

The current state of the art in fluid power engineering

A short interview with Univ.Prof.Dr.-Ing. Hubertus Murrenhoff, Head of IFAS of RWTH Aachen University, during the Fluid Power Engineering Conference in Maribor – FT'2007



Univ. Prof. Dr.-Ing. Hubertus Murrenhoff

Ventil: Prof Murrenhoff, on behalf of our fluid power engineering journal *Ventil* (the valve) I am welcoming you most cordially at the FT' 2007 in Maribor. We are very proud to have you here as the head of the most popular and important institute for fluid power engineering in Europe and a distinguished professor at RWTH Aachen University in Germany.

*This year two of the most known German fluid power magazines, *Ölhydraulik und Pneumatik* and *Fluid* have been celebrating enviable anniversaries, 50 and respectively 40 years of publishing and active influencing the developments of fluid power technology, science, education and industry in Germany, but also in Europe and in the world. Would you please express your opinions about this two magazines and their importance?*

H. Murrenhoff: I will try to answer. The question is not very easy, because you have to know that I am co-publisher of *Ölhydraulik und Pneumatik*, together with prof. Helduser in Dresden, and we are proud to be publishers of this famous fluid power magazine. It has really accompanied us since the time when prof. Backé started the cooperation in Aachen. In the very beginning he was associated with the *Industrie Anzeiger*. I don't know if you know that magazine. But then production engineering started to move away from fluid power as we it know today. A reason can be seen that fluid power is a drive technology, thus not directly associated with production, as it was in history. Then he switched from *Industrie Anzeiger* to *Ölhydraulik und Pneumatik* and became its publisher. And when he retired, back in 1994, I joined it directly, with prof. Helduser, who joined us a couple of years later. So we continued this long tradition of publishing scientific papers in German. And so this is *Ölhydraulik und Pneumatik*.

Fluid, on the other hand, gives flash-like information, more like what is going on in the field; it provides opinions and interviews, and brings it directly to the point.

That is the difference. *Ölhydraulik und Pneumatik* is going more deeply, trying to give scientific standpoints. We now have a new process with peer-reviewed papers if you like to have them peer-reviewed. If you don't want to have them peer-reviewed as a typical author from industry, you don't have to.

Ventil: Is this up to the authors, or are all of the scientific papers peer-reviewed?

H. Murrenhoff: It is up to the authors, yes. If you want to publish a reviewed paper than you have to ask for it. And then the formal process is follows the known steps: the paper is sent out to the people of the technical advisory board or other outside people known as scientific experts in the field. And then, if you get back comments the reviewers don't like very much, you have to repeat the process to satisfy the opinions of these unknown colleagues.

So that is completely different from what they use in *Fluid*, where you find a lot of advertising, things close to companies, giving some short, compressed interviews, and information about actual news from industry.

Ventil: Are you at IFAS also active in direct communications with industry?

H. Murrenhoff: Not really. We are directly associated with *Ölhydraulik und Pneumatik*, but *Fluid* is also invited to all our conferences, seminars and colloquia, the latter which we conduct on Fridays, organised for industry and their presentations. And they actually come and report about the events, make short descriptions about them, and so on. You have to understand what is the strength of each magazine in order to satisfy the reader. The strengths of *Ölhydraulik und Pneumatik* lies more on the scientific side, and provides more in-depth descriptions of scientific papers, and the research efforts at the universities and in industrial companies.

Ventil: And how are your relations with the *International Journal of Fluid Power*?

H. Murrenhoff: That is a different story. Because *Ölhydraulik und Pneumatik* is tied to the German language, this makes difficulties when it comes to making our publications understandable to the whole world. You may think in Slovenia that Germany is a big country, but looking from the English side, Germany is like Slovenia in relation to Germany. So by publishing in German you are approaching just a limited number of countries where they speak German. That is a problem, and for that reason we started to translate articles from *Ölhydraulik und Pneumatik* into English, and put them on the internet. But that is not considered to be a scientific paper in English. So if you want to publish and make developments known to the whole scientific world, you have to go to journals like *IMECE (Institution of Mechanical Engineers) – London*. They have six or seven different categories of publications and you can find everything there. So there is a huge European entity. But you can also publish in the *International Journal of Fluid Power*. So we sometimes publish in those Journals, and later on we publish a German article in *Ölhydraulik und Pneumatik*.

Ventil: Have you any coordination of the editing between the *International Journal of Fluid Power* and *Ölhydraulik und Pneumatik*?

H. Murrenhoff: No, I must say not. But sometimes it would be good to publish some articles from *Ölhydraulik und Pneumatik* in the *International Journal of Fluid Power*. But they don't allow it. So you have to publish it first in the *International Journal of Fluid Power* and create an extra article in German language for *Ölhydraulik und Pneumatik*. So we work it this way around, to satisfy and to inform the whole international scientific community of our developments. We have simply to admit that *Ölhydraulik und Pneumatik* is more like a national magazine and really only addresses German-speaking communities. And so is *Fluid*, even more so.

Ölhydraulik und Pneumatik is, let's say, also known in Asia, to English-speaking people who also know German. But some English-speaking people don't even know that it exists. You see, the English-speaking people, in general, are very lazy and they don't bother about other languages. So *Ölhydraulik und Pneumatik* is known across borders, but reviewed and looked at by only a limited amount of the fluid power community.

Ventil: So, how do you see the future development of *Ölhydraulik und Pneumatik*, *Fluid* and other fluid power magazines, looking globally?

H. Murrenhoff: I think they have the field covered pretty well, and they can continue that way for quite a while. But they also have to look at how the outside disciplines are looking at fluid power. Because you can also say that fluid power is a part of drive technology, so you can think about drive technologies in general and drive technologies under design engineering. So you have design engineering drive technologies, which can be hydraulic, pneumatic, electric, mechanical, etc. So, there is a bunch of things going on in drive technologies. So, a question could arise, is it realistic that a magazine or a journal can exist by just looking at fluid power? That is the question. But the future will show what is the right thing.

Ventil: Are you talking now more about drive technology or about mechatronics? Is mechatronics out of date already, or not?

H. Murrenhoff: Mechatronics? You have to see, we at RWTH Aachen University said, we will not use the word in our faculty as an institution or department. Because mechatronics is mechanical engineering these days.

You cannot say we have an institute for mechatronics, because mechatronics like fluid power is mechatronics right away. Each valve is a mechatronic device, each servovalve with all the



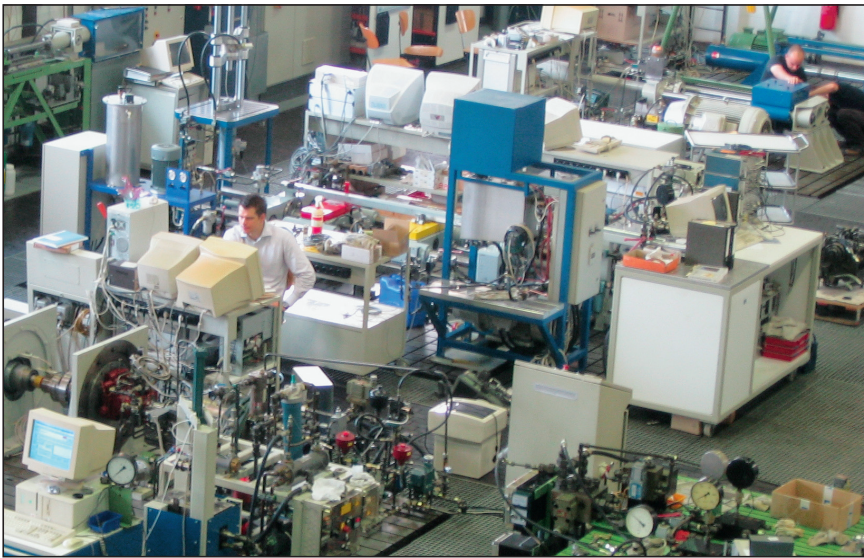
IFAS – Main building

integrated sensors and controls is a genuine mechatronic device. And so it was all the time. When other people didn't even know the word mechatronics, fluid power was mechatronics. Then all of a sudden the modern word mechatronics comes up, and everybody said OK, we will have an institute of mechatronics. But RWTH Aachen University said no, not with us, we have all the institutes involved in mechanical engineering, and they all have to do with mechatronics, because it's a part of mechanical engineering. So that is the way we look at it in Aachen, and I think the future will prove us right.

Ventil: Thank you very much for these explanations!

Next year will also be an important anniversary of your respected institute, IFAS. Would you, please, explain us some very important facts about the institute, its past and future?

H. Murrenhoff: You are right. Prof. Backé came to Aachen and founded the institute back in 1968. So in 2008 we will have the 40th anniversary, and in 2018, the year of my retirement, we will celebrate the 50th anniversary. So in 50 years we will have just two professors as heads of the institute. What comes after that, I don't know! Anyway, yes, we have this in focus. We know that we have to do something next



IFAS – Main laboratory – testing field

year. And we are still in the process of thinking “what is best to do”? Or to make a little celebration, to invite people to a “day of open doors”, with some presentations and open laboratories, or to organize a little “Fest” or party.

The next regular Aachener colloquium will, I am sorry to say, not take place at the 40th anniversary in Aachen, as it is planned to be in Dresden. But the 50th anniversary, in 2018, and the regular colloquium will come together. So then it will be a huge event. But we don't know whether we will survive until 2018. So we better celebrate the 40th anniversary next year.

Ventil: Anyway, how is the institute today?

H. Murrenhoff: You have all the information on the internet, everything is listed there. So we have a structure, like chief engineer, Mr. Meuser and scientific director, dr. Theissen, and myself, as the head of the institute. Then we have five research groups dealing with: tribology, pumps and motors, drive technology, systems and pneumatics. You have to look to the internet to get the right names of the groups and their lists of major research projects.

Ventil: Would you, please, tell us what is the percentage of pneumatic research projects?

H. Murrenhoff: We have one that I will speak about at this conference,

this is the “condition monitoring in pneumatics”. Then we have a project about pneumatic pace-drives (in German: Schrittantrieb), to be used to transport glass in LCD production. Another project deals with product planning in connection with VDMA, like improving our understanding of friction, using new materials instead of aluminium, using injection moulding for manufacturing complete components with the direct incorporation of everything, like cylinders with sensors, controls and seals, directly put together and moulded in single steps.

Ventil: Is this the most important way of development and scientific work of your institute?

H. Murrenhoff: Yes, and it is heavily based on tribology, understanding friction. Because friction is associated with lifetime and with energy improvements. So, we focus on that a lot. It is also essential to dynamic performance.

Ventil: What about nanotechnology and the associated new fields of engineering?

H. Murrenhoff: That is a part of it. Because it enables us to have surfaces with a certain structure; what kind of surface coatings you use; what is compatible with different seals; to grow certain characteristics utilizing the surface. That works together with the fluid you use; in pneumatics, of course, we have some grease at the

beginning. This all works together and gives a long predictable lifetime, less friction, and, of course, good performance. So that demands a lot of tribological research and determines also what we do in pneumatics.

Ventil: Anyway, we come now to the question of future fluid power developments, looking, understandably, from Germany.

H. Murrenhoff: As you know, Germany as well as Europe, is very strong in the fluid power industry. Sales are good, companies offer their products worldwide, they have their subsidiaries in different countries around the world. But also there are huge efforts to strengthen this position. For that reason we have to maintain what we did in the past, even to apply for more research money, also directly from industrial funds in order to bring new developments on board, and bring certain ideas and innovations forward. What we do at the institute is always a preproduction step. We also call it pre-competitive research. It is like understanding friction. Everybody is interested in it. And, if certain things are known, the knowledge bases are increased and all companies can profit from them. But you don't give just a certain company any advantage to buff the other companies.

Ventil: How about the scientific cooperations, for example, with the emerging industrial countries, like Taiwan, Korea, China, etc? Are you cooperating with them scientifically?

H. Murrenhoff: Yes, this is indeed true, but that is not so much known in the industrial world. Let's say, in the field of tribology we are doing a lot of basic research which is mostly used in the scientific world and will come to be applied in industrial applications later on. That is like an excellent new cluster we apply for; that is called tailor-made fuels, made from plants, but only from the parts which are growing in the environment anyway, and are not competing with the food supply chain – these crazy developments of bioethanol in US that caused a sudden increase in food prices, etc. That is not the way we want to go, we will use only the parts of plants that are

not usable for food. These could be green parts with a lot of water and moisture, but also wood chips. We want to make fuels out of it. And, the combustion engine people, they design the motor with the requirements of this new combustion process. And our part of it is to design high-pressure fuel pumps. Which for low-viscosity fluids might be 20 bars to 300 bars, and for diesel like fuels it may be between 2000 and 3000 bars. So we have to make sure that these components work. And here there is also a lot of tribological research required.

Ventil: *How are cooperations in these fields with different universities and institutes in the US?*

H. Murrenhoff: Yes, in this field we think we have a huge innovation which is very new and we planned here the cooperation with some institutes in the US. We are here pretty much at the cutting edge at RWTH Aachen University, but we hope to get the funding in a fierce competition. We already accomplished a preview process where also professors from MIT, Harvard and other US institutes have been engaged and on 19th of October decisions will be made and we will see if we will succeed. Meanwhile we know, we did succeed and our University was chosen as an Elite Entity.

Ventil: *Are these cooperations more intensive with US or, for example, with Japan, China or other countries?*

H. Murrenhoff: The planned research work with regard to tailor made fuels from biomass is mainly concentrated at institutes in Aachen. The cooperation with parties abroad goes in both directions meaning to learn what they are doing and then learning from our activities. The basic research is important for us in Aachen, and depending on the knowledge we gain, we of course publish it, and we will also learn what others are doing. Thus cooperation can start and we can bring certain things a step further. But the first step is always to win a contract, then do some good research, and then the cooperations can start.

I have to say that at the moment we are a little bit more oriented towards

Anglo-Saxon roots rather than the Asian roots. But that may change when it comes to research on combustion engines, which is being done also to a great extent in Japan. I don't know these connections in detail. But I know that in fluid power there is a lot going on in Japan, and it is also a little bit influenced by what we are doing here in Aachen.

Ventil: *At the end I want to ask you what is your opinion about the role of industrial as well as professional associations?*

In our country we are not so strong on the scientific side of fluid power, but we are battling to get the people together on the professional as well as on the industrial points of cooperation.

What do you think about the importance of associating professionally, industrially, internationally, etc?

H. Murrenhoff: It is more than important. It is like building a network. You may start with an association of manufactures. Then you can find out what are the problems you can solve in the medium-sized and smaller companies. In these discussions, research tasks will be found and addressed and that goes to the scientific community. And if those are funded in a proper way, you may solve actual pre-competitive problems in industry and the solutions may be used by different companies even those competing on the market.

So it is a kind of a mosaic bringing little pieces together in order to help fluid power mastering the future.

Ventil: *Is your institute also promoting this kind of development of fluid power?*

H. Murrenhoff: Yes, that is what we are doing continuously. One sort of funding that we use very actively is financed mostly through AIF (German: Arbeitsgemeinschaft industrieller Fördervereinigungen) by the Ministry of Science and Technology and coordinated by the association of manufacturers (VDMA) in Frankfurt. Here we mainly conduct pre competitive



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research accompanied by working groups from member companies. Than we also have cooperation projects financed by different ministries and consortiums of companies across the borders financed by the EU. The latest aspect would also be interesting for cooperating with companies in a country like Slovenia.

Ventil: *Are you as an institute and a university also involved in the work of standardization, like DIN-standards, ISO-standards, EU-Norm, etc.*

H. Murrenhoff: I have to admit, we could do more, but we are also limited with capacity and resources. The work is very important, but it is not the right thing for a research institute. But for industry it is very important. You could imagine the problems you would have if the different hydraulic and pneumatic components would not be in standardized sizes, connection dimensions, etc. So the work is very important but it has not to be a major focus of a research institutes.

Ventil: *Our time runs out, so we have to finish this interesting conversation and your kind explanations. We thank you very much for the time you took to talk with me, for our young and small fluid power magazine Ventil (with just 13 volumes) as one of the publishers of your enviable Ölhydraulik und Pneumatik, in the year of its 40th anniversary.*

H. Murrenhoff: Yes, but yours is a growing magazine, and that is very important for fluid power in your country. I see that everything that is going on in Slovenia is growing and expanding very quickly.

Ventil: *Thank you for your kind explanations, and again for the time you took for us.*

Thank you!

*Anton Stuček
Assistant Editor*