Chartered Institute of Management Accountants

CIMA

August 2017 Management case study examination – pre-seen material

AURORA-AUTOMOTIVE

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Job description

You are a Financial Manager with the Aurora Automotive Company ('Aurora'). You report to Jens Sneider, a Senior Financial Manager, who in turn reports to the Finance Director.

Your primary responsibilities are associated with management accounting. This means that you often have to liaise with colleagues from the Treasury and Financial Reporting functions and also from other functional areas, including Sales, Human Resources and Operations.

The automotive industry

The automotive industry has always been at the forefront of technological developments in manufacturing and in commercial business practices. For example, it has led in the development of automated manufacturing processes and of globalisation in both manufacturing and marketing.

At the start of the 20th century, when the industry first came into existence, manufacturing was heavily dependent on skilled labour. This approach quickly gave way to the use of production lines to improve efficiency and lower costs. These permitted assembly to be broken down into a series of tasks, none of which required a great deal of skill or training. Each worker would fit a specific component to each car that passed on the production line on a repetitive basis.

The introduction of more efficient production methods reduced manufacturing costs to a level where cars and other vehicles could be sold to the mass market and so the automotive industry grew to become a dominant economic force in many countries. Individual vehicles comprise literally thousands of components and many businesses were created to supply the major car makers with parts and materials.

Early production lines were highly efficient, but they offered only limited flexibility. Each production line was designed to build a specific model and there was little or no scope for different versions of a particular car or to add options or accessories during production.

The latter part of the 20th century saw a revolution take place on three fronts.

Firstly, there was a move towards modular component subsystems. Specialist manufacturers offered sub-assemblies such as engines, gearboxes, braking systems, electrical and steering systems. These could be mass produced in order to create economies of scale and the resulting assemblies could then be shipped to the factories where they could be added to the assembly process. This led to a shift away from wholly national car manufacturers to a more global outlook in which, for example, a European manufacturer might use a braking system imported from a manufacturer in Asia and an audio system from a different manufacturer in the USA.

Secondly, manufacturers started to share common components across multiple models and product groups. For example, a manufacturer might create a floor pan, which is essentially the base for the car's body. That same floor pan might then be developed into a family hatchback, a small delivery van and also a sports car. Each model would have a body suited to its role, as well as being fitted with an engine and other components that offered the appropriate level of performance or economy. Despite these differences, it would be possible to use common components in several different models of car, thereby creating significant economies of scale.

This sharing of components extended to collaborations between different manufacturers. For example, it became common practice for two or more manufacturers to agree to collaborate on the development of the basic structural elements of a car, along with major elements such as an engine and gearbox. Each manufacturer would then design the bodywork to create a different vehicle based on the same basic design, using common parts. The resulting vehicles were then sold in competition with one another, albeit with both manufacturers benefitting from the economies of scale associated with manufacturing major parts in bulk.

Thirdly, the rise of robotics in the production process allowed for many of the simple repetitive mundane tasks on the production line to be automated. Robotics also allowed for far greater precision than had been possible when using human operators. For example, a robotic welder could place the spot welds used to fix body panels in place more accurately, allowing for a stronger join and the possibility of a more attractive finish.

Robots also offered much greater flexibility. Robotic production lines could cope with different versions of the same basic car to be produced in a single run, without interruption or retooling. Each car was given a unique vehicle number and the production line tracked each vehicle individually. For example, engines would be brought to the production line in an automated sequence so that sports models were fitted with high-performance engines and economy models with a more fuel-efficient alternative. The system could also cope with optional extras and different finishes. For example, the customer could order an accessory and that could be fitted on the production line, with the robots being programmed to select different parts as necessary.

The automotive industry was an early adopter of many advanced manufacturing techniques, including just-in-time and quality circles. The complexity of the manufacturing process has made their implementation a challenge, but the industry has always placed a great deal of emphasis on economy and efficiency.

This high level of automation has not eliminated manual labour from the industry. It has always been necessary to employ human operators:

Maintenance	Some robots have self-test and self-calibration routines, but there will always be a need for engineers to repair broken equipment.
Production and control	Some production lines can be reconfigured to produce more than one model. This usually requires the line to be stopped and the equipment reset manually. Such changeovers are generally kept to the minimum by having fairly long production runs for any given model.
Unanticipated events	People can be tasked to new roles far more quickly and easily than machines. For example, an additional quality check may have to be introduced if there are concerns about a batch of parts. Also, certain tasks may benefit from a human input. For example, a final product inspection may be more effective if it is conducted visually.
Complex tasks	It may be more cost-effective to carry out certain tasks manually. For example, it may be cheaper to have human operators work on some low-volume models than it would be to program the production line.

The changes in the automotive industry have not solely been driven by changes in manufacturing technology. In the first half of the 20th century, most industrialised countries had their own automotive industries, with cars being designed to meet the tastes of local consumers. Exports were primarily to countries that did not have their own local producers. Manufacturers in Asia started to export more aggressively in the 1970s and 1980s and started to compete with local manufacturers in their home markets. Consumers became more willing to buy foreign cars and manufacturers started to develop cars that had the capacity to appeal to a more global market.

That led to a process of consolidation in the industry, with major manufacturers merging or being acquired. This process was encouraged by the development of cars for the global market. Car makers aimed to develop models that could be sold around the world. Economies of scale were often maximised by having a single factory make all cars of a particular model, using parts sourced from around the world.

Major manufacturers located their factories in countries that minimised total costs. For example, several European manufacturers built factories in Central America in order to take advantage of low wages and operating costs and also proximity to the wealthy North American markets.

Aurora Group history

Aurora was established in Europe in the early part of the 20th century. The company grew steadily throughout the first half of the century, opening new factories and developing a strong customer base across Europe.

In common with many major European manufacturers, Aurora was forced to react to the influx of cars from Asian manufacturers. These were generally regarded as better value for money than their European counterparts. They were cheaper to buy and generally better-equipped. There were, however, concerns about their reliability.

Aurora's response was to develop close ties to other companies in Europe, the US and Asia. Initially, these ties involved collaboration on parts and on car designs. As time passed, Aurora acquired control of many of the companies with which it had been collaborating. That led to the creation of the Aurora Group, which has subsidiaries across the world.

Aurora specialises in cars. It focuses on the mid-market for small hatchbacks, family saloons, sports cars and people carriers. Aurora's cars are not the cheapest in their respective ranges, but they are regarded as being of high quality and offering good value for money. Aurora also manufactures small and medium-sized vans.

Aurora has eight major assembly factories, each specialising in a particular model of car or van. Aurora also has several factories that manufacture parts and assemblies. In addition, Aurora buys parts and assemblies from a wide range of independent manufacturers.

Aurora is striving to operate in an environmentally friendly manner, while still remaining profitable. The development of more fuel-efficient cars is a priority, as is the reduction of emissions and waste in the manufacturing process. Health and safety in the workplace is also an important issue because of the risks arising from the large and powerful machines and the fumes given off in welding and painting operations.

Aurora's development into the 21st century has relied on diversification of product ranges and close attention to both present and emerging markets. Aurora pays close attention to local market conditions and consumer tastes and the company enjoys strong brand loyalty from many of its customers.

Aurora continues to be based in Westland, its country of origin. The company is quoted on the Westland Stock Exchange.

Westland's currency is the W$. Companies prepare accounts in accordance with IFRS.

Aurora Group mission statement and strategy

Mission statement

Our mission is to supply high-quality vehicles at a reasonable price for worldwide customer satisfaction.

Our vision is to build exciting, efficient, reliable and safe cars that customers will wish to buy and drive.

Strategy

We will work towards our mission by engaging the talent and passion of people who believe that there is always a better way. We will seek to understand our customers' evolving needs and, through our commitment to quality, constant innovation and respect for the planet, aim to exceed their expectations.

We will extend our business by developing or establishing partnerships to provide new products; build on existing products to extend into new segments; explore new and adjacent market opportunities and accelerate new technologies and innovation.

We will expand our market by pursuing global alliances to fill gaps in our product portfolio and open new geographic opportunities. We will increase global sales through building on our existing dealer network and investing closer to our global customers by enhancing regional business operations and global engineering centres.

Values

Corporate values

- Aurora recognises the integral relationship between its business activities and the environment.
- Aurora strives to provide products that are friendly to the Earth and to society.
- Aurora seeks to protect the environment in order to protect the future of humanity.
- Aurora respects the diversity of cultures and customs.

Staff values

- Develop new ideas and make the most effective use of time.
- Take pleasure from work and encourage honest communication.
- Respect all fellow workers and seek to work together.
- Always work with ambition and nimbleness.
- Recognise the value of research and endeavour.
- Accelerate development of the new products that our customers want and value.
- Display a commitment to create and maintain a legacy.
- Take pride in completing tasks to the best of one's ability.

Production process

Automotive assembly plants are typically broken into six main departments, although there may be slight variations between manufacturers. In consecutive order they are:

- Press shop
- Body shop
- Paint shop
- General assembly
- Trim assembly
- Final vehicle test.

Parts are sourced from both external suppliers and in-house manufacturers. Regardless of source, parts are brought together and introduced into the production process on a just-in-time basis. Most parts and assemblies will be delivered in batches throughout the day so that inventories held in the factories are minimised. Supply lines are under constant supervision management and software tracks each incoming consignment, including the estimated lead time before delivery.

The quality management process integrates testing into every stage of the assembly process. Faults are identified and rectified immediately, stopping the production line if necessary, so that errors are not duplicated or passed down the line.

Press shop

Rolls of sheet steel are cut to size and formed into the individual body parts that are subsequently welded together to make the floor and bodywork of each vehicle. Offcuts are removed and recycled.

Powerful presses apply more than 3,000 tonnes of pressure to press the flat sheets into the curved shapes required to create the car's shape. Finished parts are inspected by laser and stored on racks before passing through to the body shop for welding.

Body shop

The parts from the press shop are welded together here to form larger assemblies. The base of the car body is made up of the floor pan and the motor compartment. Robotic welding systems pick up the individual parts and hold them in the correct position while they are welded in place.

The subassemblies are joined together, first of all building up the skeleton of the car and then adding body panels, so that the car's body is ready to proceed.

Each vehicle requires thousands of different welds, each calculated to provide the requisite strength, rigidity, safety and fixing points. Up to six robots may be working together to locate, fix and weld components to any given car body at a single time.

Doors, boot lids and bonnets are built in separate subassembly lines and delivered by a conveyor to be mounted onto the rest of the body. These are lifted into place mechanically and bolted into position. The bolts are tightened by human operatives, who can make the necessary adjustments more quickly and precisely than a robot.

By this stage, the body is complete and ready to be fitted with the other components. The body is inspected by quality control staff, who also rectify any problems that would otherwise show up once the car is painted. For example, a piece of metal might have a blemish from the press and will require sanding before being painted.

Each body is tagged with a unique reference number that can be used to track the car through the production process.

Paint shop

The body shell is cleaned and primed with chemicals that are applied by immersion in tanks. These treatments offer protection against corrosion. The treated shell is then dried and painted using spray guns mounted on robotic arms. Successive layers of paint are applied and dried in ovens, with constant inspections and checks to ensure that the finish is flawless.

General assembly

The painted body shell goes through more than 350 separate processes to add all of the mechanical and electrical components. These include the engine, suspension, brake systems, wheels and gearbox.

Fluids such as lubricants and coolants are applied and a small amount of fuel is put into the tank, sufficient for the final vehicle test.

Each individual car is identified by its tag and the components that are appropriate to that model are used. Any optional extras specified by the customer are fitted at this stage too.

Trim assembly

Non-mechanical parts, such as seats, entertainment systems and interior trim are fitted internally and bumpers and decorative items such as badges are attached externally.

Final vehicle test

Quality assurance staff conduct more than 2,000 checks on each vehicle. The car is placed on a rolling road to enable the engine to drive the wheels in a controlled environment.

A final paint inspection is carried out to ensure that no damage has occurred through assembly and testing. Finally, the airbag is fitted and the car is ready for delivery to the dealership.

Retailing

Aurora uses the same basic retailing model as most car manufacturers. Its cars are sold to third party dealers, who make the final sales to customers. Dealers are appointed on the basis that they have the necessary facilities to display new cars in an attractive setting and also service and maintain cars after they have been sold.

Some dealers operate from a single showroom, while other have several. Each showroom must be approved by Aurora and must meet targets in terms of sales volume and customer satisfaction. In return, Aurora grants each approved showroom a designated ‘territory’, with no other Aurora dealers being permitted to operate within a ten-mile radius.

Dealers cannot sell new cars made by other manufacturers from their Aurora showrooms, although many dealers have other showrooms that sell other makes of car.

Customers can visit their local showroom to see the range of Aurora cars. They can buy cars that are in the showroom’s inventory or they can place an order for a specific model, in their choice of colour and with their choice of accessories. The dealer passes any orders back to Aurora and the car will be delivered to the showroom for collection.

Selling prices are set by Aurora. That prevents dealers from competing with one another by undercutting prices. It also enables Aurora to position its cars in the retail market and to adjust retail prices in response to competition from other manufacturers.

Costing information

The following unit costings relate to the manufacture and sale of the three main models of a compact car produced in one of Aurora's factories.

	Basic model		Luxury model		High performance model	
	W$		W$		W$	
Materials	4,000	38%	4,800	37%	5,000	36%
Labour	1,600	15%	1,600	12%	1,800	13%
Subassemblies	2,000	19%	2,000	15%	2,200	16%
Distribution	400	4%	400	3%	400	3%
Dealership margin	1,560	15%	1,950	15%	2,100	15%
Total	9,560	92%	10,750	83%	11,500	82%
Retail selling price	**10,400**	**100%**	**13,000**	**100%**	**14,000**	**100%**
Margin	840	8%	2,250	17%	2,500	18%
Volume based recovery at 100% factory activity						
Research and development	1,000	10%	1,000	8%	1,000	7%
Tooling	400	4%	400	3%	400	3%
Total recovery	1,400	13%	1,400	11%	1,400	10%
Total cost	10,960	105%	12,150	93%	12,900	92%
Net margin	(560)	-5%	850	7%	1,100	8%
Factory infrastructure	200	2%	200	2%	200	1%
Fully loaded cost	**11,160**	**107%**	**12,350**	**95%**	**13,100**	**94%**
Profit/(loss)	(760)	-7%	650	5%	900	6%
Volume based recovery at 70% factory activity						
Research and development	1,429	14%	1,429	11%	1,429	10%
Tooling	571	5%	571	4%	571	4%
total recovery	2,000	19%	2,000	15%	2,000	14%
Total cost	11,560	111%	12,750	98%	13,500	96%
Net margin	(1,160)	-11%	250	2%	500	4%
Factory infrastructure	286	3%	286	2%	286	2%
Fully loaded cost	**11,846**	**114%**	**13,036**	**100%**	**13,786**	**98%**
Profit/(loss)	(1,446)	-14%	(36)	0%	214	2%

Note: all numbers are shown to the nearest whole percentage.

The equivalent figures for a medium-sized saloon car are as follows:

	Basic model		Luxury model		High performance model	
	W$		W$		W$	
Materials	6,000	30%	6,800	28%	7,000	27%
Labour	2,000	10%	2,000	8%	2,200	8%
Subassemblies	4,000	20%	4,000	17%	4,400	17%
Distribution	440	2%	440	2%	440	2%
Dealership margin	3,000	15%	3,600	15%	3,900	15%
Total	15,440	77%	16,840	70%	17,940	69%
Retail selling price	**20,000**	**100%**	**24,000**	**100%**	**26,000**	**100%**
Margin	4,560	23%	7,160	30%	8,060	31%
Volume based recovery at 100% factory activity						
Research and development	2,000	10%	2,000	8%	2,000	8%
Tooling	1,200	6%	1,200	5%	1,200	5%
Total recovery	3,200	16%	3,200	13%	3,200	12%
Total cost	18,640	93%	20,040	84%	21,140	81%
Net margin	1,360	7%	3,960	17%	4,860	19%
Factory infrastructure	1,000	5%	1,000	4%	1,000	4%
Fully loaded cost	**19,640**	**98%**	**21,040**	**88%**	**22,140**	**85%**
Profit/(loss)	360	2%	2,960	12%	3,860	15%
Volume based recovery at 70% factory activity						
Research and development	2,857	14%	2,857	12%	2,857	11%
Tooling	1,714	9%	1,714	7%	1,714	7%
total recovery	4,571	23%	4,571	19%	4,571	18%
Total cost	20,011	100%	21,411	89%	22,511	87%
Net margin	(11)	0%	2,589	11%	3,489	13%
Factory infrastructure	1,429	7%	1,429	6%	1,429	5%
Fully loaded cost	**21,440**	**107%**	**22,840**	**95%**	**23,940**	**92%**
Profit/(loss)	(1,440)	-7%	1,160	5%	2,060	8%

Note: all numbers are shown to the nearest whole percentage.

Senior management team

Alan Mayer, CEO

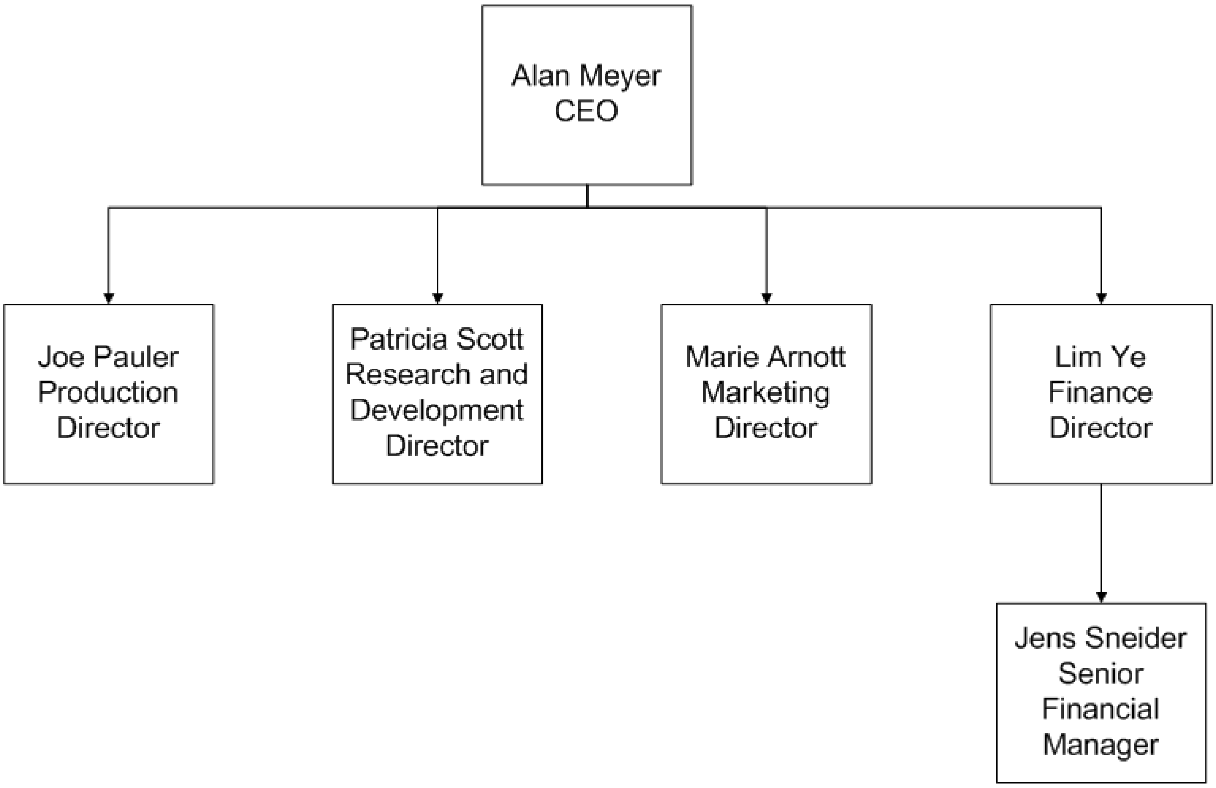
Joe Pauler, Production Director

Patricia Scott, Research and Development Director

Marie Arnott, Marketing Director

Lim Ye, Finance Director

Jens Sneider, Senior Financial Manager



Extracts from Aurora's financial statements

Consolidated statement of profit or loss

For the year ended 31 December	2016	2015
	W$m	W$m
Revenue	46,523	42,381
Cost of sales	(33,996)	(30,969)
Distribution costs	(3,302)	(3,008)
Administrative expenses	(1,189)	(1,083)
Operating profit	8,036	7,321
Finance costs	(577)	(572)
Profit before tax	7,459	6,749
Income tax expense	(2,267)	(2,051)
Profit for the year	5,192	4,698
Profit for the year attributable to:		
Owners of the parent	4,711	4,430
Non-controlling interests	481	268

Consolidated statement of financial position

As at 31 December	2016	2015
	W$m	W$m
Non-current assets		
Property, plant and equipment	15,350	14,135
Intangible assets	7,428	7,179
	22,778	21,314
Current assets		
Inventories	3,939	3,674
Trade receivables	2,167	2,048
Cash and cash equivalents	5,271	4,987
	11,377	10,709
Total assets	34,155	32,023
Equity		
Shares and share premium	2,258	2,258
Retained earnings	18,861	17,542
	21,119	19,800
Non-controlling interest	810	803
	21,929	20,603
Non-current liabilities		
Loans	7,208	7,152
Deferred tax	1,074	974
	8,282	8,126
Current liabilities		
Trade payables	1,700	1,548
Tax payable	2,244	1,746
	3,944	3,294
	34,155	32,023

Segment information

	Europe, Middle East and Africa	Asia	Americas	Total
	W$m	W$m	W$m	W$m
Sales revenue	15,818	11,166	19,539	46,523
Segment profit	2,250	1,768	4,018	8,036
Segment assets	12,296	10,588	11,271	34,155

	Cars	Vans	Total
	W$m	W$m	W$m
Sales revenue	31,636	14,887	46,523
Segment profit	5,866	2,170	8,036
Segment assets	26,641	7,514	34,155

Articles from independent trade publications

WESTLAND AUTO INDUSTRY QUARTERLY – SUMMER 2017

Aurora 'Industry 4.0' robotics enable 150 customer personalisation choices in computerised production line

Aurora has recently joined the trend towards the adoption of 'smart manufacturing'. The company awarded a major contract to Routers, who will update Aurora's production automation software so that it can install cobots (collaborative robots) in its paint shops and trim assembly sections. Cobots are essentially robots that can detect abnormal activity through force limitation or vision monitoring. This effectively enables the machines to interact with human workers and to communicate with one another. For example, during trim assembly, the robot may install a component and then stop to permit an assembly worker to step in and wire up the electrical connections. The software will track the employee's position and will decide whether it would be safe to continue to conduct robotic operations on a different part of the car. The cobot will continue to operate provided it is safe to do so, but will stop immediately if the worker's safety is at risk, even if the worker unexpectedly steps into the path of a mechanical device.

Furthermore, the software itself may determine the order in which parts are installed, allowing for the fact that a typical car can have so many customer-selected options that each car is virtually unique. As the car body arrives at each workstation in turn, the software decides the optimal order in which parts will be fitted and any human operations will be initiated by an instruction on a screen for the assembly worker.

Cobots will also communicate with one another. For example, if the self-diagnostic routines in the spray guns used for white paint require a filter to be changed then the information will be passed back up the line and the software will change the order in which cars are built so that no white cars come through until the spray guns have been maintained.

This level of smart manufacturing has been dubbed 'the fourth industrial revolution' or 'Industry 4.0'. It is expected to transform the way manufacturing is structured. It will undoubtedly enhance the motor industry's ability to adapt and deliver a diverse range of tailored products to meet the needs of individual customers.

WESTLAND AUTO INDUSTRY QUARTERLY – SUMMER 2017

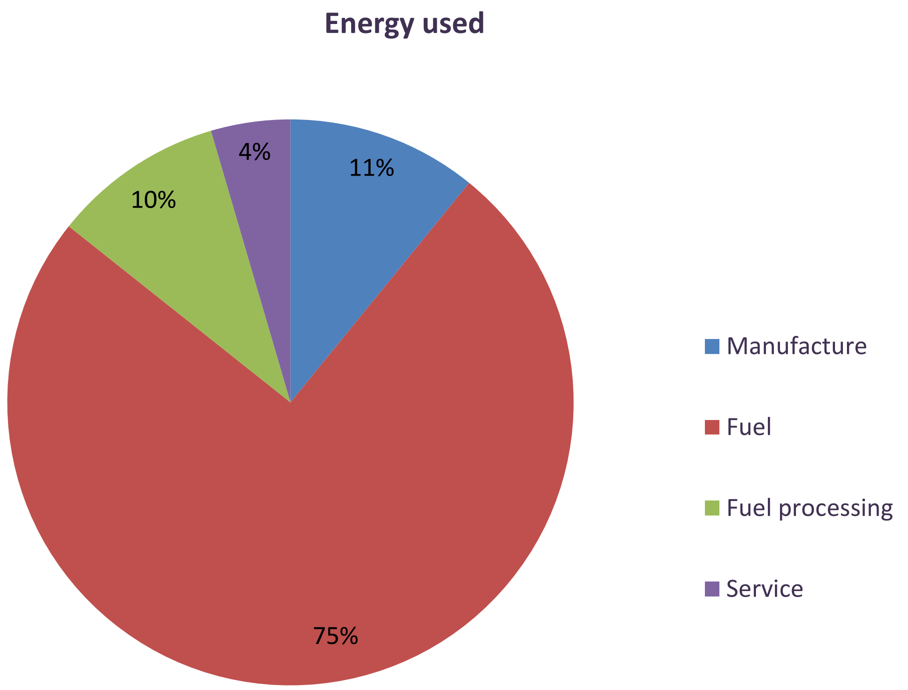
WESTLAND AUTO INDUSTRY QUARTERLY – SPRING 2017

The green lifecycle of a car

Protecting the environment requires the automotive industry to do more than simply sell cars that have good fuel economy and low emissions. It is now recognised that there are three stages in the environmental lifecycle of a car:

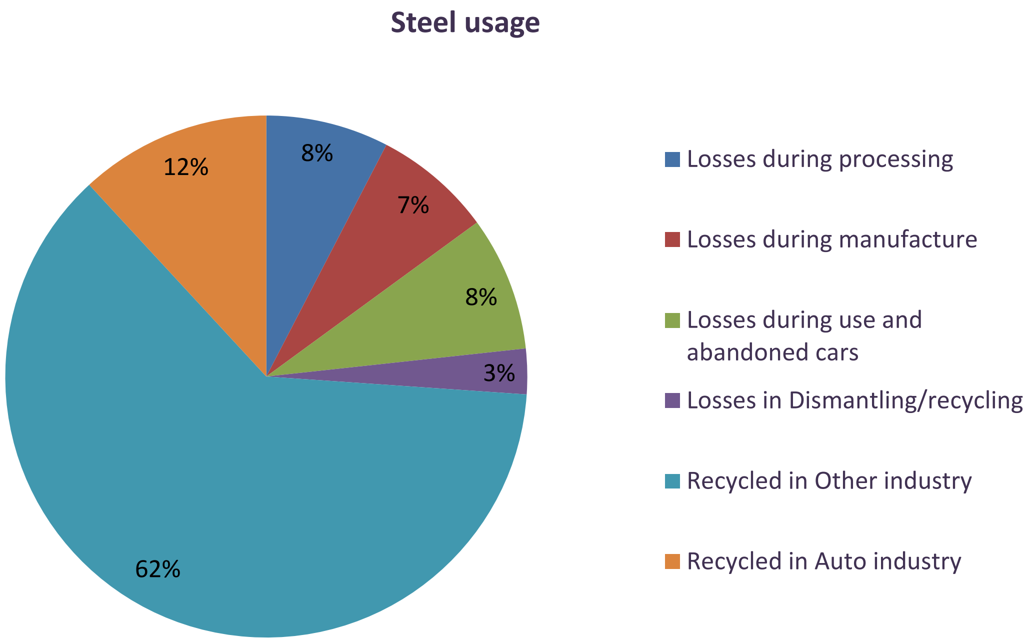
- Manufacture
- Usage
- Disposal

Environmental impact requires careful planning because the design process for a new car takes 3-4 years. That car is likely to be manufactured for 7-10 years, with only minor updates. Cars then have a 10-12 year life expectancy. Thus, design choices made today could still be affecting the environment in 25 years' time.



For example, the manufacturing process requires the creation and transportation of heavy components and assemblies. Making steel for car bodies likewise requires a considerable amount of energy. There are also environmental concerns associated with steel usage including the use of heavy metals, toxic chemicals and volatile solvents, all of which lead to high emission levels.

Some of those inputs are, of course, recovered when a car reaches the end of its life and it is broken down and recycled. There has been a measure of success in the recycling of materials. An average of 12% of the steel used in construction is recycled by the automotive industry and a further 62% is recycled by other industries. That still leaves 26% that is lost and is effectively wasted.



Looking forward, greater emphasis will be placed on designing cars with a greater consideration for the environment. Greater use of lightweight materials such as plastics and aluminium in place of steel will make cars more fuel-efficient. Greater use of alternatives to fossil fuel, such as engines designed to run on biofuels and the replacement of the internal combustion engine with electric motors, will also limit environmental damage.

Cars are also being designed with greater emphasis on making it safe and economical to dismantle them and recycle the parts when they reach the ends of their lives. For example, car paint contains far fewer chemicals than before, which means that there are fewer dangerous fumes when a car body is melted down in a furnace for recycling.

WESTLAND AUTO INDUSTRY QUARTERLY – SPRING 2017

WESTLAND AUTO INDUSTRY QUARTERLY – SUMMER 2017

Emission standards drive fuel choice and technology developments

The development of improvements to internal combustion engines has been driven by a host of factors, including legislation on emissions. Recent scandals over emissions measurement and compliance testing have heightened public awareness of the issues at stake. One crucial question is the choice of fuel, with diesel and petrol being the two most obvious possibilities. Different fuels are difficult to compare because each offers a number of advantages and disadvantages.

For many years, diesel was presented as the least damaging fuel because diesel engines used less fuel and they were simpler and more robust, so lasted longer. However, it has since been recognised that diesel engines emit sooty particles that float in the air and can cause breathing difficulties. Petrol engines do not emit such particles. Both types of engine emit potentially harmful gases, but neither type of engine has an overall advantage in terms of all emissions. Petrol has lower emissions of some gases and diesel has lower emissions of others.

Alternative fossil fuels include compressed natural gas (CNG) and liquefied petroleum gas (LPG). Both tend to produce fewer emissions that either petrol or diesel and neither produces the sooty particles associated with diesel engines.

Fuel can also be extracted from plants in the form of biodiesel. That has a host of environmental advantages, including the fact that it is renewable. There are conflicting arguments about the manner in which the impact of biodiesel should be determined. For example, growing plants reduces the level of carbon dioxide (CO_2) in the atmosphere, which offsets the emission of CO_2 when the biodiesel is used. However, there are environmental drawbacks to the farming of those crops, including the possibility that forests will be cut down for fuel crops.

Most manufacturers are exploring the use of electric motors, either in hybrid vehicles in which the internal combustion engine operates in tandem with an electric motor, or in battery driven electric vehicles. Again, there are conflicting arguments about the environmental benefits of such systems. For example, a battery driven car creates no emissions when it is driven, but recharging it requires the generation of electricity at a power station that may well create emissions and consume scarce resources.

WESTLAND AUTO INDUSTRY QUARTERLY – SUMMER 2017

WESTLAND AUTO INDUSTRY QUARTERLY – WINTER 2017

How much does it cost to make a car?

The automotive industry has always been at the forefront of developments in management techniques. That does not mean that we know all the answers. For example, it is surprisingly difficult to determine the unit cost of making a car. That is a serious matter because of the enormous investments that have to be made and the lead times associated with developing a replacement model. The costs of research and development have to be recovered from customers, but knowing how much to charge is complicated by the need to estimate the lifespan of the model and also the overall demand. On a related note, research and development usually continues throughout the life of a model, with changes and improvements being made to keep pace with consumer tastes.

Tooling is a significant cost. The robots on the production line often need to be equipped with machine tools. For example, pressing a body part requires a die to be made out of hard metal. The press forces sheet metal onto the die in order to create the precise shape. Dies are very expensive to make and their life expectancy can be limited in the event that the design team modifies the shape of the car in order to avoid it looking outdated. The variable costs can be complicated by the fact that the customer may be able to specify as many as 150 features, ranging from the engine and gearbox down to the inclusion of a smoker's pack if the car is to be fitted with a cigarette lighter and an ashtray. Some of these features may offer several options, such as paint colour. Any given model may offer many hundreds of thousands of potential permutations.

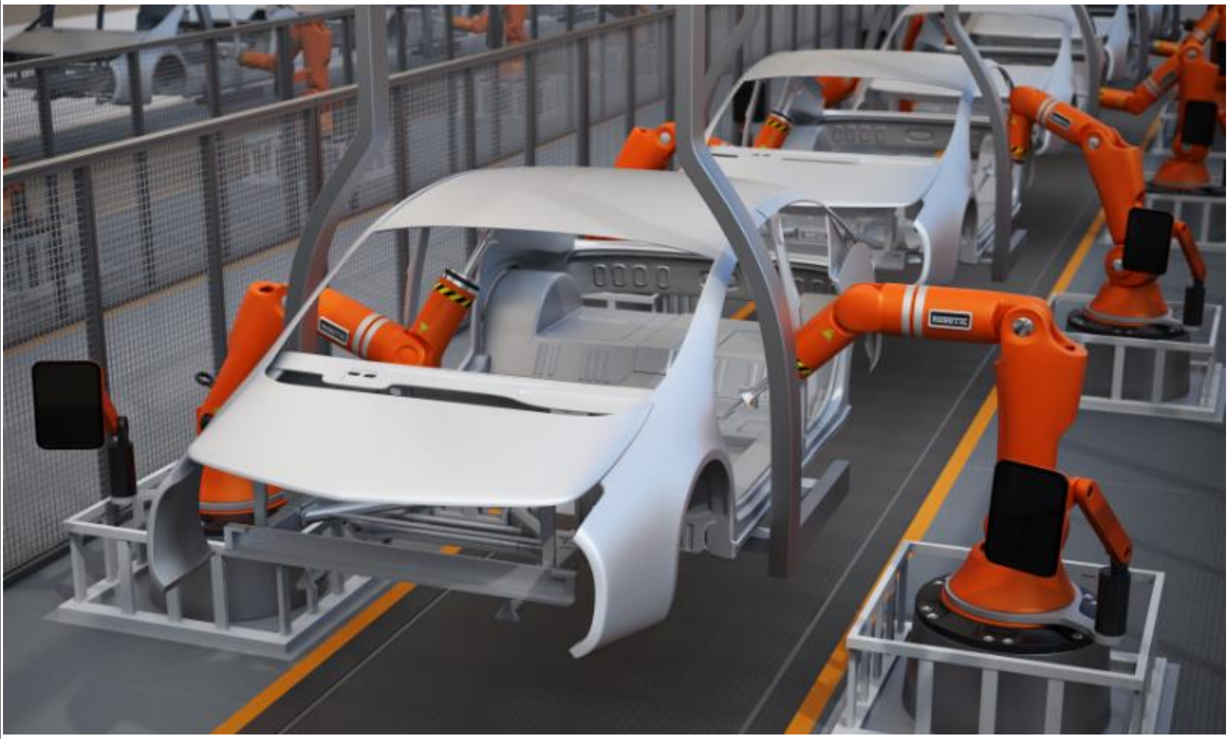
Fortunately, customers are generally asked to pay a premium for most of the options that they can specify and those are generally priced at a level where they significantly outweigh the marginal cost of adding them. For example, upgrading from fabric to leather covered seats requires more to be spent on making the seats, but the inventory cost of handling the seats will be the same, as will the cost of installing the seats in the car on the production line. If the customer is willing to pay a significant premium for upgrading the seats then the manufacturer may be left in the confusing position of knowing that the upgrade generated a significant contribution, but the amount of that contribution may be difficult to calculate.

WESTLAND AUTO INDUSTRY QUARTERLY – WINTER 2017

WESTLAND AUTO INDUSTRY QUARTERLY – SPRING 2017

Dichron's new COBOT stresses safety

Dichron's latest COBOT has been designed to enable human operators to work safely alongside robots. This has been made possible through application of several different types of sensor that enable the system to detect the presence of humans and to ensure that they are not endangered even if they step into the path of a moving object.



Firstly, the operators are required to wear badges equipped with Radio Frequency Identification (RFID) tags. The COBOTs are fitted with sensors that can triangulate the position of an RFID tag to within a few centimetres. The system is programmed to ensure that none of the machinery will stray too close to an RFID tag, even if the wearer is standing in a dangerous position that is supposed to be kept clear at all times.

Dichron has also fitted infrared detectors that can identify the presence of a human operator within the limits of the machine's mechanical range, just in case an RFID badge malfunctions. Carmakers have been quick to adopt this new technology. It is becoming increasingly clear that the safest factories are also the most productive and profitable.

WESTLAND AUTO INDUSTRY QUARTERLY – SPRING 2017

Consumer and mainstream news

Daily News

Affordable diesel hybrids are unlikely

Alexander Cwicek, Reporter

Patricia Scott, Aurora's Research and Development Director, spoke at an environmental conference last night. She announced that Aurora had no plans to develop a diesel hybrid car and she thought it highly unlikely that any other manufacturer would do so.

Currently, most hybrids have a petrol-powered engine and an electric motor. Batteries store electrical energy created when the car is braking and can power the car when driving a slow speeds in town or can augment the petrol engine when accelerating.

Ms Scott pointed out that the market for hybrid cars consisted mainly of customers who wished to reduce the emissions from their cars. At present, diesel is regarded as the less environmentally friendly alternative because of particulate emissions. She did not believe that many buyers of a hybrid car would specify a diesel engine.

Car Driver

Aurora dumps diesel

Aurora announced that it would cease all development of diesel engines, citing ongoing concerns about the environmental damage done by diesel. Existing models will continue to be offered, but no new cars will be developed with a diesel option.

Aurora is planning to launch a new model that can be specified with a biodiesel engine that offers many of the benefits of diesel without the worst of the emissions.

Aurora presently meets demand for environmentally-friendly cars with its range of hybrid and purely electric models.

Bjorn Luft, Capital City's outspoken Mayor, welcomed the news and said that he supported Aurora's decision. He claimed that his city's streets would be cleaner and safer if there were no diesel engines polluting the air.

Car Driver

Any colour you like, as long as it's not (just) black

When Henry Ford launched his world-changing Model T, he famously claimed that the car could be painted "any colour you like, as long as it's black". Car manufacturers have moved a long way since then.

Marie Arnott, Marketing Director at Aurora, launched a new option for customers to choose any colour when ordering their cars. They can either select a colour from a chart at the dealership or they can even bring in an item that can be scanned so that the colour can be matched precisely.

She said, "When you buy an Aurora, you don't just buy a car, you're making a statement. Why shouldn't you have your new car painted in your favourite colour?"

Customers will have to pay an additional W$800 to have their favourite colour. Developments in water-based paints, that are less harmful to the environment than the oil-based paints that they have replaced, make it possible to offer a wider range of colours without slowing operations down on the production line.

Car Driver

"Don't buy that new car, used cars are better"

The Car Driver blog frequently has posts from confused motorists who have gone to a car dealership to buy a new car, only to have the salesperson recommend that they buy a used car instead. The used car is usually cheaper and seems to offer a smaller profit.

In this case, the salesperson is probably motivated by the fact that many car manufacturers offer their dealers cars on interest-free terms. This is called "consignment stock". The new cars in the showroom do not actually belong to the dealer, they are still owned by the manufacturer. The dealer has up to six months to sell each car before paying anything.

Used cars are a different story. They have had to be purchased from their previous owner. The dealer's money is tied up in them, even if they were accepted as trade-ins. If the dealer's bank balance has been reduced because of used car purchases then it might make sense to encourage the next few customers to buy used cars instead of new ones.

Daily News

Workers suspended for health and safety failure

Paul Hobbs, Reporter

Strike action was threatened by staff at Aurora's Southern City assembly plant after four of their colleagues from the paint shop were suspended pending a disciplinary hearing. The paint shop workers had not been wearing the face masks, suits and breathing apparatus that are intended to prevent them from inhaling fumes and droplets of paint.

The employees claimed that the masks prevented them from talking to one another and that they were entitled to decide for themselves whether or not to endure the discomfort of the safety equipment.

A spokesperson for Aurora commented that the company had a statutory duty for the health and safety of its employees and that it would be irresponsible to permit employees to disobey the rules. Furthermore, the paint shop has to remain clean and uncontaminated. The suits prevented dirt and fibres from staff clothing from damaging the finish of the paint.