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Obituary – Andrej Šalak

Ing. Andrej Šalak Dr.Sc., one of the most experienced powder metallurgists and in particular a pioneer of ferrous powder metallurgy and sintered steels, passed away on January 6th, 2018, at the age of 93, in his hometown of Košice, Slovakia.

Andrej Šalak was born on October 20th, 1924 in Kamenica nad Cirochou in Eastern Slovakia. His father was just a farmer and ran a small pub, but he was a farsighted man who took care that his sons got as profound an education as possible. Andrej passed primary school and then secondary school at the Gymnasium in Michalovce, graduating in 1944. At the end of World War II, when Eastern Slovakia became a battleground between the German and Soviet Armies, Andrej worked in a factory in Svit, in the Tatra area, and thus avoided to be caught or recruited by any of the armies. After the turmoils of World War II he studied Mechanical Engineering at the Czech Technical University in Prague, graduating there in 1949. Even then, Andrej was a very independent and courageous mind: during the Communist takeover in February 1948, the last public supporters of the democratic government were a group of student demonstrators, and Andrej was among them. Therefore he was first denied graduation and was ordered work in a mine, "to prove his relationship to the working class". Fortunately, a sympathetic doctor who understood the background declared him physically unfit for mining, and Andrej thus was transferred to a metalworking company, the renowned Škoda. After finally being allowed to graduate, he worked in several companies until joining the Institute of Experimental Metallurgy of the Slovak Academy of Sciences (UEM-SAV, now: Institute of Materials Research) in Košice.

Here Andrej worked on deep drawing of steel sheet, earning his PhD on this topic in 1965, but he also did pioneering work in virtually every field of ferrous powder metallurgy, e.g. powder manufacturing – he tried oil atomization long before such powders were on the market – , induction sintering and sintered alloy steels. In the latter area Andrej thoroughly studied manganese as an alloy element in sintered steels and recognized the high potential of this element for obtaining excellent mechanical properties, also due to its tendency to form lower bainitic microstructures which combine favourable strength and toughness. Andrej also described the peculiar homogenization behavior of Mn during sintering, via a gas phase transport mechanism, as well as the "self-getter" effect caused by the Mn vapour shell generated around the compacts in the course of the sintering process. This specific effect enables sintering in atmospheres that would otherwise be regarded oxidizing to Mn, since the Mn vapour shell prevents oxygen and water vapour from coming in contact with the component itself. These findings were published in numerous articles, also in English journals, and anyone who works on sintered Mn steels should start with reading Andrej Šalak's publications.

However, despite his excellent performance at UEM-SAV, which made Kosice a strongpoint of powder metallurgy, Andrej was ousted from the institute in 1978 due to political reasons. Political persecution was so severe that Andrej could not even find any other employment in the city of Košice. Andrej was however not intimidated: He approached the management of the ZVL bearing company in Dolny Kubin, North Slovakia, and convinced them that powder forged bearing rings would exhibit load-bearing capacity superior to that of wrought steels and could also be produced more economically.

After getting their consent and funding, he joined ZVL-VURAL, the ZVL research facility in Žilina, and within one year produced the first specimens on the newly established powder forging line. The bearings rings manufactured on Andrej's production line were highly successful; they had about double the lifetime of wrought steel rings at 20% lower cost. Also these results were published and found international recognition, although Andrej was continuously in the focus of the political police, the StB, and was accused of espionage on several occasions when he had contact with Western scientists, as vividly described by his friend Erik Navara in the following obituary. Despite these harassments, Andrej always kept contact with his Western colleagues, and although personal meetings could only take place within Czechoslovakia, there were many fruitful discussions. The undersigned had the pleasure to first meet Andrej Šalak at the Czechoslovak PM Congress in Brno in 1982, through my academic teacher Gerhard Jangg who had been Andrej's friend for a long time. Already at that occasion I was very impressed by Andrej's very precise questions in the discussions following each lecture, where he always hit the crucial items.

After the fall of communism, in 1990, Andrej was rehabilitated. At that time he initiated the acquisition of a small part of ZVL by MIBA from Austria, which developed into what is now MIBA Sinter Slovakia, with about 1200 employees. I.e. Andrej's initiative, which started at a meeting with MIBA representatives at TU Wien in February 1990 that was organized by Gerhard Jangg, resulted in a true success story, both for MIBA and the Northern Slovak region of Dolny Kubin.

After his rehabilitation, Andrej once more joined UEM-SAV in Košice and continued work on sintered steels, cooperating in a NATO project on manganese alloyed steels. He also lived to see Mn steels being the focus of the international project "Höganäs Chair" Round III in which IMV-SAV was participating. In 1997, at the age of 73, he obtained the "big" doctorate, the Dr.sc. (equivalent to the Habilitation in the German-speaking countries) on his favourite topic, manganese alloyed sintered steels. Another topic Andrej focused on was the machining behavior of sintered steel; he could prove that the reason for the poor machinability of sintered steels is not the porosity and the resulting interrupted cut but the densification and resulting work hardening in front of the cutting edge.

Andrej is the author or co-author of more than 450 publications in scientific journals and proceedings and of 33 patents. In 1995 he published his book "Ferrous powder metallurgy", the first monograph on this topic since the "Kieffer-Hotop" of 1948. This was followed by the books "Machinability of Powder Metallurgy Steels" in 2005 and finally "Manganese in Powder Metallurgy Steels" in 2012, at the age of 88 ! Andrej was also active in organizing the Powder Metallurgy Congresses in Czechoslovakia between 1973 and 1992 and, starting from 1996, the International Conferences on Deformation and Fracture in Powder Metallurgy. His international cooperations included scientific institutions e.g. in Germany – formerly also East Germany - , Austria, Great Britain and Bulgaria. Andrej has also been a member of the Advisory Board of "Powder Metallurgy Progress" since the journal was established in 2001.

In 1995 Andrej was awarded the Gold Medal of the Presidium of the Slovak Academy of Sciences for his scientific achievements. In 2004, in the course of the Powder Metallurgy World Congress in Vienna, he received the Distinguished Service Award of the European Powder Metallurgy Association (EPMA), to honour his long and successful career in powder metallurgy..

Andrej is survived by his wife Helena, daughter Marcela and son Zdenko, 2 grandchildren (Marek and Boris) and 4 great-grandchildren. All of us who had the

opportunity to meet Andrej and get to know him personally will gratefully remember his profound knowledge in powder metallurgy and precise scientific thinking, which made him an excellent partner for discussions. Furthermore, Andrej had a specific feeling for the practical implications of scientific findings. Today, “innovation”, the transfer of scientific results to industrial practice, is a buzzword and strongly promoted e.g. by the EU, but in that connex Andrej was a true innovator already in the early days. Furthermore, Andrej will be remembered for his kind and open mind and hospitality – he liked to show visitors around his home country of Slovakia and had a profound geographic and historical knowledge - as well as his friendly manner and encouraging way in particular to young and less experienced scientists. Thus he helped ensure that powder metallurgy will make progress also in the future. Andrej Šalak will remain in our memory as a true pioneer of powder metallurgy, as an impressive and independent-minded personality and as a good and reliable friend. We shall miss him!

Herbert Danninger

My personal obituary for Ing. Andrej Salak, Dr.Sc.

I have known Dr. Salak since the time he joined our small team of scientists at the recently established Institute of Metallurgical Technology in Kosice. It was in early sixties of the past century and much of the research was oriented toward powder metallurgy.

Soon we became very close friends, much more than simply colleagues at the Institute. In addition to our devotion to research, we shared mutual interest in out-door activities all year round, i.e. going for outings to beautiful natural environments in Eastern Slovakia, bathing in lakes, mushroom picking in summer and skiing trips in winter. We used to discuss all possible topics, ranging from science to politics and what the future would bring. When I recall that period of our lives, I know that we both felt that the times we lived in were unusual, to put it mildly, and that some change was imminent.

At the start of the year 1968 I left the Institute as I was invited to Chalmers University of Technology in Gothenburg, Sweden, as visiting scientist. This position was meant as temporary, however, because of the invasion of our country by Warsaw treaty armies, followed by the Soviet occupation, I chose to remain in Sweden and changed my status of visiting scientist to doctoral student.

Even in those days I remained in correspondence touch with Dr. Salak. In early seventies his friendship became invaluable to me. I applied for being allowed permanent residence abroad (such were the conditions in the communist era) and for that I was in need of a person who would represent me in dealings with several authorities, some of which were pretty hostile. Dr. Salak obliged me and took on himself to act in my cause. His service was of utmost importance to me and, after months of dealings and actions, the outcome was successful.

We could then meet again in person and resume our research co-operation. In late seventies Dr. Salak informed me of his achievements related to sintering iron powder mixed with manganese, or ferromanganese powder. As a result of that we kept exchanging ideas and complementing each other in research. Salak made use of the very high partial pressure of manganese gas at the usual sintering temperatures and proved that manganese can diffuse into iron even when the oxygen potential of the sintering atmosphere lies above the Mn-line in the Ellingham diagram. I contributed to Salak's research with two papers, presented at two powder metallurgy symposia. Both papers confirmed and, to some extent elucidated Salak's research results.

Writing about our co-operation in research in the eighties of the last century brings back memory of an incident, typical of the times we lived in. My colleague in Sweden, Professor K. Easterling, attended a scientific conference in Slovakia. He had been well informed of Dr. Salak and of our co-operation. Salak used this opportunity and gave Easterling a couple of metallographic samples for the purpose of having them investigated, I think using surface microanalytical methods, for which we had facilities at that time missing in Kosice. The passing of the samples was noticed by some person, connected with that-time secret state police and, consequently, the samples were confiscated at an unexpected check of Easterling's suitcase at the airport. Few weeks later, Salak was called for questioning, a very unpleasant experience in the communist days. However, after the samples had been investigated at some laboratory, the preposterous "espionage" charges were dropped, to the relief of all of us involved in the incident, and did not stop our continued co-operation.

In 1987 I left Sweden for Zimbabwe and my research interests changed. However, we kept in touch and when e-mail became available our correspondence multiplied. I was informed of his research activities, leading to the D.Sc. degree and to the publication of his two books.

Dr. Salak will be remembered by me and by all his colleagues and members of the scientific community for his many qualities: a top-class scientist, a dedicated researcher, a true friend of all who worked with him and shared his broad interests.

I, personally, will miss you very much, dear Andrej. May you rest in peace.

In Jihlava, Czechia, January 12, 2018.
Erik Navara, retired professor of Physical Metallurgy