Anwoo Research Report – Introduction (Western Analysis)

Chapter 1. Introduction – Structural Limitations of Classical Physical Equations

In 1952, Dalla Valle laid the foundation for fan-based flow interpretation by analyzing vortex formation mechanisms centered on mechanical fan rotation and central pressure drops. At the time, this theory provided a meaningful framework within the limitations of laboratory conditions and analytical tools and served as a theoretical basis for various industrial flow control systems. However, the theory assumed fluid motion as a static and linear system and failed to explain the irregular and dynamic characteristics observed in real natural flow fields, such as time-dependent changes, compression and collapse of order, and core formation due to radial contraction and inflow increase.

Through experimental video analysis, we derived six new physical equations that quantitatively expose the structural limitations of Dalla Valle’s theory. These equations describe the conditions for core generation, conservation of angular momentum, compression of ordered energy, precursor signs of collapse, time-based energy induction, and structural maintenance—all of which represent key components of natural flow structures.

These equations conflict with classical mechanics models such as Bernoulli’s equation, the continuity equation, conservation of linear momentum, and the second law of thermodynamics. For example, in order for a vortex structure to form, it requires a combination of rapid radial contraction and inflow acceleration, not

just a pressure drop—a condition not considered in classical theory. Additionally, collapse is not merely caused by the fan stopping but results from a cumulative set of dynamic symptoms: tail oscillation, radial expansion, and stagnation of inflow.

These contradictions do not mean that classical equations are incorrect but rather highlight their inability to encompass the actual operating conditions of natural order. This report thus calls for a new interpretive framework that includes temporality and structural order, surpassing the limitations of static and mechanical-centered analyses.

Inherent Physical Conflicts Within the Dalla Valle Theory

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New Interpretive Proposal: The SIIEM Model and Order-Based Flow Structures

🔵 The SIIEM (Suction-Induced Inflow Extension Model) compensates for the shortcomings of classical theories and presents a quantitative model to explain the actual formation and maintenance of natural vortex structures. Based on a philosophical and physical concept that "order forms first and energy flows into that order," it surpasses pressure-centered and rotation-centered models.

🔵 The model is constructed around the following six physical equations:

1. Radial contraction + inflow increase → Core generation
2. Angular momentum conservation: $L_\theta \propto Q_{in} \cdot R$
3. Order compression law: $E_{order} = \gamma \cdot \frac{Q_{in}}{R^2}$
4. Tail vibration + radial expansion → Core collapse
5. Energy induction formula: $P_{core} = \kappa \cdot \left(\frac{\partial Q_{in}}{\partial t} \cdot \frac{1}{R}\right)$
6. Order maintenance condition: continuous suction + rotational flow → Structural stability

🔵 These equations are derived from experimental observations of natural flow fields and numerical analysis, structurally diverging from existing equations by incorporating dynamic conditions and spatiotemporal compression analysis. In this view, the fan is no longer a direct generator of vortices but rather functions as a mediating tool for forming order and guiding energy, not forcing it.

The Role and Emergence of SIIEM as a Physical Theory

This structure was empirically confirmed through the author's direct vortex flow experiments and high-speed video analysis. Unlike traditional theoretical models, it enables quantitative analysis based on equations. The repeatability of measurements and structural patterns observed through experiments are not mere conjecture but rooted in physical reproducibility and the internal principles of natural order.

SIIEM departs from the static and linear frameworks of conventional fluid dynamics by becoming the first attempt to mathematically represent the self-organizing mechanisms of order-based natural flows. Its physical roles are as follows:

- 🔷 **Quantification of order-based energy induction**: It clarifies how inflow and radial transformation generate order, a structure that traditional analysis could not interpret.
- 🔷 **Provides a time-dependent framework for non-steady, nonlinear flows**: It enables the explanation of irreversible processes like collapse and recovery through a dynamic temporal lens.
- 🔷 **Introduces the concept that order induces energy**: Moving beyond models that require external energy input, it adopts a dynamic physical principle where structure itself guides energy flow.

The SIIEM model integrates experimental observation, mathematical structure, and spatiotemporal dynamics, forming a unified analytical tool that links previously fragmented approaches. It can serve as a new theoretical framework for explaining the formation and collapse of order in physics.

📌 Summary: SIIEM is not merely a model for a single phenomenon—it establishes a new interpretive system explaining how nature spontaneously builds and sustains structure through physical equations describing the relationship between order and energy.

Chapter 2. Conclusion – From Structural Discovery to Theoretical Transition

This report dismantled and reconstructed classical fluid dynamics and thermodynamic interpretations by exposing their internal

contradictions through six new physical equations derived from natural vortex experiments. It not only revealed the analytical limitations of existing models but also proposed a new interpretive framework that formulates the self-organizing principles of natural order.

The SIIEM model goes beyond interpreting a single phenomenon. It quantifies the intrinsic relationship between natural order and energy flow and provides tools to quantitatively analyze the regions of conflict with classical equations. This offers a new scientific approach that integrates visual, mathematical, and temporal analysis.

This study arrives at the following conclusions:

- Static analysis cannot explain the dynamic creation and maintenance of natural order.
- Experiment-derived equations mathematically contradict classical theory, proving the need for new interpretive tools.
- The structural transition in which order induces energy may serve as a new paradigm in physics.

Thus, this research offers more than a conceptual model—it proposes new principles and equations for interpreting natural phenomena and lays the foundation for future theoretical and technological developments.