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# Research on Honeycomb Emergency Management Model for Quality Events

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## Abstract

Based on the introduction of the Butterfly Effect, Lorentz Equation and emergency management theory, this paper brings rapid assessment into the management mode of enterprise large quality events and also spreads out a kind of the new emergency management mode: Honeycomb Emergency Management Model with 4R emergency management mode through illustration and analysis of an empirical case, and it illustrates the working contents of the management model in details.

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*Keywords:* Butterfly effect; Honeycomb model; Rapid assessment; Quality management; Production engineering

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## 1. Introduction

With the transformation of Chinese society and the emergence of various economic organizations, the management model of state-owned enterprises and institutions have been highly constrained in the face of various emergency events at this stage. Especially for large-scale processing and manufacturing enterprises, the products have a strong influence and higher technical indicators and management indicators for the enterprises are necessary. Therefore, these enterprises should guard against product quality problems more significantly, because the major problem of product quality for an enterprise is often a deadly crisis[1]. Technical indicators can be achieved by rigid administrative means, like the "dead command" approach, so far as to omit the cost in the process of implementation. Management indicators are greatly subject to inherent institutional problems of state-owned enterprises. Many employees are overstaffed, lack of sense of responsibility, so management indicators of these factors is difficult to achieve. Some leaders are also likely to encounter faults because of the negligence of many small incidences of some major quality issues. As enterprises are obtaining a large number of social wealth, the large-scale enterprises should actively commit to social responsibility. Therefore, enterprises should be strengthened emergency management of product quality problems, develop and improve the related emergency management system, make effective operation.

In this paper, a case about the "butterfly effect" in product quality events is proposed to analyze incentives and results of the problem. The cellular-based emergency management model is improved base on rapid assessment and introduced to the safety production and quality events in emergency management. And the emergency management theory is used to deal with the unexpected quality problem of enterprise products. A quick assessment is applied at

the early stage of the "butterfly effect" to lower the level of the problem and prevent further deterioration. Strive to turn "crisis" as an "opportunity" and establish a positive corporation image.

In accordance with different stages of the event, emergency response and prediction will be given, and propose feasible solutions and remedial measures.

## 2. Related Theories

### 2.1. Butterfly effect

Meteorologist Lorenz proposed "butterfly effect" in 1963. The main idea is that when a butterfly in the rainforest of South American Amazon Basin, occasionally incites a few wings, it will probably cause a tornado in Texas of the United States in two weeks. The reason is that the movement of butterfly wings, leading to changes in the air system around, and cause the generation of weak flow, and produces a weak flow of air around it, or will cause a corresponding change in other systems, thus causing a chain reaction, eventually lead to great changes in other systems. This effect shows the result of the development of things, extremely sensitive to initial conditions. Small differences in input can quickly zoom in to the output, and ultimately lead to great differences in the results[2]. According to the ideas of Lorenz, in the course of the campaign, even if a variety of errors and uncertainty are very small, there may be accumulated results in the process. The error will grow exponentially through progressively larger, forming a huge movement.

### 2.2. Lorentz equation

Lorenz simplified the convection model of Rayleigh-Benard to analyze the motion state of the gas. Here  $x$  is proportional to the intensity of convective motion,  $y$  is proportional to the horizontal temperature change,  $z$  is proportional to the vertical temperature change, the parameter  $\sigma$ ,  $b$ ,  $r$  are positive constants, the resulted equations is now known as the Lorentz equation[3]:

$$\begin{cases} \frac{dx}{dt} = -\sigma(x - y) \\ \frac{dy}{dt} = rx - y - xz \\ \frac{dz}{dt} = xy - bz \end{cases} \quad (1)$$

### 2.3. Honeycomb pattern

In nature, the honeycomb is a perfect combination of growth and expansion of the structure. It is arranged perfectly with many hexagons. For large external pressure, it is shared within the uniform and offset together to resist the crisis. And it saves materials and is durable with the close integration between the modules of the nest. Therefore, applications of honeycomb pattern are introduced in many areas from the perspective of bionics[4].

### 2.4. Rapid assessment

In the process when product quality events happen, rapid assessment is to assess the problem quickly and accurately on key issues after the event, to obtain the core content affecting emergency decisions. This contains several aspects[5]: *i*) Severity of the product quality problems, range of influence and spread situation; *ii*) Casualties of product quality problems; *iii*) Support capacity and loss situation of related enterprises; *iv*) Determine whether to accept external assistance and what level of emergency plans start. Rapid assessment of the situation is not a simple analysis, but rather a complex system of emergency management. Enterprises need accumulate knowledge and experience effectively over the long term, at the same time, the need for internal staff training is necessary. This

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