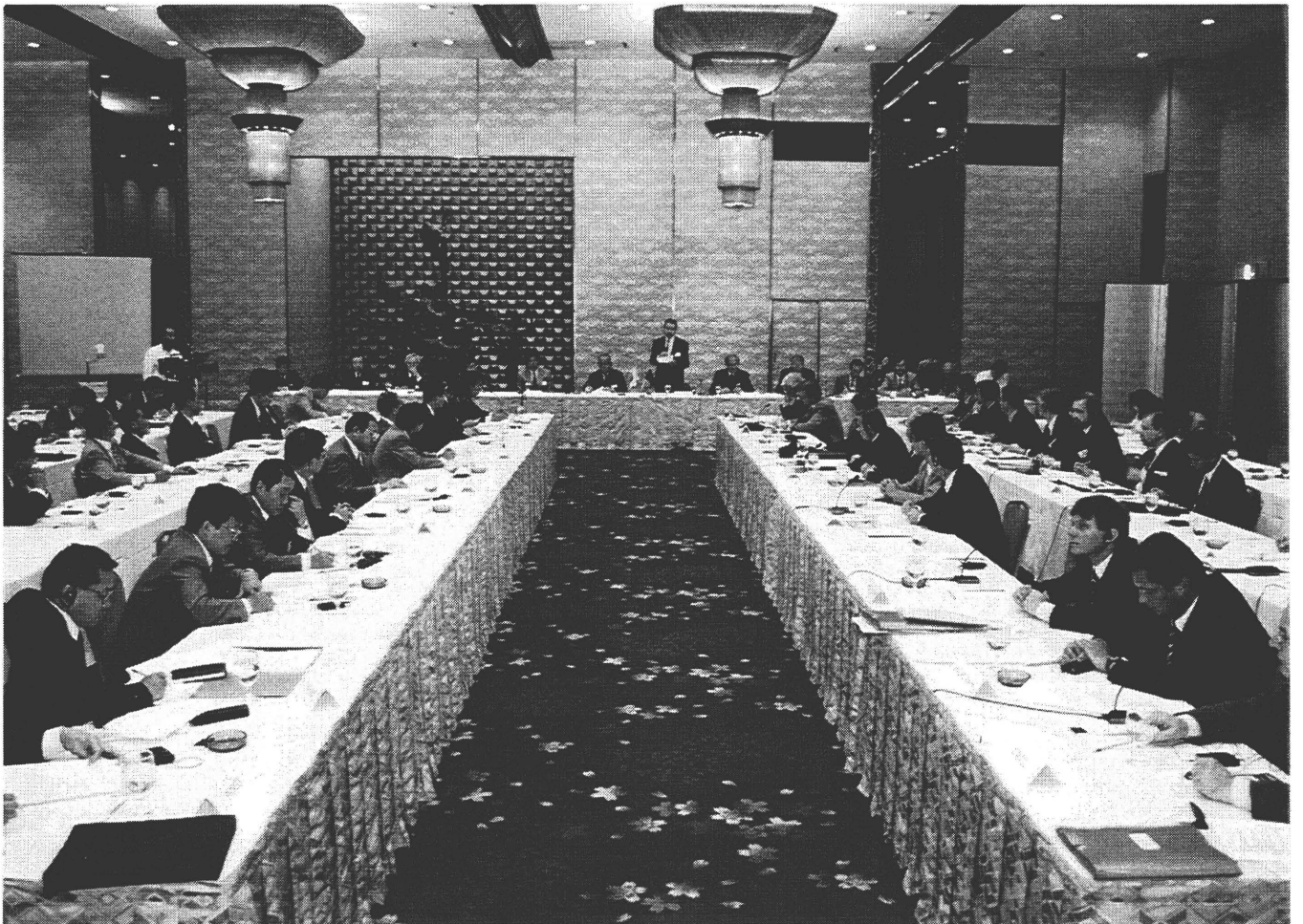
7



8



10



11



12



13



14

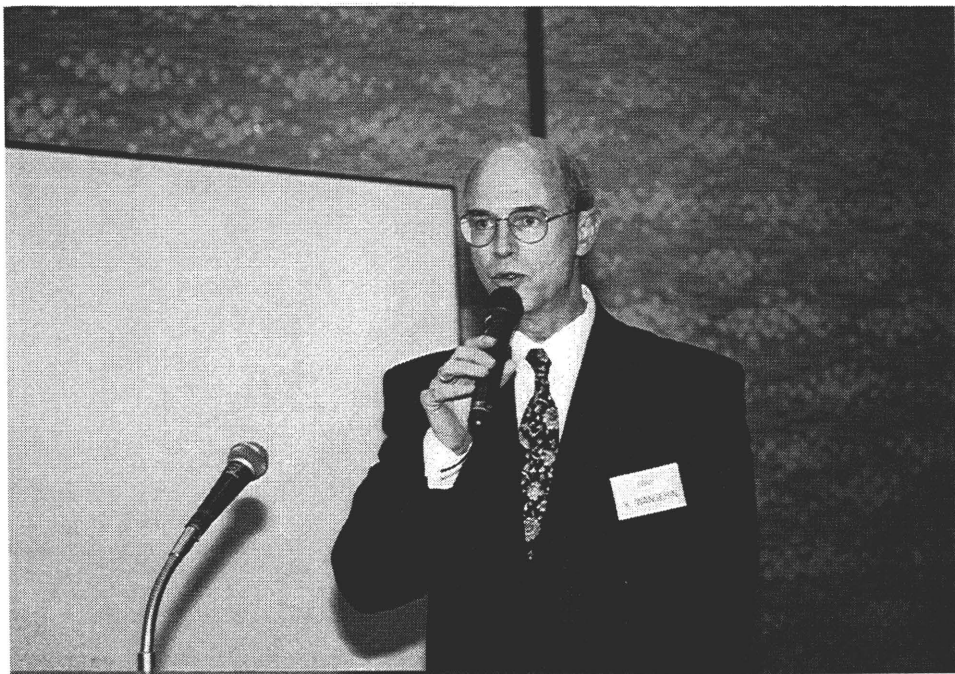




15



16



17

*For further information please contact:*

**MR. THOMAS BOURKE  
INTERNATIONAL CO-OPERATION EUROPE LIMITED  
TREVES CENTRE  
45 RUE DE TREVES  
1040 BRUSSELS  
BELGIUM**

**TEL: +32 2 238.78.02/.13/.38**

**FAX: +32 2 238.77.16**