Rane TRW Steering Systems – where flawless process makes quality products

Text & Photos: Bhargav TS

Steering system in automotives is one of the direct areas of contact between the driver and the vehicle. It is an important element to maneuver the vehicle to execute a turn or avoid obstacles. The market for steering system has been driven primarily by the exponential growth of the automotive sector, especially in the emerging economies. The demand for fuel-efficient and easily maneuverable vehicles is fueling demand for advanced automotive steering systems in these regions.

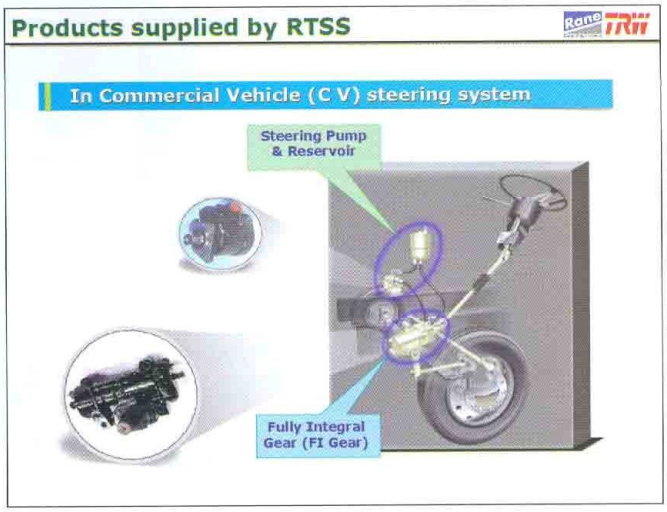
In India, the Chennai-based Rane Group manufactures wide range of auto components except tyres. In fact a vehicle can be made with the components manufactured by the group. The company's steering gear division, Rane TRW Steering Systems Ltd (RTSSL), a 50-50 joint venture with ZF TRW, manufactures fully integrated hydraulic steering gears, hydraulic pumps, power-rack and pinion, power steering fluid including plastic reservoirs, and supplies to major OEMs in the country.

Recently *Auto Components India* visited its Viralimalai plant near Trichy in Tamil Nadu to understand its production and process systems, and productivity and quality improvement methodologies. We were able see the manufacturing process, quality levels and the deep involvement from the top management to the grass root level.

The Viralimalai plant, established in 1988 as Rane Power Steering Ltd, has 2 divisions; FIG division and Valve division. FIG division manufactures hydraulic power steering systems for commercial vehicles and tractors, and the Valve division manufactures power-rack and pinion valve and supplies to its Guduvancheri plant.

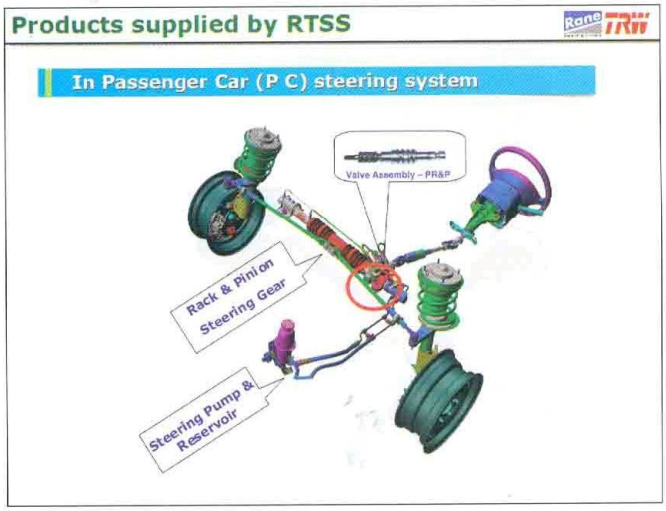
In October 2005, the company bagged the prestigious Deming Prize, reputed to be one of the highest awards on TQM in the world. Employing the Japanese methodology of TQM (Total Quality Management), it roots out inefficiencies through countermeasures including ensuring quality at source, moving from inspection to assurance and building stability in the manufacturing process. The company also gives importance to the Japanese concept of mistake-proofing or poka-yoke. In the assembly line, you can see hundreds of poka-yoke.

RTSSL has different manufacturing cells based on the component lines. The lines are differentiated according to the process sequence the component carries and are separated based on the heat treatment. A lot of innovation has gone into the manufacturing process. Using alternative materials weight is reduced. The company uses Special Purpose Machines (SPMs) to manufacture different parts. SPMs are manufactured in-house in correlation with the supplier detailing requisites and the applications of the machines. SPMs are used for internal, external parts manufacturing, valve production and also for assembly operations. External parts, made up of casting, once machined will go to the inspection area. They are washed to remove contaminants and finally sent to the assembly line.



Internal parts will undergo a lot of processes like steel forging, boring, mounting hole operations and finally finishing. The finishing operations in-turn goes through various stages like milling, drilling, deburring, grinding, honing and burnishing.

Internal parts of the steering system include rack piston, central shaft and worm shaft undergo for heat treatment to get the hardness trait. Post the finishing process these parts get the desired accuracy in dimensions, geometry and surface. Before heat treatment the parts have to cross 7 stages and after heat treatment 5 stages. All the processes are conveyor- driven. After these processes, the products will go for performance testing. Finally the external parts, internal parts and valves, respectively, will get fitted in the assembly lines.



Standard room

Housing machining

Housing machining

Housing cell

Rack cell (Lean production)

Forged rack

Rack grinding

Material handling - sector shaft

Worm shaft

Heat treatment

Sub-assembly line

Sub-assembly

Main assembly 1

Main assembly 2

Main assembly 3

Main assembly 4

Testing

Ready for surface treatment

Valve assembly line

Valve assembly

Assembly

There are 5 stations in the assembly line operations. In station one, housing of these components and sub assemblies of worm shaft and rack piston take place. The second station takes care of sector shaft and side cover assembly. The third and fourth stations take care of the wall house assembly and finally the assembled components will go for leak testing. Leak testing is done with specially imported Japanese machines. Similarly with the machines imported from Australia the balance testing is performed before delivery.

For housing, a component has to be measured for its dimensional accuracy. When it conforms to the specifications it is tagged 'go ahead'. The profile projector is used to magnify the component on the screen as the automotive industry is sensitive to dimensional accuracies. Similarly with the help of video measuring machine intersection angles and the curvature measurements are taken care.

Surface finishing is mandatory for all the components and grinding operations takes the lead in that.

Quick facts

- Established in 1988 as Rane Power Steering Ltd
- In 1997 formed 50-50 JV with TRW
- Received Deming Prize in 2005
- All the products are tested and shipped
- Increased quality & productivity with advanced grinding machines
- Around 30% weight reduction achieved in SUV gears
- Has 53% market share in hydraulic power steering
- Automation levels are around 50-60%
- 1200 PPM for valve and 200 PPM for FIG
- ITI education inside the factory for 88 students a year

In 2007-08, only 2-3 models were being manufactured in the plant. But now there are more than 25 models and the metrology calls for more investment in equipment. As the import costs are alarming indigenisation has become a necessity. Rane encourages the employees to innovate. As it has localised the procurement, the company is able to work on its lead time.

Business excellence model

During the plant tour, the Senior Vice President – Operations & TQM, K Sudhakar said, "We are very proud to say that we have come up with the business excellence model. The concept of machining is the same, but the processes are different for each component. We are the third to receive 'Deming Prize' in India and that exhibits our quality strength. We have come up with the 'Rane Business Excellence Model' and started giving tangible results to the model. Training is our major strength and we are able to sustain the TQM principles in our outputs through high morale of the employees."

In most of the operations, the company has worked on weight optimisation by using different manufacturing processes and raw materials. RTSSL has significantly reduced the weight of the components it makes by using cast iron with modified specification. With the help of Value Analysis and Value Engineering (VAVE) excellent results are arrived at. Around 30% of weight reduction is achieved in SUV steering gears. The company also gets input from its Japanese counterpart and brought down 35% material content in gears.

The RTSSL team has delivered futuristic products satisfying the customer's expectations. For instance, in tractors, it is working on recirculating ball steering, but it requires modification in the integral column and together with the customers, it has arrived on 'collaborative approach model.'

Quality is the mantra for RTSSL and works round the clock to achieve 'zero defects'. It also

The team that is driving the Viralimalai plant of RTSSL

promotes 5S (the key targets of 5S are workplace morale, safety and efficiency), suggestions, QC and kaizen programmes. This gets the workforce to voluntarily participate to improve quality levels. The company has more than 175 authorised service centres and they attend to complaints. The consolidated report is received once in a month from them and Warranty Management System (WMS) works on the complaints online. The company currently supplies to Tata, Mahindra, Renault, Ashok Leyland, Nissan, Isuzu and Ford.

Innovation is a focus area for RTSSL. It has developed a special powerful gear for farming operations. Integral power steering in tractors with a combination of hydraulic and hydrostatic mechanisms is what the company delivers to the farmers. It has also come up with one gear to drive 2 axles (front axles). It is cost effective and will be launched in a year. Once this is successful in the market, bagging a business of 4000 gears a month would be phenomenal, the company looks forward. For rear axle gearing, it gets inquiries from Tata Defence team and the steering manufacturer plans to trial-run it in December this year.

Moving ahead through innovation

Rane TRW Steering Systems achieves high levels of productivity and profit through innovative management practices and production processes. In an interview with Bhargav TS, RTSSL's Senior Vice President – Operations & TQM, K Sudhakar explained how the company re-designs the components it manufactures to reduce weight and optimise the processes to be competent and cost-effective in the domestic and export markets. The excerpts:

Q: What is your road map ahead and how do you plan to beat the competition?

Sudhakar: We are now entering into the small commercial vehicle (SCV) segment for which we are developing the systems. We are currently working on miniature of the gears but it will be of the same concept of recirculating ball, so that is our immediate priority. We have also started working on tractor hydraulic steering system. The volume is going to be huge and we expect the volumes to be 700,000 a year in the next 2 years.

Staying competitive is a challenge, so we are working on to use low-cost gears, which will replace the current gears without compromising on the quality. We will be using the same material at the same time we will be working on different process and the configuration will change. We normally work on value engineering the parts, where we will re-design the component to have less weight and to optimise the process.

Q: What are your plans on exports?

Sudhakar: We are currently exploring opportunities along with our partner TRW. Manufacturing the sub-assemblies requires huge investments. We are ready to do that and export to all our partners' facilities. We will be localising the machineries to offer low-cost solution. We are also in talks with Isuzu for their pick-up both for the domestic and export market. We hope that we can grow in these areas.

Q: What is your current market share in the CV hydraulic power steering system?

Sudhakar: Our vision is to be a leader in domestic hydraulic power steering and currently we have a market share of around 53%, which is broadly classified into M&HCV and LCV. In M&HCV we have a market share of 49% and in LCV our market share is around 62%.

Q: What is the current plant capacity?

Sudhakar: Currently we are making 18,000 units a month and this year we will reach 21,000 units and next year we will have 25,000 units. This capacity expansion will be done by optimising the process parameters and adding some machines.

Q: What is the current level of automation?

Sudhakar: The plant automation is around 50-60%. In certain machines only loading and unloading is done manually. Many operations are automated. In certain cases gauging is also automated, which is called in-process gauging. In high precise components we cannot go for manual inspection, so we have automated it and all the close tolerance components are passed to the next station only after digital inspection.

Q: What are the initiatives taken to use alternative sources of power?

Sudhakar: The power tariff has increased in the last one and a half years and the diesel cost is also increasing so last year we invested in solar energy. We have installed about 1 MW and started reaping the benefits from the renewable source. Our board has also approved capex to install another 1 MW and also planning 1 more. This will help us to save huge amount on the power bill. **ACI**