DETR
ENVIRONMENT
TRANSPORT
REGIONS

GOOD PRACTICE CASE STUDY 374

Efficient JIT supply chain management

Nissan Motor Manufacturing (UK) Ltd

- **Load consolidation giving improved vehicle utilisation**
- **Fewer vehicle miles resulting in lower fuel consumption, congestion and less pollution**
- **Improved planning and predictability**
- **Reductions in carbon dioxide and other vehicle exhaust emissions**

BEST PRACTICE PROGRAMME

ENERGY EFFICIENCY

BEST PRACTICE PROGRAMME

GOOD PRACTICE CASE STUDY 374

BACKGROUND

Nissan Motor Manufacturing (UK) Ltd operates a vehicle assembly plant in Sunderland, Tyne and Wear, where currently the Primera and Micra models are assembled. In order to compete effectively in the UK and world export markets, Nissan needs the ability to produce vehicles at minimal cost whilst retaining the production flexibility and quality control necessary to maintain its market position. Effective supply chain management is critical to achieving these objectives.

Each vehicle is constructed from a large number of component parts sourced from various UK and European suppliers. Historically, each supplier would transfer goods from the point of manufacture to the component stock warehousing facilities at the Nissan plant. Component deliveries were unpacked and sorted by Nissan staff and subsequently distributed to sub-warehousing facilities, or direct to the production line.

Over recent years commercial necessity has driven Nissan to move to a Just In Time (JIT) based supply system. This led to inventory levels being reduced from 12 to 2.5 days' supply. As the JIT system developed, however, the quantity and frequency of goods vehicle traffic to and from the site increased significantly, with consequential energy and environmental penalties. In addition, the management and administration of the system became increasingly cumbersome.

For this reason in 1990 Nissan piloted an integrated logistics scheme to resolve the administration difficulties and to reduce the adverse environmental impact of the supplier-based JIT delivery system.

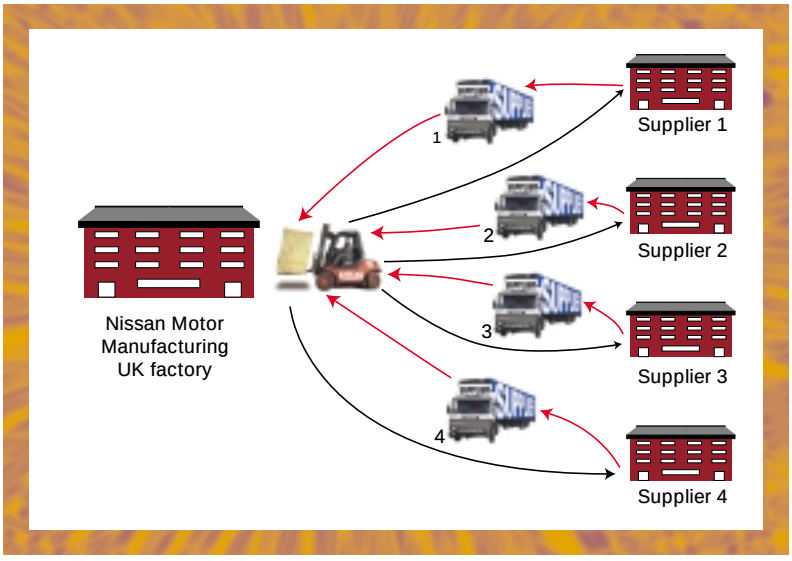

Fig 1 Traditional component delivery system

IMPLEMENTATION OF THE INTEGRATED LOGISTICS SCHEME

Under the original system the suppliers transported the component parts to the Sunderland site, where the components were unloaded and stocked. This arrangement is shown in Fig 1.

Nissan recognised that there were significant opportunities for load consolidation as well as the potential for further reductions in inventory levels. A remote consolidation scheme, based in the Midlands, was therefore piloted with Ryder Integrated Logistics during 1990/91. This scheme was not solely restricted to transport planning: every aspect of the supply chain was considered with the intention of eliminating or reducing waste packaging, storage space, unpacking time, line transfer, etc. The fully integrated logistics scheme combined the management and operation of all these elements of the supply chain within one single logistical management activity.

The logistics scheme comprises a supplier collection activity, a consolidation activity, a JIT component delivery system, and a re-usable packaging control and return system, and operates in three stages:

- the supplier collection;
- the 'cross-dock' load consolidation;
- the 'line-haul' delivery to Nissan.

The project was monitored independently by Cadogan Consultants. Tel: 0141 270 7060.

The logistics scheme is managed by Ryder Integrated Logistics. Tel: 01753 735000.

There are other suppliers of similar services on the market. Please consult your supplier directories or contact ETSU who may be able to supply you with more details.

KEY ELEMENTS OF THE LOGISTICS SCHEME

The component flows are illustrated in Fig 2. As a result of load consolidation, vehicle utilisation on the line-haul is very good compared with average industry vehicle utilisation levels, resulting in reduced vehicle mileage, with consequential fuel savings and environmental benefits.

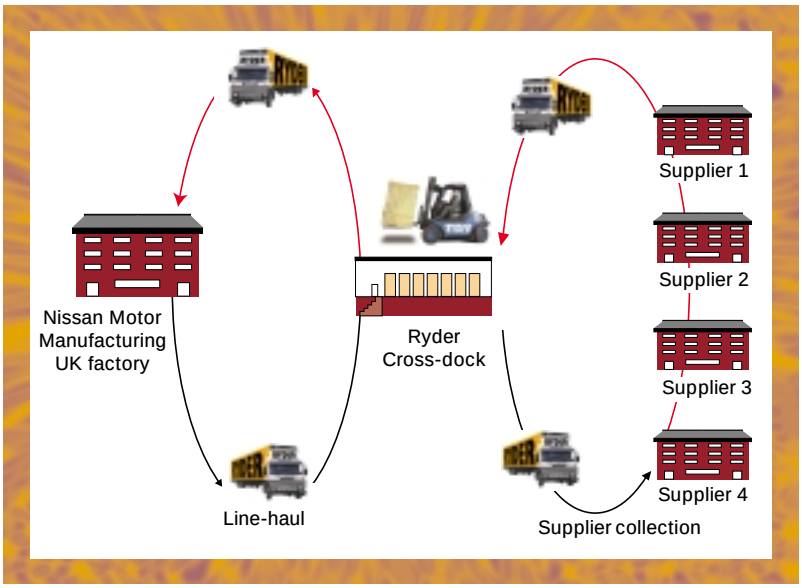

Fig 2 Operation of the integrated logistics scheme

KEY ELEMENTS OF THE LOGISTICS SCHEME

Supplier Collection

The success of this operation relies heavily on the partnerships forged between Nissan, Ryder and the suppliers. Nissan's predictable ordering system is a key aspect of the scheme, enabling Ryder to manage the supply chain more efficiently.

Order generation is based on Nissan's planned production. The 'delivery manifest' details the component type and quantity and the precise date, time, and location for the delivery. Ryder developed and employs JIT routing and scheduling software to optimise the component collection and packaging return schedule. The 'collection manifest' stipulates exact collection times for the components from suppliers' premises.

'Cross-dock' load consolidation

The cross-dock is a load consolidation point. The cross-dock site was selected on the basis of proximity to the suppliers and the trunk road network. Collection vehicles are unloaded at the cross-dock and the line-haul loads are assembled to meet the requirements of the Nissan production line. The line-haul loads are marked with the discrete delivery time and location information detailed in the delivery manifest. The maximum stock ever retained within the cross-dock is sufficient for approximately 16 hours' supply.

'Line-Haul' deliveries

The consolidated loads leave the cross-dock at a scheduled time to meet the delivery times specified in the delivery manifest. The line-haul drivers are responsible for the correct and timely delivery and off-loading of components to coded site locations in accordance with the delivery manifests. A computerised load receipt system (POD, proof of delivery system) acknowledges receipt of the incoming goods. It also identifies the type and quantity of re-usable packaging which may be collected from each delivery point to be returned on the line-haul vehicle to the cross-dock. Packaging returned to the cross-dock is returned to the suppliers by the vehicles used in the supplier collection process.

Supply chain visibility

The electronic ordering and manifest generation scheme allows greatly improved supply chain visibility. All ordered products have a Release Authorisation Notice (RAN) which is effectively a batch and component identifier. The RAN also provides time and location information for each batch of components ordered and entered into the supply chain. Any fault that develops in the supply chain can therefore be identified readily and the downstream supply implication assessed.

Quality management and control of the supply chain

Quality management within the supply chain is maintained through a programme of continuous review and improvement. The system addresses all elements of the supply chain including Quality, Cost, Delivery, Development and Management and consequently is termed **QCDDM**.

BENEFITS OF THE LOGISTICS SCHEME

CALCULATING THE BENEFITS FROM THE LOGISTICS SCHEME

The operation of the Ryder logistics scheme has helped Nissan reduce inventory levels from 2.5 to 0.7 days' supply whilst significantly reducing the overall vehicle mileage within the supply chain.

Ryder's line-haul and supplier collection activities currently provide two complete component deliveries per shift. This involves 4.7 million vehicle miles per year. To calculate the mileage saving attributable to the implementation of this logistics scheme, the Ryder mileage should be compared with that which would have occurred under a supplier-based JIT scheme providing two complete component deliveries per shift. This is not easy to ascertain. An extreme scenario would be if each individual supplier had to make 18 return journeys per week (two per shift), equivalent to approximately 38.5 million vehicle miles per year. This would result in major congestion at the Nissan plant and would imply very low supplier vehicle utilisation. Under such circumstances it is most likely that the suppliers would develop more efficient schemes, incorporating consolidation, to meet the Company's JIT requirements. It is therefore not possible to predict what the total mileage would be under such a supplier-based JIT delivery system. It is extremely unlikely, however, that such a system could match the efficiency of the existing logistics scheme.

An alternative approach is to compare Ryder's total current vehicle miles with an estimate of the total supplier mileage that occurred before the logistics scheme was implemented in 1991. At this time Nissan had reduced its inventory level to 2.5 days. Assuming that this would require four complete component deliveries each week, to cover nine shifts, and that each supplier would make four return journeys per week, this would equate to approximately 8.6 million vehicle miles per year. This is a simplification of how suppliers would have organised their component deliveries, but nevertheless represents a reasonable estimate of the total supplier vehicle mileage.

Using this approach the direct mileage reduction benefit is estimated to be approximately 3.9 million vehicle miles per annum. Assuming that the Ryder mileage is undertaken by 38-tonne vehicles with an average fuel consumption of 8 mpg (1.76 miles per litre) and that the supplier mileage would have been in smaller vehicles with an average fuel consumption of 11 mpg (2.42 miles per litre), then a total of 194,300 gallons (871,000 litres) of fuel is saved. This fuel reduction represents a cost saving of £427,000.

ADDITIONAL BENEFITS

There are considerable related benefits which improve the commercial and environmental aspects of the supply chain.

- The logistics scheme improves supply chain visibility. Previously haulage charges levied by a supplier formed part of the component cost and were not always readily identifiable. Supplier collection agreements and ex-works agreements convert this supplier profit element into a controllable cost for Nissan.
- The transfer of haulage responsibility from the supplier to Ryder has enabled Nissan to improve planning and predictability of transport movement and deliveries with associated efficiency improvements and cost reductions.
- From the supplier's point of view, third party consolidation and haulage reduces the risk and cost associated with delivery scheduling, insurance and freight handling. The logistics schemes allow participating suppliers to focus on their core production activity.

Electronic ordering and manifest generation, improving supply chain visibility

HOST ORGANISATION

NMUK'S mission statement is 'to profitably build the highest quality car in Europe.' Since establishment of the plant at Sunderland in 1984, we have continually developed the operation into what is now widely recognised as the most efficient car manufacturing plant in Europe. Making cars in high volume is primarily a material logistics exercise and consequently a key aspect of this development has been our focus on logistics to manage component part deliveries to our plant from over 200 suppliers throughout Europe. The evolution of our logistics strategies and subsequent control of the pipeline has led to a reduction in our overall costs whilst improving the service level to the production line at Sunderland. It has also given associated environmental benefits from reduced road usage and fuel consumption, lessening traffic consumption and air pollution.

Current logistics operations will be further enhanced to support the introduction of the third model to the plant in the year 2000. This will give further improvements in delivery frequency and efficiency whilst maintaining current high environmental standards. Instrumental in the on-going success of our logistics operations will be the close working relationships which NMUK has developed with both component suppliers and logistics partners.

Terry Hogg
Director of Production Control
Nissan Motor Manufacturing (UK) Ltd

NISSAN MOTOR MANUFACTURING (UK) LTD

Nissan Motor Manufacturing (UK) Ltd was established in 1984 at Sunderland. Since production commenced in 1986 over 1.5 million vehicles have been manufactured. Originally the Japanese-designed Nissan Bluebird was produced in relatively small numbers. Currently the plant manufactures the Primera and the Micra. Production has increased steadily and now exceeds 270,000 cars annually, which are exported to over 48 countries, including Japan.

CONCLUSIONS

The initiative has also produced a range of environmental and other benefits including:

- a reduction in overall traffic volumes meaning fewer accidents, less noise and less congestion;
- a reduction in carbon dioxide emissions of at least 2,300 tonnes per year;
- a reduction in other vehicle exhaust emissions such as nitrogen oxides, sulphur dioxide and particulates;
- a major reduction in the quantity of waste packaging disposed to landfill.

CONCLUSIONS

Nissan has introduced and sustained a commercially efficient Just In Time supply chain. This has been achieved without the adverse impacts on road traffic which are often associated with JIT systems.

The logistics scheme has significantly reduced:

- the car component stockholding and stock handling activities at the Nissan site. Inventory has been reduced from 2.5 to 0.7 days' supply since the scheme was implemented;
- the quantity of fuel consumed by multiple JIT supplier deliveries;
- the total number of vehicle movements and vehicle miles travelled.

The supply chain efficiency improvements achieved by Nissan and Ryder can be achieved by other manufacturing companies.

To implement such schemes consideration must be given to:

- examining the entire supply chain for potential efficiency improvements;
- establishing open and visible commercial relationships between the manufacturer and its individual suppliers;
- the use of routing and scheduling software to optimise collection and delivery manifests.

Changes will be required to the operating practices and structure of the companies involved. However, the commercial, management and environmental benefits are likely to significantly out-weigh the costs involved in changing current practices.

Nissan experienced little difficulty in implementing the desired changes. However the implementation required time, patience, commercial transparency and an extremely high level of understanding and commitment at all levels from Nissan, Ryder and the suppliers.

Returnable packaging

The Department of the Environment, Transport and the Regions' Energy Efficiency Best Practice Programme provides impartial, authoritative information on energy efficiency techniques and technologies in industry, transport and buildings. The information is disseminated through publications, videos and software, together with seminars, workshops and other events. Publications within the Best Practice Programme are shown opposite.

Further information

For buildings-related topics please contact:
Enquiries Bureau
BRECSU
Building Research Establishment
Garston, Watford, WD2 7JR
Tel 01923 664258
Fax 01923 664787
E-mail brecsuenq@bre.co.uk

For industrial and transport topics please contact:
Energy Efficiency Enquiries Bureau
ETSU
Harwell, Didcot, Oxfordshire,
OX11 0RA
Tel 01235 436747
Fax 01235 433066
E-mail etsuenq@aeat.co.uk

Energy Consumption Guides: compare energy use in specific processes, operations, plant and building types.

Good Practice: promotes proven energy efficient techniques through Guides and Case Studies.

New Practice: monitors first commercial applications of new energy efficiency measures.

Future Practice: reports on joint R & D ventures into new energy efficiency measures.

General Information: describes concepts and approaches yet to be fully established as good practice.

Fuel Efficiency Booklets: give detailed information on specific technologies and techniques.

Energy Efficiency in Buildings: helps new energy managers understand the use and costs of heating, lighting etc.