Student 2: High Merit

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[1] Improved productivity, control of harmful emissions, waste elimination and better utilisation of available resources have been flow-on effects from the introduction of more flexible equipment and process design. The constant drive to increase productivity and reduce costs has led to speedy adoption of proven new technology, with the move towards lowering the numbers of people required through increased automation particularly evident in critical areas like the paint shop.

The efficient painting of the car bodies has traditionally been a major cost factor in the automotive production process and so the paint shop has been an obvious focus for investment in new technologies and techniques to improve process efficiency and product quality to produce a significant overall increase in productivity.

[2] Recent developments such as the movement from solvent-borne to water-borne dip primers and from anodic to cathodic electro-deposition have improved both the corrosion protection of the metal car body and environmental safety in the plant through reduced emission levels.

[3] Picking up on the 'clean room' concept has become an important part of the paint shop structure. This innovation produces a more stable application environment which means that painting defects arising out of dirt and dust particles carried in by people and residues stuck to the car bodies from previous procedures can be considerably reduced. However, to achieve a real 'clean room' condition the direct entry of outside air has to be prevented. To do this the area next to the spray booths is totally enclosed, with separate ventilation and air filters cleaning very fine dust particles from the metal car or truck body before it moves to the spray booth. An air lock is used to provide monitored access for workers who are required to wear special lint free clothing made of asbestos-resistant fibres. Automatic control systems for heating, cooling and air conditioning are incorporated in the air supply line. A control room monitoring system graphically displays all of the critical operating parameters and makes sure that they stay aligned with the programmed optimum levels.

[4] Robots are used extensively in the paint shop in modern automobile plants. This is because of their ability to maintain the spray gun application at the constant optimum required speed and angle to the body surface to make sure that a uniform coating of paint is applied. Use of robots has allowed high lustre coatings accurate to a very precise +/- 5 microns to be reliably applied – and this application can be accurately maintained over long periods of time.

[5] Achieving the high quality of paint finish required to meet customer requirements means that large volumes of high quality demineralised water are needed. Supplying this water needs expensive ion exchange equipment. However, on the plus side, improved system design has led to previously high levels of water wastage being reduced, with some manufacturers claiming a reduction from the industry average of 900 litres per body to as little as 200 litres per completed painted body.

[6] After the electro-deposition coating, each of the cars gets three coats of paint – a primer, a colour and a clear coat. Through its movement to convert to the use of water-borne electro-deposition paints Toyota has developed new processes for recycling paint residues from the washings from the walls and floors. During the spraying process a high percentage of the paint coming out of the spray gun inevitably ends up as overspray and if it can't be recovered, this paint ends up as expensive wastage. At the Toyota plant the paint now recovered can be mixed with new paint to create an almost waste-free painting process.

[7]....Throughout the rapid global adoption of automotive technology vehicle collisions have consistently been one of the highest causes of human deaths from accident - with two thirds of those killed being pedestrians. Personal safety has therefore been a major consideration of car and truck manufacturers since the early days of motor transport. In terms of ongoing vehicle design both active and passive safety innovations are significant customer considerations.

Well established active safety design features such as mirrors, headlights and electronic signalling were introduced to assist with crash prevention. Passive safety features such as safety belts and air bags are design elements introduced to help to protect the occupants in the event of a crash. As research results have shown new active and passive design features to be effective in saving lives they have been progressively standardised by increasingly internationalised legislation.

Safety innovation has now become a key marketing feature and new crash avoidance systems like infra-red night vision and adaptive cruise control, and crashworthy feature such as body crumple zones and tempered glass side widows have become standard in truck design to minimise driver injury on long trips. In the Mercedes-Benz factory many of the new features are fitted as standard to all vehicles while many others are well established optional extras that can be specified for fitting when the vehicle is ordered.