INTERVIEW – Dr.-Ing. Alvin Anthony, Sales Engineer, expresses his views on the challenges taken up by the Forwarder2020 project

The Forwarder2020 project is coordinated by HSM, a forestry machines developer and builder located in Germany. In this interview Dr.-Ing. Alvin Anthony, Sales Engineer at Dana Rexroth Transmission Systems, takes time to express his views about the challenges taken up by the Forwarder2020 project and the project´s impact on the Institute's general research activities - a great opportunity to learn more about the functioning of the hydrostatic-mechanical power-split transmission (Module 1).

Dana Rexroth Transmission Systems (DRTS) is in the business of developing and manufacturing technologically advanced hydro mechanical variable transmissions. The major advantages of this new technology are the fuel savings achieved by intelligent control of mechanical and hydraulic components. This leads to increased machine productivity. Dana Rexroth is a joint venture of the Dana Corporation and Bosch Rexroth AG. Both parent organisations are leaders in their respective business segment. The collaboration developed in the form of a joint venture Dana Rexroth was to advance transmission technology which has not seen many innovations since its induction in the mechanical engineering market segment in the early 1940's. The transmissions developed by DRTS are technologically advanced in the sense that they offer an infinitely variable speed or stepless speed output. The advantage of this transmission technology is that is does not use the standard torque converter which is currently the industry standard, but instead uses a hydrostatic transmission.

Short Biography

Dr.-Ing. Alvin Anthony, Sales Engineer at Dana Rexroth Transmission Systems, has 16 years of experience in Sales and Engineering. His key attributes are a multi-disciplinary engineering skill-set and corporate cross functional experience. He finished his bachelor in Mechanical and master in Mechatronics in India. Furthermore he holds a Doctor of Engineering from the University of Parma and is specialized on Fluid Power and Control Systems. Before finishing his PhD he worked for a company in India as a development and ship repair engineer, specialized on fluid power and vibrations.

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Dr.-Ing. Anthony, you are an expert in fluid power control systems. You are then a key partner in the development of the development of module 1, hydrostatic-mechanical power-split transmission. Why has your organisation decided to join this Forwarder2020 project?

HSM is a strategic customer for DRTS. We would like to support HSM in their development activities in order to bring HSM in a position to be a technology leader. Each application requires a dedicated software setup. This is needed to ensure machine´s dynamics and productivity. With the participation of DRTS we will develop this software setup for the forestry application.

Please briefly describe DRTS´s role in the project and the functioning of the different innovations developed by DRTS.

DRTS as an industrial partner supports the consortium of the Forwarder2020 project with three important inputs: driveline design, transmission selection and transmission control development.

DRTS supported HSM in the overall driveline design of the Forwarder2020 prototype. This starts from the diesel engine output shaft, implement pump configuration, cardan shaft to the transmission and the two output shafts to the front and rear axle. This also includes the axle positioning inside the machine frame. As this is a vehicle with an articulated frame, the overall machine dimensions (width and heights) should not be affected by this activity.

Because the installation space for the transmission is tight in forestry applications, DRTS is proposing the selection of the so called “short drop” transmission. The installation space in forestry machines requires a short distance between transmission input and output shaft. This is because cardan shafts do only allow a limited inclination. For this reason DRTS developed the “short drop” transmission. In order to reduce the amount of product validation, the “short drop” transmission is using all rotating parts from an actual product of DRTS, which is already developed and validated.

The third input of DRTS is the development of the transmission control system. A powersplit driveline has full CVT functionality. The software control allows disconnecting engine speed from vehicle speed to ensure optimum driveline efficiency. As mentioned before the transmission control is providing machine productivity and dynamics. In order to do this the software is managing proportional clutches and hydrostatic units. A communication through CAN bus with vehicle HMI and diesel engine is required. There is also a diagnosis interface which allows parametrization and communication of error messages. In addition the software needs to be prepared for connectivity and condition monitoring.

What are the environmental impacts of the innovations which DRTS contribute to the new Forwarder2020 prototype?

With the CVT functionality there is the possibility to disconnect vehicle speed from engine speed. With this we can operate the engine and the transmission in the “best point of efficiency”. This results in reduced fuel consumption reduced CO_2-emissions and reduced noise emissions. Also engine vibration is on a lower level, which provides a more comfortable environment for the operator. As mentioned before, machine productivity is not affected.

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Up to now, which are the main achievements of DRTS in the project?

Up to now the driveline design is completed and implemented. HSM did procure the required parts and completed the prototype setup. The activities for the next weeks are to implement and validate the software control into the driving machine. This is ongoing for the next months. Next steps are field tests in Saxony and rolling road test at KIT, Karlsruhe. Purpose of the rolling road test is to operate the machine in extreme downhill condition. In this condition, the braking behaviour needs to be optimized in order to avoid engine overspeed – this will be a common activity between HSM, KIT and DRTS.

What is the connection between the Forwarder2020 project and your general company´s objectives?

DRTS has long experience in transmission design, hydraulics and software development. In the Forwarder2020 project we are sharing our experience with the involved partners. Our activity in the project corresponds to our day-to-day business. We are developing our driveline solution for all kinds of applications. In this case we do this for a forestry machine.

As Forwarder2020 is your first EU-project: what are your experiences in working on an EU project up to now?

The setup of the EU project allows manufacturers like HSM to develop a machine with multiple innovations. Usually there is a high financial effort needed which in this case is covered by the European Union. Smaller partners with excellent engineering input are also invited to participate. This allows a cooperation, which is typically only found in global operating companies. DRTS is proud to be part of this consortium. In 2018 Bosch Rexroth hosted the “Mobile 2018” event with 1000 participants from all over the world. DRTS participated in this with a presentation where also the EU project Forwarder2020 was proudly presented.

What will be the highest impact of Forwarder2020 on the forestry sector and on logging activities in general? (Added-value for foresters and wood industry)

The Forwarder2020 project includes, from an engineering point of view, multiple innovations. Not only about driveline, also about axle-design and crane hydraulics. For DRTS as a transmission supplier it is difficult to foresee the overall acceptance from the final customer in the field. Nevertheless we provide our full support and experience. The efficiency advantage of the driveline is not only a theory; this has been proved successfully in earthmoving and material handling applications. DRTS will support the consortium to achieve that similar improvements will be achieved in the forestry applications.

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