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## ILMAR ÖPIK

On June 17, 1997, Estonian scientific and engineering society and the public will celebrate the 80<sup>th</sup> birthday of a well-known scientist and engineer, a member of the Estonian Academy of Sciences Ilmar Öpik.

Many a renowned scientist has descended from the Öpik family. This article is dedicated to Ilmar Öpik, a professor of Tallinn Technical University, a researcher of Estonian oil shale as fuel for electrical power production, an environmentalist and efficient promoter in the field of Estonian energy policy management.

Ilmar Öpik was born in Tallinn. He was the first child of Paul Öpik, a navy officer, and his wife Ella, a schoolmistress. Paul Öpik (1888-1967) had graduated from Riga Polytechnic Institute in 1913 where he had studied at the Faculty of Business Administration. Paul Öpik became a leading financier in Estonia: from 1923 – the head of the Treasury, from 1925 – the director of the Bank of Estonia, and in 1928-1940 the president of the Long Loan Bank. Paul Öpik's brothers, astronomer Ernst Öpik (1893-1985) and geologist Armin Öpik (1898-1983), were well-known scientists.

Ilmar Öpik attended Tallinn Real School (1929-1931) and after that Gustav Adolf Gymnasium (1931-1935).

In 1935, Ilmar Öpik graduated from Gustav Adolf Gymnasium *cum laude*.

Ilmar Öpik studied in the Faculty of Engineering at Tartu University (1935-1936) and in the Faculty of Civil and Mechanical Engineering at Tallinn Technical University (1936-1940). He belonged to the academic students' society *Liivika* and was twice elected a member of the Tallinn Students' Board. Ilmar Öpik graduated from Tallinn Technical University in 1940 *cum laude*.

From 1937 till 1941, still a student at the Technical University, Ilmar Öpik worked at the design department of the *Franz Krull Machine-Building Factory* in Tallinn under the guidance of Prof. P. M. Scheloumov. In these years Ilmar Öpik participated in designing the *Glen Davis Shale Oil Plant* in Australia and the *Maardu Phosphorite Concentration Plant* in Estonia.

Ilmar Öpik was a great sports fan as a schoolboy already. He has always been a devoted yachtsman.

In January 1941 Ilmar Öpik commenced to take his postgraduate course at the Department of Mechanical Engineering of Tallinn Technical University under the supervision of Prof. H. Einberg and Prof. J. Kopvillem.

The outbreak of World War II in the early summer of 1941 cut off his postgraduate studies. Ilmar Öpik was called up and sent to the district of Sverdlovsk in the ranks of the Labour Battalion. Later he worked in the same region as a design engineer of thermal power plants for *Bogoslavsky Aluminum Plant*, *Solikamsk Magnesium Plant*, and *Egorchino Thermal Power Plant*.

Having returned to Estonia, Ilmar Öpik continued his engineering work in the field of the reconstruction of the oil shale industry (1944–1946). He participated in the reconstruction of oil shale mines and oil shale processing plants. He also took part in the construction of the new thermal power plant burning oil shale in Kiviõli.

In 1946, Ilmar Öpik became an Assistant Professor of the Thermal Engineering Department at Tallinn Technical University and in 1957 – the Head of the same department. The main courses he lectured on heat transfer, fuels and combustors, and steam boilers. He has educated a great number of thermal power engineers. His approach is analytical, leaving the solution to the students to find out. He has been a supervisor of several graduates and postgraduates.

Since 1968 Ilmar Öpik has been connected with the Estonian Academy of Sciences, at the beginning as an Academician – Secretary of the Division of Physics, Mathematics and Engineering, and in 1977–1987 as Vice-President. He retired in 1987.

Ilmar Öpik defended his thesis for the degree of Candidate of Technical Sciences “On the Sintering of Fly Ash Deposits on the Heating Surfaces by Utilizing Estonian Oil Shale” at Tallinn Technical University in 1953. In 1963, he received the degree of Doctor of Technical Sciences defending his thesis “The Influence of Inorganic Matter of Oil Shale on the Conditions of Boiler Operation” at Moscow Power Engineering Institute.

Ilmar Öpik is a member of the Estonian Academy of Sciences (1967), and a Foreign Member of the Finnish Academy of Technology (1992). Since 1994 he is a Member Emeritus of the Estonian Academy of Sciences.

In 1960, Ilmar Öpik founded the Research Laboratory of Heat Engineering at Tallinn Technical University.

Since 1984 Ilmar Öpik is the Editor in Chief and since 1996 the Editor Emeritus of the international scientific journal “*Oil Shale*”.



Acad. Ilmar Öpik and Prof. Arvo Ots, 1990

Being a versatile scientist, Ilmar Öpik has focused his attention on different research trends. His special interest, however, has always been connected with the utilization of Estonian oil shale.

As a result of Ilmar Öpik's research, the theory of the formation of bound ash deposits on the boiler heating surfaces when fired with fuels rich in calcium and alkali metal (Estonian oil shale, Kansk-Achinsk brown coals, and others) was created. This theory of the formation of ash deposits on the steam boiler heating surfaces most originally relates mechanical phenomena to chemical processes. He was one of the first researchers to draw attention to the fact that the fouling intensity of the boiler heating surfaces is simultaneously connected with the physical and chemical properties of the mineral matter of the fuel. It enabled to draw a number of conclusions relevant to the design of modern steam boiler heating surfaces depending on the qualitative and quantitative characteristics of the fuel. The results of this research were taken into account in designing the oil shale boilers for Baltic and Estonian power plants in Estonia as well as for the Nazarovo power plant in Siberia.

At Tallinn Technical University, Ilmar Öpik was a pioneer of research into the high temperature corrosion of the alloys used for boiler heating surface tubes. He was the first to prove a correlation between the intensity of the wear of the boiler heating surface tubes and the high temperature corrosion activity of the ash forming during conversion processes of fuel mineral matter in combustor. Consequently, it is

possible to influence the corrosion activity of the fuel ash knowing the behaviour of the mineral matter. Also, in the middle of the sixties he laid a new foundation for the experimental study on the high-temperature corrosion intensity of alloys under the influence of ash and ambient gas taking into account the behaviour of ash during the corrosion process. This experimental methodology for investigation of the high-temperature corrosion intensity of alloys is still in use.

The primary aim of this kind of investigations was to design new steam boilers for burning solid fuels with complicated individual properties of the mineral matter.

Besides classical studies on the utilization of Estonian oil shale in power plants, Ilmar Öpik has paid much attention to the problems connected with thermal processing of Estonian oil shale and utilization of ash after the combustion and thermal processing. Economic valuation of the utilization of Estonian oil shale has been the subject of his research, too.

Ilmar Öpik has also investigated the risk factor in the application of new technologies, and possible multiplication of the unit capacity.

One specific feature of his activities is solving practical problems in a close connection with theoretical aspects.

On top of the research directly related to his professionalism, Ilmar Öpik has always been interested in oceanography and the exploration of the Baltic Sea. He has participated in several maritime expeditions. He was the head of the design group of the research liner *Livonia* in 1982-1984. He is a member of the Baltic Sea working group for ICES.

His research activity and the matter of publications within the recent years belongs to the field of power economy and policy.

Ilmar Öpik has published about 150 works.

Ilmar Öpik is an expert of the Ministry of Economic Affairs of Estonia, a member of the Board of RAS *Kiviter*, and the head of the Price Committee for Oil Shale and Electricity Prices.

Ilmar Öpik was awarded: the State Technical Science Prize of the U.S.S.R., the K. E. v. Baer Medal and P. Kogerman Medal given by the Estonian Academy of Sciences, the Merit Medal of the Finnish Academy of Technology, and the 3<sup>rd</sup> Class Order of the National Coat of Arms.

*Professor Arvo OTS*

*Head of the Thermal Engineering Department*

*Tallinn Technical University*