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## SDTL's Smartmatic Transmission Selector

### **The Concept's Benefits to Manufacturers and End-Users**

#### **Executive Summary**

By using the Smartmatic Selector to produce a fully automatic transmission on a layshaft gearbox platform, a major benefit offered to the transmission manufacturer is the ease of making manual and automatic transmissions on the same line. No longer is there a need to have two discreet manufacturing facilities with all the operational and cost penalties associated with them. This markedly increases production efficiency and return on assets employed.

While the Smartmatic is based on the layshaft manual transmission gear arrangement, it provides the full functionality of an automatic transmission.

**It is not just another automated manual transmission.** It provides a fully functional and fully controllable automatic transmission that is smaller, lighter and cheaper to produce than current automatic transmission offerings. Put simply, the Smartmatic transmission is one where the selector forks, synchroniser rings and dog clutch mechanisms that are usual in a manual transmission are replaced with compact hydraulically (or electrically) actuated Smartmatic selectors.

What sets this concept apart from all others is the full controllability of the selector mechanism and the ability to tailor shift speeds for sports (very fast) applications, or luxury motoring (slower, synchronised, full power shifts), by making changes to the control system only.

The factor that determines whether or not the Smartmatic transmission is regarded as manual or automatic is purely a question of how much driver intervention in the gear changing process is allowed by the control system. The market tendency is to reduce the intervention, or provide for intervention under defined circumstances. The trend to "tiptronic" or "selespeed" gear changing is a typical example.

Transmissions incorporating the "Smartmatic" technology give a very wide range of possibilities for the application engineers (sometimes called Vehicle Engineers) because of the flexibility on

things such as shift speed and the number of ratios available. Like any layshaft transmission, the addition of ratios is nothing like the problem it is in a conventional automatic transmission.

For example, in sports cars, the shift speed can be much faster than is available by mechanically shifting components to engage gears or a dog clutch. The upshifts can be made to be automatic, while the skilled driver can do the down shift when entering into changed driving conditions to select the gear most appropriate. Conversely, in a fully automatic transmission equipped family car, or luxury derivative, the shift speeds can be slowed and synchronised to provide virtually imperceptible gear shifts.

When combined with the lower weight and compactness of a Smartmatic, this total freedom to control gear shifts for any set of circumstances means that the transmission manufacturer can offer the vehicle manufacturers a total solution from the one production facility.

### **The Financial Benefits of the Smartmatic Concept to the Manufacturer**

For the transmission manufacturer, the Smartmatic concept offers the opportunity for enormous financial gains in all areas, the sum of which amounts to a very sizeable increase to fully accounted profit levels.

Each key financial area is discussed briefly in the following paragraphs.

#### **Investment in Facilities and Tools and an Increased Return on that Investment**

The major benefit of the Smartmatic concept is that it is based on conventional layshaft constant mesh manual transmission layouts. Both manual and automatic versions can be produced on a shared manufacturing facility, with only revisions to certain stations being required. Therefore, any manufacturer with a manual transmission production line can go into production of fully automatic transmissions with only minor revisions to the existing facilities and tools (F&T). *The adoption of the Smartmatic concept does NOT require a huge investment in new F&T for a new technology.*

#### **Economic Profit Margin Increase**

Being able to upgrade to a new technology without having to amortise hundreds of millions of Dollars for tooling and facilities means that not only a more exciting product can be offered to the manufacturer's clients, but also that a manufacturer can charge a higher price for a "manual" transmission hence the long term economic profit margin of the transmission manufacturer will be significantly enhanced (see also Production Cost below).

#### **Lower Inventory Carry Costs**

A significant advantage to the transmission manufacturer and its customers is in the area of service and spare parts. No longer is there a need to carry two inventories, one for manuals and one for the automatics.

#### **Lower "per unit" Production Cost**

When utilising this new technology, the difference in the cost of manufacture of a manual transmission and its “sister” automatic layshaft transmission could be, if not zero, then at least significantly smaller than the nominal A\$800 disparity in unit production cost that currently exists between a manual transmission and a normal planetary gear based automatic transmission.

Looking at these projected cost savings from the global manufacturers’ point of view, the following assumptions were made:

- Automated manuals and concepts like the Smartmatic Selector are increasing in popularity to such a degree that their current 3% to 4% replacement rate of traditional automatics in the Light Vehicle Market will increase to over 30% (approx. 12 million units) by the year 2012.
- If everyone in this market segment would adopt the Smartmatic concept and generate a per unit saving of say A\$700, the cumulative saving to the industry, over one decade only, would amount to over A\$50 billion!

### **Less Engineering Support Required**

For a manufacturer who fully adopts the Smartmatic transmission selector concept, engineering costs can potentially be reduced as the company would only need to work with one design instead of two quite different designs.

### **Reduced Staff Overheads**

Staff overheads can also be lowered as “duplication” of designs, production lines and even plants would be eliminated. Conversely, manufacturers who now only produce one type of transmission variant, ie. manuals only, will have the flexibility to produce an end product that can be a manual, semi-automatic or fully automatic transmission, without having to increase staffing levels.

Savings can also be achieved in the area of product training as technicians can be trained, in less time than needed with larger product differentiation, to have a thorough understanding of the transmission and how it works regardless of whether or not the transmission is being applied as a manual, semi-automatic, or full automatic.

### **Rationalisation of Product Offerings**

For a full range transmission manufacturer adopting the Smartmatic concept, the reduction in product diversification, ie. rationalisation from two to one base product, and the resultant economies of scale will translate into a significant financial benefit.

### **Higher Return on Assets Employed**

The ability to offer manual and automatic and even semi-automatic transmissions from the one production facility, without having to have separate lines or plants and the accompanying costs of

facilities and manpower, will result in a markedly higher return on assets employed by a company utilising this new technology.

### **Lower Warranty Liabilities**

There is a growing trend in the automotive industry to offer extended warranty on new cars. Warranty periods of 3 years and 100, 000 km are quite common now, with some car makers offering much more. Some modern transmissions are also “sealed for life”, the expectation being that it will require no attention for the life of the vehicle. Gone are the days of regular fluid top-ups and changes, regular band adjustments and so on.

Any transmission incorporating the Smartmatic selector concept will be able to compete on those terms, thereby decreasing the manufacturer’s warranty liabilities.

That statement made, it should be qualified by saying that inherent in the “sealed for life” approach is that an automatic sensing and warning system is included in the transmission and its management system. A major portion of the product liability is obtained by removing the chance for anyone to “fiddle” with the transmission during normal vehicle service.

There may be times, however, when some component in a manufacturer’s 100% OK Quality system “slips through the net” and finds its way into a customer’s car. On such a very rare occasion the company would most likely repair the car under the terms of its warranty, and an important factor is therefore the cost of effecting a repair.

With many of the lower cost items, it is often cheaper to replace the whole assembly than it is to attempt a repair. A higher cost item like a transmission will always be in the “grey area” of this decision process and a significant criteria is the ease of disassembly and reassembly. It is therefore important that any new transmission be as simple as possible to disassemble and repair, and that it should automatically sense and warn the owner of any impending problem such as loss of fluid, for example.

### **Large Increase to Fully Accounted Profit Levels**

Any manufacturer who adopts the Smartmatic transmission selector technology will not only benefit from a higher per unit economic profit but also enjoy financial benefit from the above noted areas. All these will add to the “bottom line” in the form of greatly increased fully accounted corporate profits.

### **The Sales Benefits with Smartmatic**

With Smartmatic, the sales team of a manufacturer utilising this exciting new technology have a distinct advantage over those competitors who do not have it. There is not a transmission offering available today that a Smartmatic could not replace.

This means that the company’s sales team can go out into the market place knowing that they can offer a solution for any transmission requirement, be it manual, semi-automatic, ‘tiptronic’ or fully automatic.

### **The Human Resources Benefits**

Because there is no need to have two plants to manufacture manual and automatic transmission offerings, the staffing requirements are significantly reduced.

Likewise, because the manual and automatic Smartmatic offerings are basically the same product, there is a greatly reduced need in areas of engineering support, purchasing and supply, parts and service, accounting and administration.

The rationalised product offering also enables the number of technical training programs to be reduced and more focused on the core technology.

### **The Product Development Benefits**

With the Smartmatic concept, the product development office can focus its attention on the refinement and application of the core technology, quickly resolving any field problems or applications issues.

### **The Parts and Service (P&S) Benefits**

The Smartmatic transmission concept enables the manufacturer to greatly decrease the number of spare parts it must carry. This provides an opportunity to greatly increase the level of inventory turnover. Lower manpower levels and simplified administration processes are all factors that would bring about major improvements in the P&S operations profitability.

The rationalised product offerings also minimises the range of skills required to service the product in the field. Training and service aid programs are therefore much more focused and efficient, allowing for highly cost effective customer support for the product in the field.

***DISCLOSURE:*** *Since first being engaged as independent consultants by Select Design Technologies Limited in the first quarter of 1999, the directors of Decson (authors of this paper) were appointed directors of Select Design Technologies Limited in July 2000. The authors of this paper can therefore no longer be regarded as independent consultants. The above statements on Decson letterhead are presented this way purely as a means of conveying to the reader the credentials of the authors to make such “expert” comment.*