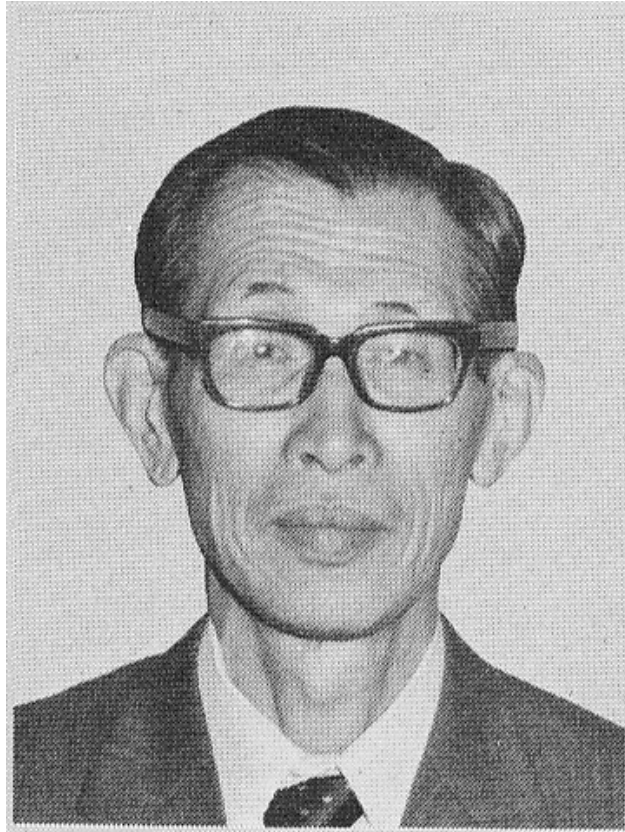


**Kouichi Iinoya**  
**22 November 1917 – 26 November 1998**



On 26 November 1998, Professor Kouichi Iinoya passed away in Kyoto, Japan. He was actively discussing the powder technology of particle sedimentation processes until 2 days before he died. Iinoya was not only the founder of powder technology in Japan but also one of the greatest leaders in the world. He established the educational and research systems of powder technology in Japan, and the four organizations listed below were founded under his strong leadership to promote the development of powder and aerosol technologies.

Iinoya was a founder of these four organizations:

- 1 Japan Association of Aerosol Science and Technology (JAAST)
- 2 The Society of Powder Technology, Japan (STPJ)
- 3 Association of Powder Process Industry and Engineering, Japan (APPIE)
- 4 International Fine Particle Research Institute (IFPRI)

### **Personal History**

1917 Born on 22 November in Nagoya, Japan  
1941 Graduated, Department of Mechanical Engineering, Tokyo Imperial University

- 1941-45 Military service
- 1941-64 Lecturer, Associate Professor and Professor,  
Department of Mechanical and Chemical Engineering, Nagoya University
- 1953 Doctor of Engineering, Nagoya University
- 1959-61 Fulbright exchange scholar,  
University of Wisconsin and Georgia Institute of Technology, USA
- 1964-81 Professor, Department of Chemical Engineering, Kyoto University  
Prof. Emeritus 1981-98
- 1964-65 Special Research Engineer, Georgia Institute of Technology, USA
- 1975-85 President, The Society of Powder Technology, Japan
- 1981-88 Professor, Department of Industrial Engineering, Aichi Institute of Technology
- 1989-92 Honorary President, Japan Association of Aerosol Science and Technology
- 1988-92 President, The Association of Powder Process Industry and Engineering, Japan
- 1992-98 Adviser, The Association of Powder Process Industry and Engineering, Japan

## **Awards**

- 1941 West Award, Department of Mechanical Engineering, Tokyo Imperial University
- 1969 Distinguished Research Award, The Japan Soc. of Powder and Powder Metallurgy
- 1981 Hausner Award, Fine Particle Society, USA
- 1987 Distinguished Contribution Award, APPIE
- 1991 Zuiho Award, The Order of the Sacred Treasure, Gold and Silver Star,  
Government of Japan
- 1991 Honorary Doctor of Engineering, Karlsruhe Technical University, Germany

## **Publications, selected from 188 original papers:**

- (1953) Characteristics of some special type cyclones, The Soc. of Mechanical Engineering, Japan 17(5):185-190.
- (1954) On the air flow of a cyclone dust separator, The Soc. of Mechanical Engineering, Japan 18(69):42-48.
- (1956) Experiments on the collection efficiencies of cyclone dust collectors, The Soc. of Mechanical Engineering, Japan 20(89):38-44.
- (1993) Dry submicron classification by a small blow down cyclone, KONA 11:223-227.
- (1963) Particle size classifier for the subsieve range, Review Sci. Instr. 34:1023.
- (1967) Liquid surface profile in contact with symmetrical solid surfaces, Powder Technology 1:28.
- (1971) Theoretical study of the scatter of experimental data due to particle size distribution, J. Chem. Eng., Japan 4:60.
- (1971) Particle size classification by deposition angle in a gas centrifuge at reduced pressure,

- J. Chem. Eng., Japan 4:167.
- (1972) Effect of gravitation on a round-nozzle cascade impactor, J. Chem. Eng., Japan 5:285.
- (1972) Theoretical analysis of partial-renewal type air filter, J. Chem. Eng., Japan 5:401.
- (1973) Error in measurement of gas flow rate in gas-solids two-phase flow by use of a horizontal diffuser, J. Chem. Eng., Japan 6:278.
- (1974) Application of electric field effects to dust collection filters, J. Aerosol Sci. 5:357.
- (1974) The capillary binding force of a liquid bridge, Powder Techn. 10:231.
- (1975) State of equilibrium between dust pipe and jet flow in slit nozzle impactor, Powder Techn. 11:173.
- (1976) Electrification of gas-solid suspensions flowing in steel and insulating-coated pipes, J. Electrostatics 2:341.
- (1978) Effect of probe diameter on isokinetic sampling errors, J. Chem. Eng., Japan 11:48.
- (1978) The analytical optimal design of a fabric filter system, J. Chem. Eng., Japan 11:136.
- (1978) Electrification of particles by impact on inclined metal plates, AIChE J. 24:950.
- (1980) Model simulation of particle motion in turbulent gas-solid pipe flow, Powder Techn. 26:217.
- (1980) Theoretical study of electrostatic effects on isokinetic dust-sampling, Chem. Eng., Japan 13:467.
- (1982) Effects of corona precharger on performance of fabric filter, J. Chem. Eng., Japan 15:211.
- (more than 170 additional papers)

### **Books, selected from 42:**

- 1 Powder Engineering Outline, editor 1995, Particle Technology Information Center
- 2 Powder Technology Handbook, co-editor 1991, Marcel Dekker
- 3 Powder and Bulk Solids Handling Processes, co-author 1988, Marcel Dekker
- 4 Handbook of Powder Technology, editor 1986, Nikkan Kogyo
- 5 Terminology Dictionary of Powder Technology, editor 1981, Nikkan Kogyo
- 6 Bag Filters Handbook, editor 1977, Sangyo Gizyutsu Center
- 7 Dust Collection Engineering, 1980, Nikkan Kogyo
- 8 Technical Manual of Dust Collection, 1973, Nikkan Kogyo
- 9 Dust Collectors, 1963, Nikkan Kogyo

(more than 30 additional books)

**Iinoya's research work may be classified into the following three fields:**

### **1. Design and operation of aerosol dust collectors**

Iinoya and his colleagues published about 80 papers on this subject. The most important work is on the design of cyclones. Iinoya was the first to systematically study the behavior of particles in cyclones. He carried out precise experiments from 1952 to 1957, finding the optimal design of cyclone dust collectors. The separation performance of his cyclone is very sharp. Cyclones with his special designs are among the simplest separators of sub-micron particles.

He also studied fibrous air filters for separating very fine aerosol particles. The results of his work provided the basis for construction of clean rooms.

From 1965, Iinoya and his students carried out fundamental research on bag filters for industrial gas cleaning. Their work included not only development of optimal design for bag filter systems, but also economic construction methods. The results were widely applied to industrial gas cleaning and environmental protection systems in the world. The research was extended to the development of highly sophisticated measuring methods for particle size distribution. The design and operational problems of aerosol cascade impactors and aerosol samplers were thoroughly solved.

### **2. Powder Technology**

Iinoya and colleagues published about 60 papers on this subject. He edited his famous handbook on powder technology in 1965. The particle classifier invented by Iinoya was the first development based on particle and fluid dynamics. Gas-solid two-phase flow was also analyzed using equations of particle motion. This research work enabled estimation of the dynamic change for pneumatic conveying.

The work of Iinoya and his students on powder feeders was the first systematic approach to reveal the complex powder motion. Both static and dynamic characteristics were well described by the new theory, and the powder feeders were utilized as control units for powder handling processes. Also, the powder feeder they invented has been widely used in Japanese industry, including for high-pressure applications such as coal gasification.

The electrification of particles by impacting on the wall of powder handling equipment such as pneumatic conveyor lines was first systematically studied by Iinoya and his students. The complex particle electrification process was first theoretically solved by Iinoya and his students.

Various mechanical properties were also analyzed by his group. The results were applied to dislodging particle layers on bag filters. Adhesion and cohesion between particles were

also included in his work. He received an award from the Japan Society of Powder and Powder Metallurgy for this important work.

### **3. Process control**

Inoya and colleagues published about 30 papers on this subject. He began research on instrumentation in 1943. The dynamics of various processes were studied with particular attention to powder handling processes.

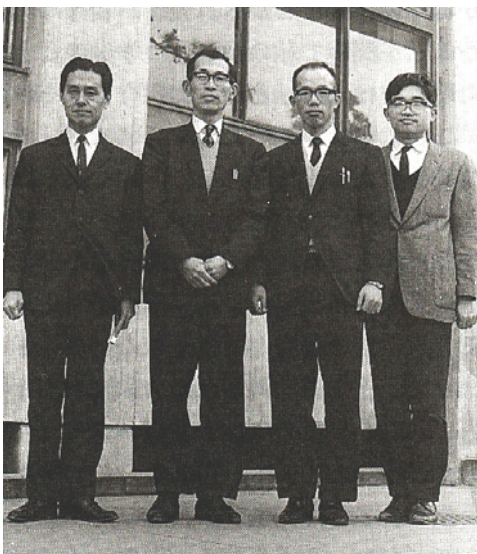
The invention of the powder flow meter is the most revolutionary contribution in industrial powder handling process control. The flow meter is very simple and is utilized all over the world.

### **Character of Prof. Inoya and contribution to aerosol technology**

Prof. Inoya had unusual ability to stimulate his students and colleagues, and to create an environment in which they could perform their best. His special and radical personality, and his vivid suggestions have inspired many more recent researches. More than ten students became professors in various universities in Japan.

Aside from his truly exceptional research record, Inoya provided strong leadership toward solving air pollution control problems. From 1977 to 1980, he was a committee member of the Ministry of Labor, Japan. From 1981 to 1989, he was a committee member of the Ministry of International Trade and Industry, Japan. From 1972 to 1978, he was a committee member of the Pollution Control Council Kyoto. He organized many international meetings related to powder and aerosol technologies.

Inoya's work opened new aspects of powder and aerosol technologies in the world.



*Kyoto University (1964)*



*Minneapolis, May 1975*



*Dr. Davies and Prof. Inoya*



*Prof. Inoya (1990)*



*Prof. Inoya (center) 1992*

*Biography prepared by  
Prof. Yoshida, Hiroshima University*