

Improvement Measures of Cause of Malfunction in Automatic Residential Kitchen Fire Extinguishing System: Focusing on Theory of Market Failure

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Abstract: In this study, the cause and the improvement measure of malfunction in the automatic residential kitchen fire extinguishing system were sought by associating with the theory of market failure. First, in the perspective of monopoly, installing the kitchen fire extinguisher by the constructor during the apartment construction, the monopoly is made. Therefore, as improvement measure, it is necessary to allow free competition among the businesses by guaranteeing the consumer's choice. Second, in the perspective of externality, there is a problem of making profit of the business by inducing the consumer to receive the charged repair of the defective product by the problem occurred by ageing. Therefore, it is necessary to grant the authority to collect and inspect the fire-fighting supplies under distribution. Finally, in the perspective of information asymmetry, the business has not informed the information of defective products to the consumers. Therefore, the information asymmetry occurred between the enterprise and the consumer should be reduced by disclosing the type approval and the acceptance criteria of product inspection.

For the follow-up research, the research that is seeking out the improvement measure in order to guarantee the safe life is required by examining if other fire—fighting supplies are the reliable product or not.

Keywords: Automatic residential kitchen fire extinguishing system, theory of market failure, monopoly, information asymmetry

1. Introduction

Recently, there is a trend that the fire in the apartment housing is being increased. In 2019, the fire occurred in the apartment housing was total 4,837 cases. Among which the fire occurred in the apartment was 2,886 cases and the fire of the kitchen appliance were 1,314 cases the highest.[A] Therefore, in all the floors of apartment and the studio apartment of 30 floors or higher, the automatic residential kitchen fire extinguishing system should be installed based on National Fire Safety Council 101(NFSC 101).[B] Automatic residential kitchen fire extinguishing system refers to the fire extinguishing system that blocks the heat source automatically when the fire occurs by the use of heat-generating cooking utensils installed at residential kitchen.[C] However, recently, there was accident that it was ruptured and released the fire extinguishing agent while the fire was not broken out.[D] As such, the fire accident by the product defects by August, 2020 was 30 cases. [E] Although the fire brigade mobilized by the fire outbreak, the case that the fire brigade is mobilized by the malfunction of fire-fighting facilities is considerable. In Jeonbuk, the cases that the fire brigade was mobilized by the malfunction of fire-fighting facilities were 285 cases for 3 years. [F] There are lots of cases that the fire service force is wasted by such mobilization.

Existing research by Lim Byung-Hyun et al. (2001)[G] researched the method to minimize the malfunction utilizing the technology of distinguishing the factors causing the false fire alarm of flame detector from the pure flame and the sensor technology. In the research by Lee Soo-Sang (2016)[H], he analyzed the cause of malfunction in the smoke detector and suggested the improvement measures to reduce the malfunction by increasing the reliability analyzing the installation and inspection criteria. Cha Jong-Ho (2016)[I] researched the solution for the standard related to the cause of false alarm and the countermeasure by dividing it into detector, receiver and other area. In the research by Gwak Ji-Hyun et al. (2013)[J], this fire extinguishing system has no clear standards for the installation location providing that it should be installed one or two depending on the floor area. As such, he claimed that since it is recognized as appropriate if the required quantity is installed, it does not guarantee the effective fire suppression for the fire protection subject. He conducted the research of examining the installation location of the fire extinguishing equipment and the fire extinguishing performance characteristics according to the horizontal separation distance. Baek Chang-Sun et al. (2018) [K] performed the research of comparing the domestic and overseas legal system and the standards for the purpose of analyzing the validity to reestablish the application range of automatic fire extinguishing equipments.

As such, in the preceding researches, there are many researches on the malfunction of the detectors. In the research on the automatic fire extinguishing system, the research on the installation location and the application range occupies the most rather than that on the malfunction. However, it is hard to find the research that analyzed the malfunction of automatic residential kitchen fire extinguishing system, which is the facilities in our daily living where we are actually living, with the theory of market failure.

Therefore, the purpose of this study is to increase the reliability and the safety of fire protection facilities by identifying the cause of malfunction in the automatic residential kitchen fire extinguishing system, which we can encounter in real life, associating with the theory of market failure and by preparing the improvement measures.

2. Theory of Market Failure

2.1. Needs of Theory of Market Failure

Market failure refers that the distribution of the resources in the market becomes the inefficient phenomenon by the price. Market price is determined through the supply and the demand in the competitive market between the producers and the consumers. [L] This market price distributes the scarce resources efficiently in the economic life. The economists proved that if the ideological market called perfectly competitive market having delicate conditions is established, the efficiency becomes the collateral.

However, due to difficult establishment conditions, the resources are not distributed efficiently in the market. In the market, depending on the situation, the goods and the services are produced more or less than those that the consumers want. In here, producing less than the consumer wants refers that the scarce resources are not distributed enough and producing more than the consumer wants is deemed that there may be the waste of scarce resources.

2.2. Factor of Advent of Market Failure Theory

Generally the factors that the theory of market failure appeared are the monopoly, public goods, externality and information asymmetry. Since the automatic residential kitchen fire extinguishing system, which is the subject of this study, is not the fire protection equipment that is used by all the people, the public goods, one of the factor that the theory of market failure appears, is not related to this study and excluded.

2.2.1. Monopoly

The market failure occurs if the participants in the market cannot compete freely. That is, if the perfectly competitive market is realized, the market failure does not occur and if the imperfectly competitive market is realized, the market failure may occur. [M]

Monopoly refers to the state that the competition is lacked by exercising the monopoly in the price or the quantity as one enterprise of small number of enterprises occupies the market. For the resources distribution to become optimized state, the market should be under perfect competition. However, if it does not in the optimal state, the imperfect competition like monopoly occurs in the market, which becomes the reason of market failure. In such market, the enterprises have existing technology, capital and experience and it is not easy for new enterprise to enter into the market. In addition the price is high compared to the perfectly competitive market and the monopoly having low production capacity causes the economic inefficiency.

2.2.2. Externality

It is the phenomenon that certain market participant does not receive or pay any price although an economic action of it brings unintended profits or damage.[14] Since in this phenomenon, the products are produced more or under the optimal level and the social benefits or cost are not reflected properly in the market, it depends on the principle of market only and the cause the problem that the resources are distributed inefficiently. In case that it brings the damage, it refers that the negative (-) externality occurs and in case of bring the benefits, it refers that the positive (+) externality occurs.

2.2.3. Information Asymmetry

It refers to the case that in the trade situation in the market, there is the difference in the information between the seller and the buyer. [N] If the seller and the buyer make a trade having complete information, the efficiency of the market is increased. However, it is hard to take complete information in the trade, and it is deemed to be unrealistic that the parties in the trade make a deal in the state that they possess the balanced information. The information favorable for customer should be informed to the customer in advance in order not to get a loss. However, it is common that the customer who does not know such information received the damage since it is not informed to the customer in advance. Therefore, the information asymmetry makes the efficient resources distribution impossible. [O]

3. Seeking Cause of Malfunction in Automatic Residential Kitchen Fire Extinguishing System

3.1. Monopolistic Perspective

To supply the kitchen fire extinguishing facilities developed by ‘OO’ Company to Korea, it unified the distribution channel to Korean enterprise ‘OO’ Company. [P] Installing the kitchen fire extinguisher in the apartment is mandatory from 1994, it is general that it is installed when the construct constructs the apartment. For that, the monopoly of this automatic kitchen fire extinguishing system occurs. In the apartment 6 years after the completion in January, 2019, the kitchen fire extinguisher manufactured by △△ Company was exploded in the state that it was not used for cooking. [Q] According to the investigation by Board of Audit and Inspection, the products of same company has been exploded several years before and the households that the explosion was made reached to several hundred. [R] If the situation that one enterprise monopolizes the product and deals with them due to such case may occur, there will be a problem that many victims are made. [S]

3.2. Perspective of Externality

The enterprise provides the paid repair to the consumers after expressing the problem caused by product defect as if it is natural phenomenon caused by the ageing and delivers the information that it exchanges the product with inexpensive price through the group purchase. In addition, for the households who do not accept the offer although it recommended the product exchange, it showed the attitude that it was not responsible when those households received the damage. For that, the consumers are exposed to the risk and to secure the safety, the households accept the offer of that enterprise. [T] There is a problem that through such behavior, the enterprise induces the consumers to replace the equipment and takes the profits through the income generated through the replacement. However, the penalty against the enterprise is generous.

3.3. Perspective of Information Asymmetry

More than 100 cases occurred across the country that the automatic residential kitchen fire extinguishing equipment manufactured by same company. The manufacturer claimed that it was not the defective product. However, differently from its claim, it was verified that it reinforced the product. In the results of comparing the product that was not exploded and the product that was replaced after the explosion, the thickness of value was changed. Although the manufacturer knew that the products were defective, it expressed it like a phenomenon occurs naturally by the product ageing. The consumers who do not know about the automatic residential kitchen fire extinguishing equipment cannot trust the information delivered by the manufacturer. However, since the manufacturer does not provide the exact information, the consumers cannot know the exact information.

4. Improvement Measures of Cause of Malfunction in Automatic Residential kitchen Fire Extinguishing System.

4.1. Perspective of Monopoly: Guarantee Consumer’s Choice

To prevent the installation of automatic residential kitchen fire extinguishing system when the constructor constructs the apartment, Korea Fire Equipment Inspection Corporation discloses the information such as accident case, etc. of the automatic residential kitchen fire extinguishing system received the type approval and the acceptance criteria of product inspection through its homepage so that the consumer can select the residential kitchen fire extinguishing system. Through that, it is necessary to make free competition among the enterprises.

4.2. Perspective of Externality: Grant Right to Inspect in Distribution Stage to Korea Fire Equipment Inspection Corporation

The right to inspect the fire protection equipments under distribution is vested to the chief of fire department but Korea Fire Equipment Inspection Corporation is commissioned only with the right to type approval and product inspection [U] and does not have a right to collect and inspect the product in the distribution stage. [V] It is necessary to grant the right that Korea Fire Equipment Inspection Corporation can collect and inspect the product under distribution by commissioning the right to collect and inspect the product in the distribution stage also should be commissioned to Korea Fire Equipment Inspection Corporation. [W]

4.3. Perspective of Information Asymmetry: Disclose Information of Type Approval and Acceptance Criteria of Product Inspection.

It is rare that the enterprise provides the good information to the consumers. However, if the government, public institution, etc. provide the good information to the consumers, the information asymmetry occurred between the enterprise and the consumers can be reduced. The government reduces the information asymmetry occurred between the enterprise and the consumers by disclosing the details of the acceptance criteria of the products received the type approval for fire protection and the fire protection product inspection. [23].

5. Conclusion

This study was performed to increase the reliability and the safety of fire protection facilities by identifying the causes of malfunction in the residential kitchen fire extinguishing system, which we encounter in our daily living, associating with the theory of market failure and by preparing the improvement measures according to them.

For the cause of malfunction in the residential kitchen fire extinguishing system, first, it is general to install the kitchen fire extinguisher when the constructor constructs the apartment. For that, the monopoly of the residential kitchen fire extinguishing system occurs. Recently, the case that the residential kitchen fire extinguishing system manufactured by a company exploded, lots of damage occurred. Therefore, as an improvement measure, it is necessary to make a free competition among the businesses by guaranteeing the consumer's choice on the residential kitchen fire extinguishing system.

Second, in the perspective of externality, there is a problem that the manufacturer takes the profit of the manufacturer by inducing the consumer to receive the paid repair after expressing the problem occurred through the defective product as if it is the phenomenon that would occur naturally through the ageing. Therefore, although the right to collect and inspect the fire protection products under distribution is vested to the chief of fire department, it is necessary to grant it to Korea Fire Equipment Inspection Corporation.

Finally, in the perspective of information asymmetry, the enterprise claimed to the consumers that it was not the defective product but differently from its claim, it was defective product and it was confirmed that it reinforced the products saying to the consumers that it was a problem occurred by the ageing. Therefore, it is necessary to reduce the information asymmetry occurred between the enterprise and the consumers by disclosing the information of type approval and the acceptance criteria in the product inspection.

For the follow-up research, the research to seek the improvement measures in order to guarantee the safe life by examining of the fire protection products, which should guarantee the safety of the people like residential kitchen fire extinguishing system are the products trust worthy by the people.

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