NOTE

Endeavors to Reduce Environmental Pollutants in Products

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1 Introduction

Worldwide concern for the environment is mounting year by year. Serious problems have arisen - global warming due to increasing emissions of greenhouse gases, a rapid rise in waste volume resulting from global economic growth and higher living standards, plus the release of environmental pollutants owing to inappropriate treatment and illegal dumping of wastes.

FUJITSU TEN's environmental measures for its products consist of energy conservation to cut the power consumed by products, resource conservation through making products more compact and lightweight, recycling to reduce wastes, and reduction of lead, hexavalent chromium and other environmental pollutants. Further, in the process of manufacturing our products, we pursue energy and resource conservation by heightening production efficiency and making effective use of materials so as to cut down on wastefulness.

As we move on into the 21st century more and more regulations are being put into place concerning the reduction or elimination of environ mental pollutants that cause harm to human beings and other organisms. Measures to counter the harmful substances contained in products are now an important issue.

2 FUJITSU TEN's product environmental measures

Our products have a long history of contributing to the environment, stretching back to 1973, the year after FUJITSU TEN's foundation, when we produced emission control units to reduce the air pollution that Los Angeles was suffering due to exhaust gases. Responding to the regulatory Muskie Act which was passed at that time, car manufacturers equipped vehicles exported to California with simple engine control systems (regulating ignition timing and throttle opening degree) for reduction of the CO (carbon monoxide), HC (hydrocarbon) and NOx (nitrogen oxides) contained in automobile exhaust, and FUJITSU TEN contributed thereby to the alleviation of smog and similar in that state's urban areas.

When world attention focused on environmental problems in the 1990s, we began to grapple with them in earnest. Our first move was to totally eliminate the cleaning chlorofluorocarbon used in our production processes, since it was an ozone depleting substance. Subsequently our emphasis has moved on to green product development in order to lessen the environmental pollutants imposed by the products themselves. Fig. 1 shows the course taken by our environmental measures for products in the past and the course they are set to take in future.

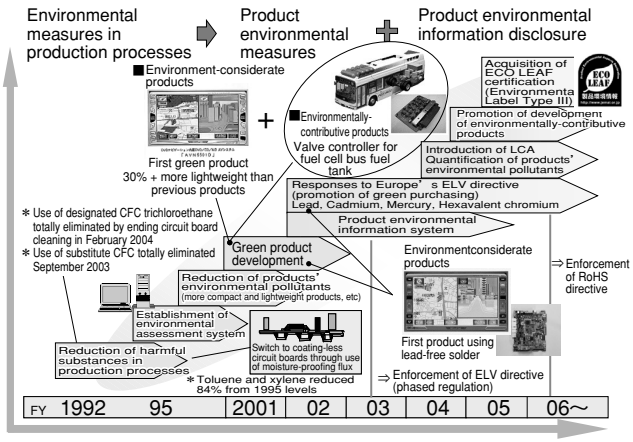


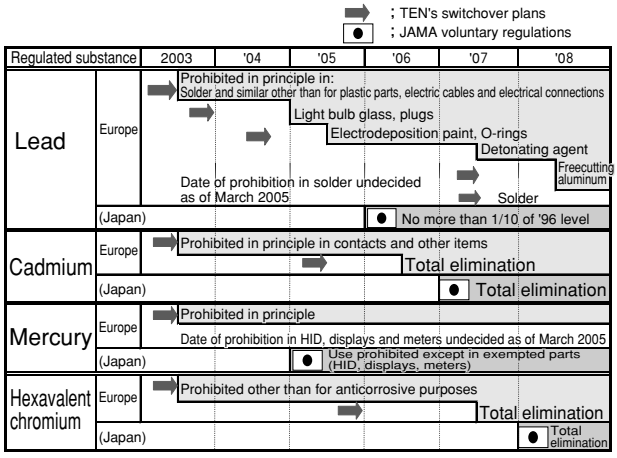
Fig.1 Environmental measures history for Fujitsu TEN products

3 Overview of environmental pollutant regulations relating to products

The environmental regulations that concern our products include the European ELV directive (on end-of-life vehicles) the European RoHS directive (imposing restrictions on the use of designated harmful substances in electrical and electronic equipment), the mercury regulations laid down by individual states of the U.S.A., and the voluntary regulations devised by the Japan Automobile Manufacturers Association (JAMA).

Of these regulations, the one with the largest impact is the European ELV directive. Fig. 2 gives an overview of this regulation and of JAMA's voluntary regulations. As used herein, the term "environmental pollutants" refers to lead, cadmium, mercury and hexavalent chromium. Lead in solder used for electrical connections is not currently regulated by the European ELV directive but is

highly likely to become so under future amendments (the directive already prohibits the use of lead in solder used for mechanical bonding of fuel tanks and similar). Furthermore, home audio products marketed from July 2006 onward will be subject to the regulations of the European RoHS directive, which adds bromide flame retardants to the 4 regulated substances of the ELV directive and will apply to solder lead right from the beginning.



【Criteria for determining presence of the 4 substances】
When a product is broken down into the minimum units of its component parts/materials/submaterials, the concentrations of lead, mercury and hexavalent chromium in such minimum units should be no more than 1,000 ppm by weight and the concentration of cadmium should be no more than 100 ppm by weight.
Intentional addition of the substances is not permissible (in principle, not even in an amount of 1 ppm).

Example: A DC motor is made up of more than 20 component items including the casing, magnets, copper wire, protective paint, solder, etc. If the motor is checked whether the content of all 4 substances in all such items is below the criterion levels, it will be necessary to analyze each layer of their surface treatments for content of the 4 substances since hexavalent chromium may have been used for their surface treatments.
In some cases, the lead content of the magnets, magnetic paint and other component items may be above the criterion levels.

Fig.2 Overview of European ELV directives and Fujitsu TEN's promotion plan

4 Measures for products

The content of our currently proceeding activities for elimination of environmental pollutants is set forth in Fig. 3. Top priority is the elimination of hexavalent chromium, which is to be implemented in all products. The switch to hexavalent chromium-free products began in August 2004 and is scheduled to be completed in December 2005. We are also moving urgently ahead with elimination of lead from solder. This was initiated with the elimination of solder lead from general specification car audio products in fiscal 2002; since fiscal 2003 it has been applied to certain OEM products for automobile manufacturers, and each year its application is being expanded to more equipment types. Some customers specify lead-free solder from the prototype onward. The technology for switching to lead-free solder has been presented in these pages many times before and does not need repeating here.

Suffice it to say that the switch has entailed not only changes in the solder materials, but also changes to electronic part specifications (changes to the terminal platings and improved heat resistance due to soldering temperature of 40℃ UP), together with work method changes and replacement of soldering equipment at all of our production bases. This represents an unprecedentedly large reformation of FUJITSU TEN Group's manufacturing. Accordingly we are proceeding with this transition as a project activity centering around the design, production and purchasing departments, with completion targeted for July 2007.

Lead in materials such as steel plate, brass and free-cutting aluminum is either unregulated or permitted in minute amounts at the present time. In the future however we will proceed with activities for total elimination of lead from such materials. Elimination of lead from other parts and materials such as polyvinyl chloride, paint additive and light bulb glass is already complete.

Additionally we have eliminated the use of cadmium from motor rectifiers, relay contacts and the like.

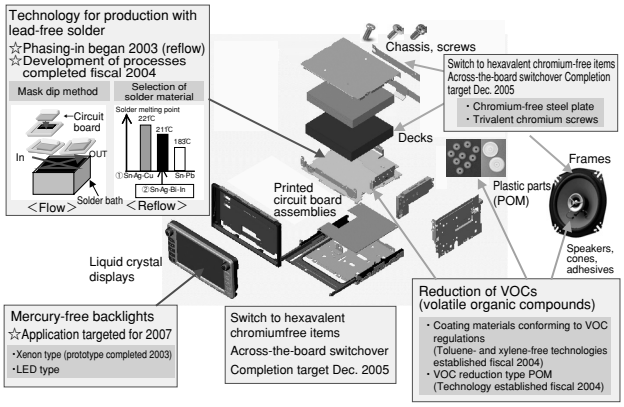


Fig.3 Endeavors to reduce products' environmental pollutants

5 FUJITSU TEN's endeavors and newly-developed information systems

In order to reduce/eliminate environmental pollutants, FUJITSU TEN requires the cooperation of all departments involved with products, and to make its policy thoroughly known among them. Design departments determine specifications and conduct assessments of parts and materials for selection purposes. And in parallel with the design departments' activities, the purchasing departments implement green purchasing and acceptance inspection for environmental pollutants, while the production engineering departments develop methods for the switches to lead-free solder and hexavalent chromium free items.

But it is the design departments that have the major

role, and a product environmental information assessment system is used in order that the designers verify in the product design stage whether environmental measures have been taken. (Such system is presented in Fig. 4.) When a new equipment type is designed, this system functions like a barrier that must be passed before the prototype stage can be proceeded to; design changes must be implemented as necessary until the standards are met. Further, the results of environmental measure assessment are retained as evidence, which besides being of use in the event of some fault (environmental performance inadequacy), is also used as a database for future new equipment types.

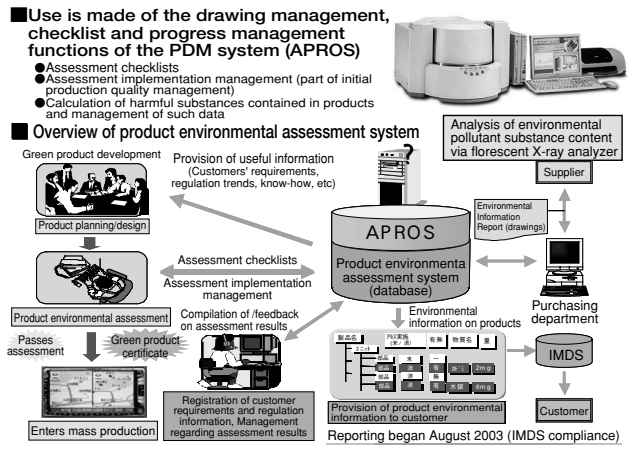


Fig.4 Present product information/environmental assessment system

Next is described the creation of information systems for when environmental measure design is actually carried out.

The parts that are the objects of the environmental measures (parts for applying lead-containing solder to terminals, and pressed metal plate parts and screws that use hexavalent chromium) are used in all products in numerous varieties. Therefore a vast amount of work is required for the design changes, substitute item assessment and switchovers at production sites that are entailed by the switch to lead and hexavalent chromium free items, making it extremely difficult to control which parts of which products undergo the switches at which times. Accordingly, systems were created that would enable switchover operations to be accomplished quickly, efficiently and without omissions in the course of the elimination of lead and hexavalent chromium.

5.1 Provision of information for parts targeted for switchover

Designers must first of all know the environmental information for the products they are in charge of. To that end they identify those of the parts making up new products and products in production that contain environmental pollutants (lead or hexavalent chromium) and seek substitutes for them. If none are found they request the venders to make improvements. We have now constructed a tool that allows such information to be shared and utilized throughout the company (Fig. 5). This tool provides information on environmental pollutant content in parts targeted for switchover and makes clear the overall switchover parameters. It can be utilized by various departments involved in parts switchover to get basic switchover information - by design departments when issuing drawing change instructions, by production/purchasing departments when placing orders and making changes to production master plans, etc.

(As of March 2003, the tool has registered roughly 1,700 parts containing hexavalent chromium and roughly 8,000 parts containing lead in their terminals.)

環境対応 旧品番→新品番

検索結果CSVでダウンロードする

※新品番は部品認定の最終認定まで完了しているものを使用してください。

切替時期が空白のものは、鉛フリー化を行わないで下さい。
部品プロより切替時期の指示がされるまでお待ちください。
(鉛フリーについて不明な点は、部品プロ 阿部(4788)までお願いいたします)

旧品番	区分	新品番	品名	発番者	発番日	STCD	STCAD	切替時期
8111O0-00840730	鉛(含有)	8111O0-24090730	ﾀﾞｲｵｰﾄﾞ	畳原 佳徳	2004/04/20	7		鉛:1次
8111O0-00840739	鉛(含有)	8111O0-24090739	ﾀﾞｲｵｰﾄﾞ		2004/04/20			
8111O0-00860730	鉛(含有)	8111O0-24100730	ﾀﾞｲｵｰﾄﾞ	畳原 佳徳	2004/04/20	7		鉛:1次
8111O0-00860737	鉛(含有)	8111O0-24100737	ﾀﾞｲｵｰﾄﾞ		2004/04/20			
8111O0-00860738	鉛(含有)	8111O0-24100738	ﾀﾞｲｵｰﾄﾞ		2004/04/20			
8111O0-00860739	鉛(含有)	8111O0-24100739	ﾀﾞｲｵｰﾄﾞ		2004/04/20			
8111O0-0086073X	鉛(含有)	8111O0-2410073X	ﾀﾞｲｵｰﾄﾞ		2004/04/20			
8111O0-05740700	鉛(含有)	8111O0-23720700	ﾀﾞｲｵｰﾄﾞ	中條 良和	2004/01/27	7		鉛:1次
8111O0-05830700	鉛(含有)	8111O0-24980700	ﾀﾞｲｵｰﾄﾞ	畳原 佳徳	2004/07/29	7	7	鉛:2次
8111O0-05900700	鉛(含有)	8111O0-24990700	ﾀﾞｲｵｰﾄﾞ	畳原 佳徳	2004/07/29	7	7	鉛:2次
8111O0-05910700	鉛(含有)	8111O0-25000700	ﾀﾞｲｵｰﾄﾞ	畳原 佳徳	2004/07/29	7	7	鉛:2次
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8111O0-07190730	鉛(含有)	8111O0-24050730	ﾀﾞｲｵｰﾄﾞ	畳原 佳徳	2004/03/26	7	7	鉛:1次
8111O0-07190739	鉛(含有)	8111O0-24050739	ﾀﾞｲｵｰﾄﾞ		2004/03/26			
8111O0-07330730	鉛(含有)	8111O0-24340730	ﾀﾞｲｵｰﾄﾞ	畳原 佳徳	2004/05/27		7	鉛:1次
8111O0-07330739	鉛(含有)	8111O0-24340739	ﾀﾞｲｵｰﾄﾞ		2004/05/27			
8111O0-07340730	鉛(含有)	8111O0-23880730	ﾀﾞｲｵｰﾄﾞ	畳原 佳徳	2004/03/10	7		鉛:1次
8111O0-07340739	鉛(含有)	8111O0-23880739	ﾀﾞｲｵｰﾄﾞ	木山 薫	2004/03/10			
8111O0-0734073R	鉛(含有)	8111O0-2388073R	ﾀﾞｲｵｰﾄﾞ	市来 知実	2004/03/10			
8111O0-0734073X	鉛(含有)	8111O0-2388073X	ﾀﾞｲｵｰﾄﾞ	市来 知実	2004/03/10			
8111O0-0734073Z	鉛(含有)	8111O0-2388073Z	ﾀﾞｲｵｰﾄﾞ	市来 知実	2004/03/10			
8111O0-07420730	鉛(含有)	8111O0-24350730	ﾀﾞｲｵｰﾄﾞ	畳原 佳徳	2004/05/27	7		鉛:1次
8111O0-07420739	鉛(含有)	8111O0-24350739	ﾀﾞｲｵｰﾄﾞ		2004/05/27			

Fig.5 Provision of information on parts targeted for switchover

5.2 Enhanced efficiency of design change operations in response to environmental regulations

For the switchover from parts containing environmental pollutants to ones that do not, we have constructed a tool that makes automatic alterations to the product part lists while also registering the content of (keeping histories of) the design departments' design changes. This tool was realized by expanding the functions of the existing design support tool (known by the acronym APROS) that performs uniform management of part Nos., product part lists, design changes and issuing of drawings.

The following processes are generally held to be necessary for changing the design departments' drawings:

①Identification of parts that are targeted for change, and coordination for the switchover

②Preparation of change notification sheets

③Preparation of plan for drawing issue
④Altering of part lists and preparation of notificatory lists of alterations
⑤Electronic approval of drawings
⑥Sending out of drawings

The newly constructed tool automatically identifies, in advance and without omission, the product part lists that include parts targeted for the change. This enables the departments concerned in the switchover to conduct advance discussion among themselves and issue a collective approval, following which the tool incorporates the content of such approval in the change notification sheets. In this way the tool automates processes ③ to ⑤ (refer to Fig. 6).

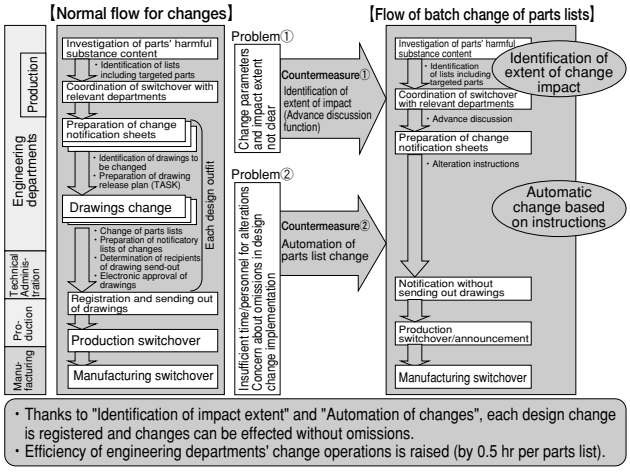

Fig.6 Mechanisms for batch alteration of design part lists in response to environmental measures (Pb, Cr^{6+})

By synchronizing this tool with the part switchover timing and applying it a dozen or so times, it was possible to process automatically a total of some 37,000 design part list alterations (a figure amounting to about 2 years' worth of design changes). Further, the tool has limited the design departments' work in such matters to the advance discussion and decisions on switchovers, thus effecting a major reduction in man-hours over previous practice.

5.3 Tool to render transparent the state of progress of environmental measures (under construction)

Below is described a "Mieruka[(1)](visualization) tool" that is currently under construction with the purposes of enabling information on parts switchovers in response to environmental regulations to be shared and utilized worldwide in real time, and of providing support and feedback for achievement of targets for elimination of environmental pollutants (refer to Fig. 7).

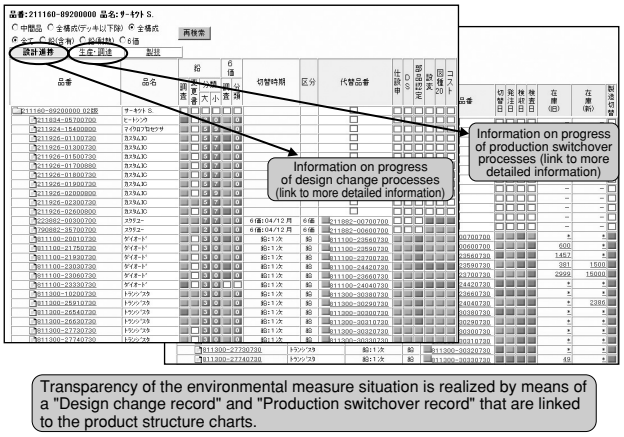

Fig.7 Mieruka (visualization) of the progress of environmental measures (Note1)

The principal element of this tool is structure charts expressed via a multistage regular expansion of lists of products' component parts. More specifically, such charts express structural information in (family) tree form, with the parent (whole) - child (part) relations expressed in the parts lists for each level arrayed into parent - child - grandchild - great-grandchild branches, extending down to the terminal level parts. The tool provides screen displays of the following information concerning the component parts:

- **Parts data (environmental pollutant content, part specifications)**
- **Design change information (progress of drawing issue, parts approval information)**
- **Parts purchasing information (venders determined, order status)**
- **Production switchover information (parts deliveries and inventories), etc.**

For aggregation of information the tool is linked with the data systems of the various departments and bases. The screens are configured so as to display using color coding how far (up to which process) switchovers have been implemented and to show at a glance the parts inventory situation before and after switchovers. Care has been taken to provide hyperlinks to more detailed information, which users can access by mouse-clicking on items of interest.

Thus the tool will enable the outfits involved in the switchovers to perform their switchover operations without omissions, and will offer feedback support concerning

(Note 1): "Mieruka", put simply, is an approach for rendering problems "visible". It could also be said that this approach refers to work places where the difference between normal and abnormal condition is clear, or to job site where various work issues are taken care of without hesitation.

the previous and subsequent processes. (As of March 2005 the tool permits aggregation of information from 3 domestic bases and 1 overseas base. The number of such bases is to be expanded in the future.)

The tools developed so far permit efficient and omission-free implementation of mainly in-house design change operations. In future tools will need to be developed to meet outstanding requirements for:

- **Expansion of the above-described Mieruka for environmental measures**
- **Storage of environmental measure evidence**
- **Control of environmental pollutants contained in submaterials (such as solder) added to products in production processes**

6 Conclusion

Measures for environmental pollutants are necessary in order to proactively prevent environmental pollution and harmful impacts on human health when products are discarded, as well as to facilitate recycling of products that have reached the end of their service, turning them into reusable resources. Therefore it is our duty as manufacturers to develop products free of harm to humans or other organisms, and to make products that can be used generation after generation through any number of changes in their form.

Profiles of Writers

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