

# Fluid Power Over Four Decades

A short interview with Professor Emeritus Wolfgang Backé, Dr.-Ing. Dr. h.c. mult., former Head of IFAS of RWTH Aachen University, on the occasion of his 80<sup>th</sup> birthday celebration in Aachen on 31 July 2009



em. Univ.-Prof. Dr.-Ing. Dr. h.c. mult.  
Wolfgang Backé

**Ventil:** Prof. Backé, it is a great honor for our fluid power engineering journal Ventil to have an interview with you as one of the most prominent professors and experts in the field of Fluid Power worldwide. In July this year you celebrated your 80<sup>th</sup> birthday anniversary. On behalf of the journal Ventil I would like to congratulate you on this special occasion. On 31 July 2009 there was a great event in Aachen, a special Colloquium to honor your birthday. It was an extraordinary honor for me to have been a part of this event, to which about 160 guests from Germany and abroad were invited and to celebrate it with you and your respected wife Ms. Seitz-Backé. What were your feelings on this day and what are your feelings now?

**Prof. Backé:** First of all, thank you for your good wishes. My answer to your question is that I felt great and I am very proud that I could run the institute for 26 years and reached some good results so the institute has got a better reputation in Germany and also globally.

**Ventil:** You have been professor emeritus for fifteen years and are still active at the Institute IFAS where you were a director for 26 years. How do you see the development of the Institute nowadays?

**Prof. Backé:** I am happy that the Institute IFAS is running so well under the guidance of my successor professor Murrenhoff.

But we have to realize that research in the field of fluid power has become more difficult today. The real important discoveries, as for example the proportional technique, the cartridge technique, the displacement control technique and the secondary control was introduced and much research has already been done in this field.

So, today the research is much more directed to a deeper knowledge of materials, hydrodynamics, production possibilities and to a condition monitoring.

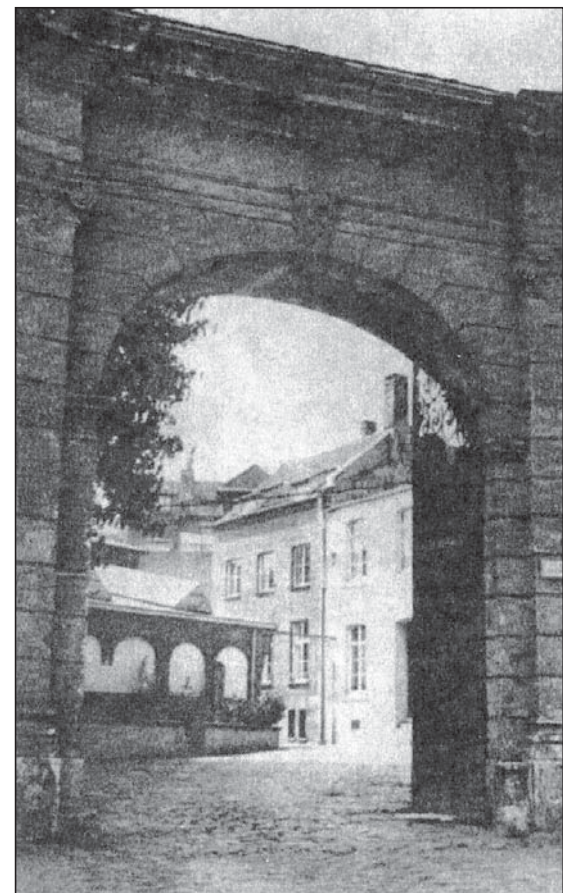
**Ventil:** Let's go back to the beginning of your career in fluid power, Prof. Backé. You earned your BSc in Mechanical Engineering at RWTH Aachen in 1955 and your PhD at the Institute of Machine Tools at RWTH Aachen in 1959. What were the reasons for continuing your professional career in the field of Fluid Power?

**Prof. Backé:** From the beginning of my studies I was interested in fluid power. At that time machine tools were the main application of fluid power. We had one ingenious lecturer who could explain fluid power very well. So the signal circuit at that time was electric but sometimes also hydraulic or pneumatic. It was fascinating how the automatic pro-

cedures went on, only controlled by the electric or fluid power switches.

**Ventil:** After spending some years at another university and in the industry, you rejoined RWTH Aachen in 1968 and established the Institute for Hydraulics and Pneumatics (IHP), today known as the Institute for Fluid Power Drives and Controls (IFAS). What were the reasons for such a step?

**Prof. Backé:** I think that in the field of fluid power a few years of industrial experience are necessary because fluid power is quite related to an application. But I thought that in this field a lot of systematic work



The first building of the Institute for Hydraulics and Pneumatics (1968 – 1972)

was necessary. The knowledge of the fundamentals has to be taught to students who want to work in this field successfully.

**Ventil:** Can you describe the beginnings of the institute IHP and the main research interests in a bit more detail. How big was the Institute in the beginning?

**Prof. Backé:** The beginning of the IHP was not easy. We were only a few people and we had nearly no measuring devices, so our only chance was to write intelligent applications to research funding organizations and in this way increase our manpower, measuring devices and testing stands. We made systematic tests of all the available control devices and displacement units.

At last we covered the whole field of fluid power. Because of our reasonable reports we earned good reputation and joined research projects carried out by a group of institutes, so we worked for instance in the field of production technology, in the field of medical technique, in the field of power transmission and in the field of robotics.

**Ventil:** Prof. Backé, after the establishment of the new Institute in 1968 you spent the next 26 years as Professor and Director of Fluid Power Transmission and Control at the Faculty of Mechanical Engineering. During these years your Institute became one of the world's largest and renowned research institutes in the field of Fluid Power. How did you succeed in this and what were the main driving forces for such a success?

**Prof. Backé:** There really were good opportunities at that time. We were the only institute that was fully working on fluid power. Other universities employed experts from the industry to teach the students, but that could only give an explanation of a single application of fluid power and not the whole field. Our system of handling the whole field from the fundamentals to the different applications systematically seems to be the right way.

So other universities as Dresden, Braunschweig, Hamburg, Karlsruhe followed our system and founded special institutes for fluid power. The same is true for other countries like England, Sweden, Finland, Slovenia and Japan, to only name a few.

**Ventil:** Well, this is probably only one of the reasons why you are called The Pope of the Fluid Power among the "Fluid Power people" all around the world. For your leadership and distinguished contributions to fluid power and motion control, including the establishment of one of the world's largest and renowned research institutes in the field of fluid power, you were honored during your professional career with numerous national and international recognitions, rewards and medals like ASME medal, "Verdinstkreuz des Verdinstordens" of the Federal Republic of Germany etc. You also hold honorary doctorates from the University of Tampere, Finland, the University of Linköping, Sweden and the University of Bath, UK. You were also the honorary professor at the Technical University of Taiyuan (1981) and the Technical University of Hangzhou (1989) in China. What is the secret to your success?

**Prof. Backé:** I have no special secrets, but I had fun working intensively on

fluid power problems. Another point may be that I am very interested in special research objects, so I was a serious discussion partner to my students.

We have contacts with nearly all groups working on fluid power in Germany as well as around the world. I am always happy to meet colleagues on conferences and discuss present and future developments in fluid power.

**Ventil:** Your main activities as full and emeritus professor have also included the promotion of 122 doctorate students, to whom you were "Doktorvater". Many of them, including myself, came from abroad to study with you. 122 is an incredible number and achievement!

**Prof. Backé:** It is my experience that there are excellent students in any country in the world if your institute is well known as a forge of systems and new ideas. I am proud that many of my former doctorate students hold important positions in the industry or at universities.

**Ventil:** As your "Doktorsohn" I can confirm your special feeling for people, for their research work and especially for the novelties in the specific research field. You have



*The handing of the Bundesverdienstkreuzes of the Federal Republic of Germany by President Herzog*



IFAS today – Main building

always found the right research idea at the right time. Can you give some advice in this direction to those of us, who continue your work as university professors in the field of Fluid Power?

**Prof. Backé:** I have always said that is very necessary that a university professor has good contacts in the industry - this means to the applications - so he can hear and see what the real problems in practice are. I recommend that capable younger scientists should start their way as university professors to transmit and increase the knowledge of fluid power.

**Ventil:** Your research work in Fluid Power was very rich and innovative the entire time during your professional career. Besides the theoretical approach you always wanted to end the research with a prototype and with experimental verification. Are there any special milestones, research fields or research achievements, which seem to you as the most important in your career?

**Prof. Backé:** The theoretical approach of the system cannot take into account all the peripheral influences. Therefore in our field, near to applications, it is necessary to prove the applicability of a development by experiments and to correct the theoretical model after the test results. Such corrections by unexpected influences

often happen during our tests. That is true, for instance, for different kinds of valves or displacement units.

**Ventil:** One of your important personal characteristics has always been a special feeling for the industry. You have succeeded in developing and kept it active, this, so important university-industry cooperation, not only in Germany but also with companies from abroad. How did you do it and what are the secrets to such a success?

**Prof. Backé:** It takes a lot of time for an institute to get a good reputation in the industry. If the institute gets a request from a company, the company must rely on the delivery of the report on time and get an accurate analysis of the results. That means that the members of the institute have to work more or less under industrial conditions.

**Ventil:** For many years you have been the publisher of the globally known journal O+P, which has been a very important source of information and research ideas for researchers and industrial environment all over the world. Also our journal Ventil has followed it as a model. You have also started to organize a scientific conference AFK, now IFK and initialized and moderated numerous so called "O+P Gespräche" – O+P

discussions. All these activities prove that you have a special feeling for research and especially for the responsibility to transfer this knowledge to the industry and vice versa.

**Prof. Backé:** I think that it is an important task of university institutes to spread the knowledge of their field and to stimulate innovations. For this purpose we used all the possibilities you mentioned: a journal with applicable and innovative articles, conferences and discussions.

**Ventil:** How do you see nowadays the position and the development of fluid power in Germany and also globally?

**Prof. Backé:** We have to realize that fluid power has got a strong competitor in electricity. The introduction of microelectronics in the signal path of systems has strengthened the position of fluid power.

But electricity is also trying to enter the energy path of systems. Because of the lower force density, until now only low force applications have been possible. In this area, whether electric or fluid power means are used often depends on the price. But we must see that it is a tendency to use electrical systems mainly to avoid oil losses.

That is the reason why the research in the sealing technique is so important. Until now there has been an increase of fluid power production in spite of the competition by electric systems, but that can change if electric drives or fuel cells are further developed.

**Ventil:** Prof. Backé, in the last few years your focus has been perhaps a bit more in pneumatics, which is becoming increasingly important and already takes almost 50% of the market in comparison to hydraulics. In your opinion, what, is the reason for such a growth and where do you see the most important advantages of pneumatics?

**Prof. Backé:** This higher annual increase of pneumatics in comparison

to hydraulics is astonishing. I found that this fact does not only have one single reason but several. The main reason may be that a pneumatic system can be used anywhere: in production engineering, handling, packaging or in process engineering. There are companies which offer prefabricated components. So there is no need for the components to be designed and produced, but the user can select them out of the catalog and build up complete systems. Furthermore, he can insert desired functions into the components: as acceleration and deceleration characteristics, speed behavior, generation of desired forces and so on.

The energy costs are higher in pneumatics but on the other side the investment and maintenance costs can be much lower. So, for a long working period the overall costs of a pneumatic system can be lower than of an electric or hydraulic drive.

**Ventil:** What is your opinion on the future development of fluid power?

**Prof. Backé:** I think that the development by permanent innovations will continue in the future. They will strengthen fluid power. But the innovations, which open wide new fields will be becoming rarer. The competition with electricity will become more severe, that is sure, so it is necessary to find new applications where the special advantages of fluid power are used and are not replaceable.

Until now hydraulic drives have dominated the mobile machinery. The hydraulic high force cylinder cannot be easily replaced by an electric device. But high torque electric motors can perhaps become a strong competition. That is especially true if the fuel cells can one day replace the diesel engine. But that will take decades.

**Ventil:** And the last question, Prof. Backé. What are your plans for your future professional activities?

**Prof. Backé:** I have just moved out of my cabinet in IFAS. Combined with this is the decision to stop profes-

sional activities. Young people must have the chance to gain reputation in the field of fluid power. I am still interested in publishing articles in different magazines. Anyhow, if someone asks a question, I will still try to find an adequate answer.

But I am happy to have some more time to read historical books. I am mainly interested in historical descriptions and biographies. Events, to which I have direct personal connections often attract my attention. The history of Aachen and surroundings offers many such possibilities.

**Ventil:** Prof. Backé, in the name of our journal Ventil and in my personal name I thank you very much for your answers and the time you took for us. I also wish you many fruitful activities and happy years with your wife Frau Seitz-Backé in the time to come.

*For journal Ventil:  
Niko Heraković*

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### ■ 7<sup>th</sup> Internationales Fluidtechnisches

#### Kolloquium – 7<sup>th</sup> IFK – Sedmi mednarodni kolokvij o fluidni tehniki

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Aachen, ZRN

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- pnevmatika

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