Making the Imp

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The following article on the Imp's early production planning is by 'Old Rooter' Cyril Weighell. Now aged 93, Cyril has lost his eyesight and is recovering from a major operation, though is still pin-sharp in mind as is evident from the quality of this article which was dictated and sent in by Imp Club member and 'Old Rooter' Mike Andrews to whom I am most grateful. GP

Preamble

The Second World War had just begun and on 1st January 1940 I commenced a five-year student apprenticeship with Vauxhall Motors. This was duly completed and several years of experience in production engineering research followed before I was assigned to Vauxhall's expanded Production Engineering Department for Vauxhall's new vehicle ranges.

Subsequent promotion to Senior Production Engineer put me in charge of planning production of the new engine and transmission ranges for new car and truck models. This included responsibility for jig and tool specification and design as well as specifying and negotiating the purchase and proving of all the machine tools and equipment required. Car and truck vehicle assembly operations were an interesting and demanding added assignment. In 1954 this provided an opportunity to visit General Motors factories in the USA to study manufacturing techniques and, particularly, their developments in the fields of CAD and automation. The wide experience gained in this time proved to be extremely valuable in the years that followed.

The Beginning

In 1959 an advertisement for a Group Planning Engineer for the Rootes Group led me to Devonshire House where Geoffrey Rootes and Group Production Director, George Shrigley, made me an offer I could not refuse.

Having joined Rootes it became my responsibility, as Group Planning Engineer, reporting to George Shrigley, to examine and approve (or revise/reject) all Group project proposals from boiler houses to machines and tooling and expenditure for dies, etc. Now, Rootes management had been investigating the possibility of producing a car to rival the BMC Mini and VW 'Beetle' following post-war study of the German plant where Volkswagen had developed the 'peoples car' and mass-produced the VW rear-engined model. The 'Beetle' had shown how, although rear-

It's the new 'baby'

AND THE EXPRESS, OF COURSE, GETS THE FIRST PICTURE

By BASIL CAUDEN

MORE than £22,000,000 is being spent on building new factories in Scotland—to produce the first baby car ever built by the Rootes group.

It is the Hillman 850. The prototype has a rear engine and all-round independent suspension.

Both air - cooled and water-cooled units are on test and soon it will be decided which is to power the new car.

News of the 850 leaked out in a Milan newspaper, and last night a Rootes spokesman said: "The car which was seen by the Italians in Warwickshire was obviously one of our prototypes.

"But the final model is unlikely to come out until the autumn of next year and we doubt that the shape the Italians saw will bear much resemblance to the actual model."

It will be built at Linwood, near Paisley. Initial production will be 150,000 a year, with half being sold abroad.

10,000 jobs

It will mean work for 10,000 people and the 850 will be the first car produced in Scotland for 32 years.

Some of the money to build the new factories is being advanced by the Government. This will be paid back by the company.

engined, the simpler construction, lightweight components and mass production methods would make a successful car that, after the war, much of the population would be able to afford and, if widely exported, would bring much-needed income to a war-stricken Germany. Rootes' own Advance Product Engineers had been working on project 'Apex' and a study of manufacturing costings for the car was underway with the result that within a few weeks of joining I was presented with the first of the projects needed to build a totally new small Rootes car in a new factory.

Costing the Project

When Project Apex (which, as we all know, became the Imp) fell on my desk for review I saw that the project was to be a joint operation between the Pressed Steel Company and Rootes. Our section of the project was to plan, purchase and install the machines and equipment needed for the chassis components and assemblies, and to prepare for delivery of the bodies, to be made by the Pressed Steel Company, for us to finish and finally assemble into cars.

I read the project document draft and reviewed it in detail against my earlier experiences and thought it feasible but under-financed. Discussing this with George Shrigley, now Group Director, I told him it would need a further 15% of investment for the chassis content without the body tooling. On his speakerphone he immediately rang Sir Reginald Rootes and asked me to explain to him how I had arrived at this conclusion.

The outcome eventually had two results. The first was that Sir Reginald accepted my revised estimate. The second was that I was later given the task of Acting Planning Manager, Rootes (Scotland) Ltd., for *'planning the new car plant at Linwood, Scotland, including machine tools, assembly, die-casting and building progress'*. I was to be *'additionally responsible for establishing systems for engineering change, quality control, pre-production, inspection, progress and build'*.

The Job

The detail work involved in planning manufacture of every component in a car, the tooling required, the machines and equipment to make and assemble the components all needed trained and experienced staff. We had to build a team from scratch, where possible re-assigning

The first Imps roll off the production line
(All photos accompanying this article from Google Images and www.imps4ever.info)

engineers from other parts of the Rootes Group and supplementing the team, also using some outside consultants who worked with us in the offices.

The first problem was to find office accommodation for them. Peter Ware headed Product Engineering and the small team working on Apex was located in the Engine Test House at Ryton. Initially space was made for us in this peculiar building, formerly built to test aero engines made at the Stoke Plant during the war. The concrete construction of the wind tunnel was open to the sky on each side of the aero engine testbed. This almost filled the building block leaving little floor space for more staff since the new car engine testbed and drawing boards, etc, were already there.

While it is desirable for production engineers to be next to the designers working on the car there was really no room at Ryton for production engineering staff or for the shop floor layout plans. However, there was an empty factory in Canterbury Street, Coventry, so we set up offices there. It was no longer used for car trim and assembly but still belonged to Rootes.

Why build in Scotland?

There were two major factors determining the location for this new factory. The first was that the Government at the time forced manufacturers to develop in areas of high unemployment away from their current factory sites. Vauxhall and Ford, for example, built in the Liverpool area. The second factor led Rootes to choose Scotland because the Pressed Steel Company's factory at Linwood near Glasgow was already building car bodies there for Volvo. As PSC Oxford factories also supplied most of Rootes bodies for our other car ranges this was a natural development.

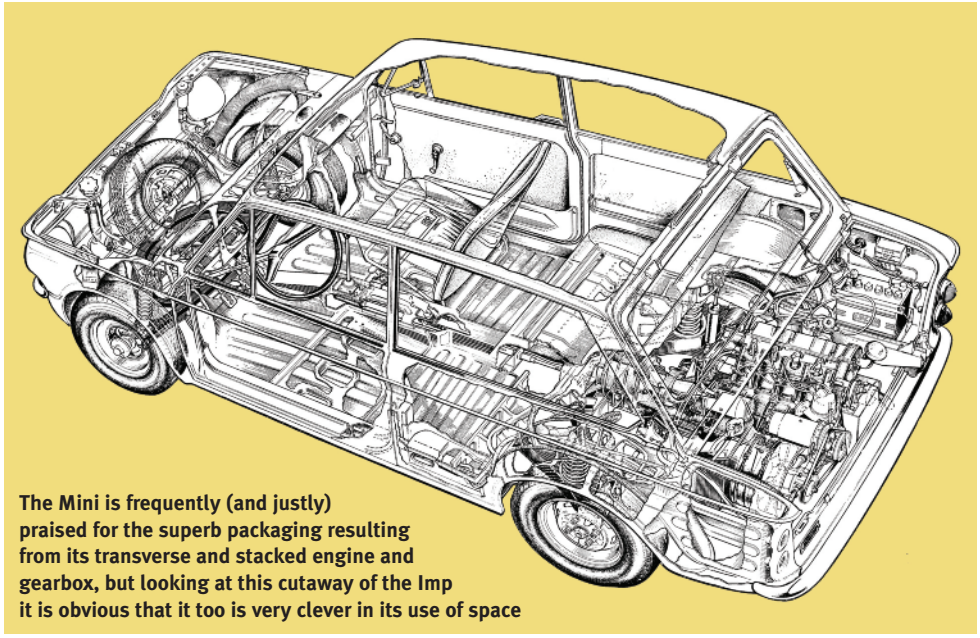
The Linwood site for building the factory was not ideal. The marshland demanded many piles 60 feet or more deep but on the plus side it was adjacent to the Pressed Steel factory, with only a road between, so that bodies could be sent over on an enclosed bridge across this road.

Some background on the engine castings

Design of this rear-engined car required that the weight of the power unit be kept as low as possible requiring aluminium castings for the main items, engine block and head, gearbox and transfer box; some 14 or so castings. Most were high pressure die-cast except for the head and block which required different processes. While we were able to purchase the cylinder head castings from an experienced supplier the block castings were a different problem.

The four cast-iron liners, as well as a steel oil tube needed to feed oil to the crankshaft bearings, had to be cast-in and outside experience of suitable processes was needed. Alumasc, a company casting high volumes of aluminium beer barrels, etc, at that time, provided access to the basic technology that guided us in casting the blocks in-house; of course they still had to be machined!

I had visited the American factories of General Motors and Chrysler, both of which had die-cast, six-cylinder blocks in production. These were designed to take finish-machined liners, assembled into the finish-machined blocks. The Apex's compact design depended on casting the cylinder liners in the block and finish machining these in position afterwards. This required firstly, that the liner castings must be rough bored and faced at the ends to provide inside-to-outside concentricity as well as good locations in the casting dies, also preventing molten metal from getting inside the liners. Retaining the rough exterior surface of the cast iron liners was important as it was this feature that ensured secure locking to the aluminium flooding around them as it rose to fill the dies from the pressurised vat of molten metal below. Of course, it was important to pre-heat the iron liners to match the temperature of the molten aluminium. While the steel oil supply pipe only needed protection from molten aluminium entry, no exterior treatment was necessary as it was not subjected to the mechanical strains experienced by the cylinder liners.



The Mini is frequently (and justly) praised for the superb packaging resulting from its transverse and stacked engine and gearbox, but looking at this cutaway of the Imp it is obvious that it too is very clever in its use of space

Casting aluminium – the business point of view

The original master plan to provide aluminium die-castings had been to co-operate with the Doehler-Jarvis Company in the USA, already casting aluminium cylinder blocks and other large components for American industry. The company had been taken over by National Lead of New Jersey just before the Apex Project was evolving and negotiations began between the Rootes brothers and the new owners to have DJ build a die-casting factory in the UK. However, the plan foundered, possibly on a question as to which company should hold the majority share in this new venture.

The outcome was that Rootes set up a separate foundry building, adjacent to the new car plant, with die-casting machines and a separate laboratory for quality control, all to be under the management of 'Bill' W.F.C. Bryant.

Getting down to it

My first task was to plan, approve and direct the plans to make each finished part and arrange the layout of the factory to house the machines and equipment required to assemble everything needed to build complete cars at 150,000 per year. Engines were planned for 180,000 per year to provide additionally for sales to other companies for their low-volume products needing a small, powerful, lightweight engine. It was decided to machine the engine components at Rootes' Stoke factory and to build and test the engines there. This utilised the experience and familiarity of the workers and staff who were accustomed to building engines for other Rootes models.

I personally planned the machine line for the aluminium cylinder blocks, using milling machines for the first operations as the broaching techniques in use in the Humber factory, although good for cast-iron cylinder blocks, were not ideal for aluminium.

Timescale pressures

The Purchasing Department at the Coventry-based Humber factory obtained quotations for the machines and equipment we specified and there was excellent co-operation between all those whose help was needed to complete the project. Production engineering was effectively started in March 1961 for the announcement in March 1963 giving us just 24 months to finalise product design and proving; design and build the factory; plan, equip, install and test everything needed; organise the systems and personnel required – all this on a new site with a new workforce, most of whom had never worked in a factory before.

Working together to plan ahead

Production of the bodies was in the hands of the Pressed Steel Company so was not my

direct responsibility although it was important that we worked closely with their engineers. For example, the variety of specifications to be catered for required detailed co-ordination on parts fitted before the body was delivered and was also an essential part of the production control system. A particular example of the need for close co-operation arose when it was found necessary to raise the front sidelight height!

Another occasion is particularly memorable when a late management decision was made to lengthen the wheelbase of the car by several inches. Apart from the many product-engineering changes, there were associated die changes, tooling revisions, assembly tooling and planning changes including factory re-arrangements. The increased car length also required longer stations on the conveyors and, of course, on the final assembly conveyor. To get this done quickly I held a meeting of all the conveyor suppliers to implement the changes on the 23 conveyors affected. Furthermore I had the station length increased sufficiently to accommodate not only the imminent model change but also to make some provision for future larger models not yet planned.

Getting down to it – the 'nitty gritty'

As the work progressed on detailing the planning of each component released from the Engineering Department, the machines and equipment necessary could be specified and quotations sought. The potential suppliers were required to provide, along with their quotation, a ground plan of each machine showing the location and details of services required: power supply, swarf removal, etc. Special machines were required to have their electric and hydraulic pipe and conduit runs accessible for servicing, not hidden inside the base of the machine as was a common feature at that time. As orders were confirmed it was possible to make paper templates to scale (1/4" to the foot) so that these could be pinned down on equally scaled factory floorplans and thus enable the layout of the workshops to be developed to provide proper workflow and access for removal of swarf, etc. The plans were set up on wheeled tables that could be moved around for easy access and to relate to the various parts of the factory as required. This also allowed ready access for the different engineers planning fork-lift truck movements, personnel gangways, overhead conveyors, offices, power supplies, lighting, emergency provisions and access into and from the building. Other necessary services such as workers' personal lockers, toilets and washing facilities had to be positioned suiting the density of personnel in the different

areas. No computers were available to do this at the time but the technique we used was well known and quick, cheap and effective.

Getting the Factory ready

All the preparatory work could be done in our Coventry base while the factory buildings were beginning to take shape at Linwood, but as they did so, other decisions became important. Many details had to be decided, such as the colours to be used on the service piping, floors and gangway markings, Notice Board locations and styling, choice of tiles in dining areas, washrooms and lavatories – all needed consideration – some at top management level. As the factory space became accessible from the builders we were able to mark the locations for plant and machines so as to be ready for their installation on delivery. Foundations had been prepared to drawings supplied by the makers for paint booths, conveyor drives, heat-treatment plant and other such services.

To prepare for deliveries it was important to hire and train security staff and to secure all access to the buildings for qualified persons having security clearance. It was interesting to work with Scottish people and we soon became aware of differences, not only in their culture but in their attitudes to working practices. Many of the workers had no previous experience of the factory environment, coming from shipyards with their totally different timetables and methods. A gradual increase in the workforce numbers was noticeable; the need to train men to work the machines and equipment being installed is an obvious example leading to the increase.

Administration

Developing the factory administration was critical. New management had to be engaged and responsibility for working arrangements assigned. One example in my field was to set up the Engineering Change Committee. Regular meetings brought together Product Engineers, Production Engineers, Inspection and Purchasing Staff plus others possibly affected by any proposed design changes. It was inevitable that the consequences of road-testing of later prototypes and other development testing must lead to design changes which needed to be considered as to the affects on material in the pipeline or changes to machines and equipment, including inspection and packaging requirements.

After March 1963

The announcement of the Imp, to be made in a new factory in western Scotland bringing work for the thousands of unemployed, brought celebrations and applause from politicians, local dignitaries and the many Scottish people affected. However, there remained many loose ends to be tied up by the engineers and production staff under the appointed managements of both factories. Faults in bodywork quality, power train, cooling systems and control reliability had been listed in customer dissatisfaction reports. Many of these may be put down to time limitation in product development and proving although much depended on quality control in the body build and at other suppliers.

For myself, my job had been finished successfully, on time and within my forecast budget. Accordingly I am proud to have been associated with all those whose efforts, carried out in a timely and competent manner, had been dedicated to bringing the Apex project to fruition as the Imp.

Footnote

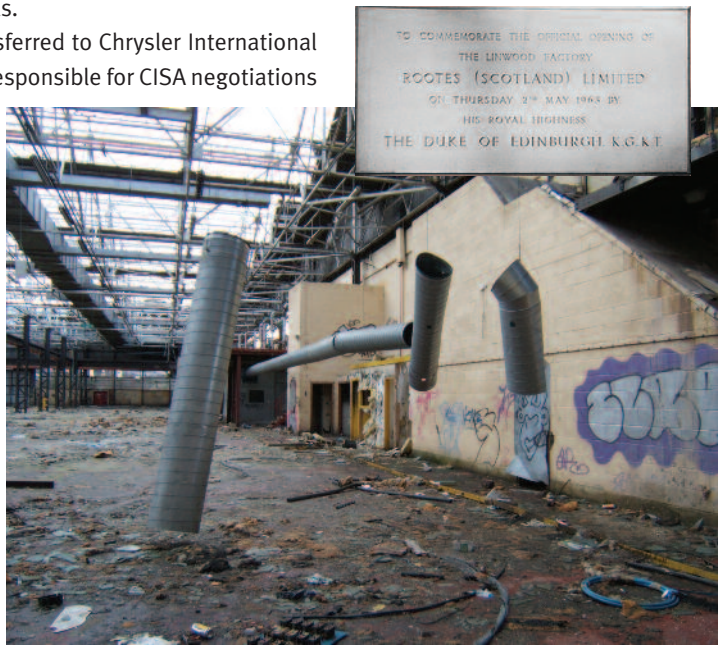
Perhaps I can record that in a conversation with Geoffrey Rootes on plans for the future I gave my view that, however good had been our Manufacturing Planning, we now needed a Product Planning function.

So what happened? By the end of 1963 I was put in charge of Group Forward Planning and able to set up the Product Planning function.

By May 1967, as a member of Rootes Motors Administration Committee and Director of the Product Planning and Development Division with 1,500 staff, we were geared up for planning and engineering future models.

Four years later, I transferred to Chrysler International S.A. (CISA) and became responsible for CISA negotiations with Governments and Industry in the fields of Vehicle Safety and Emissions in the world outside America.

I retired from Chrysler International and the motor industry in 1978.



Nothing lasts forever. Linwood, proudly opened by the Duke of Edinburgh in 1963, has now been largely demolished