

## The Principle and Preventive Measures of Strong Magnet Stealing Electricity

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**Abstract:** This paper analyzes various ways and methods of stealing electric in the society, a variety of unknown methods of stealing electric are revealed, and some targeted measures to help improve the technical level of anti-stealing electricity are put forward. Firstly, the principle of stealing electricity is discussed, and the methods of stealing electricity, such as the current coil of short-circuit watt-hour meter, the series of shunt resistance or disconnection of voltage coil, and the replacement of zero line and fire line of input watt-hour meter are introduced. This paper mainly introduces the principle and preventive measures of strong magnet stealing electricity.

### 1. Introduction

As the development of social economy and increasing electricity consumption, the stealing electricity problem becomes more and more prominent in society. According to conservative estimation, the loss of stealing electricity reaches 20 billion yuan every year in China. The condition not only disturbs the development of power supply enterprises, but also seriously affects the economic construction and social stability. At present, watt-hour meter are generally installed in the special metering box, and cable is used through the pipeline into, out of the way, metering box needs to be locked, power supply departments read through the small glass window on the meter box. If conventional stealing electricity methods are used, such as bypassing the meter current coil, changing the voltage coil of the meter, external stealing electricity device, the metering device, or changing the meter appearance or external wiring, or destroyed the original lead seal, meter readers are easy to find in the power supply department or electricity monitoring personnel. For a long time, the problem of stealing electricity has been troubling the power supply department, although the power supply department has strengthened the measures against stealing electric power from many aspects, because of the endless means of stealing electricity, it brings great difficulty to the anti-stealing work, so-called way is one foot higher, the devil is one foot higher. Therefore, it is necessary for us to study the ways and methods of stealing electricity in order to better improve the anti-stealing technology level and plug the loopholes of stealing electricity completely.

### 2. The method for changing the electrical parameters of watt-hour meter

#### 1) The shorten circuit the current coil of meter

This is usually done by short-circuiting a current coil with a wire either inside or outside the meter. The more subtle method is to insert a wire with two pins at each end of the current coil into the meter, and it reduces the current flowing into the meter. This method can make the meter speed slow down to achieve the purpose of stealing electricity. Many people think this method can stop the meter, while not, because the resistance of meter current coil is very small. When the external wire is short-circuited, the short-circuited wire can only put part of the current flowing into the current coil. Therefore, it is wrong to judge whether users have stolen electricity only by observing

meter switching.

2) Series voltage divider on voltage coil or disconnecting voltage coil

For single-phase meters, it is easy to disconnect the voltage connector of meter, condition will cause the meter to fail, but it is easy to be found. If a resistance is connected to the voltage coil and the load end is directly connected, the resistance is covered with insulating tape or insulating sleeve, and it can be very hidden. The principle is to reduce the voltage through the voltage coil to achieve the purpose of less measurement.

3) Replacing the null line and live line of meter, and null line flows into the current coil of the meter

The method of stealing electricity is to use electricity by exchanging the zero line with the neighbor or taking another ground line to form a one-by-one fire system, so that own meter zero line is suspended. Since the current coil is suspended and no current flows through it, the meter will not rotate. When the power supply department checks the electricity, the zero line of own meter is restored, and metering is normal. This method is easy to control stealing electricity or not in the room, it is difficult for the power supply personnel to find the truth. The key to stealing electricity is to exchange the zero line of electricity flowing into the meter with the hot line.

4) Using auxiliary transformers

In the case of stealing electricity, a transformer is used to output a secondary high current and reverse it into the current coil of the meter, it reverses the meter. This method does not have any trace, the stealing electricity person only needs to make ammeter inversion and reduce certain degree of electricity before the supply department reads meter every month, it needs more professional level.

5) High power signal interference

High power signals interference with the internal components of the watt-hour meter, or other signals change the internal data of the watt-hour meter, it can be minimized or ignored.

Preventive measures are found by strengthening the monitoring of remote metering automation system on abnormal metering, the abnormality is found out to handle on site in time; The inspection system of watt-hour meter reading process should be established without metering automation.

The load terminal is connected to the phase shifter, and it adjusts the electrical angle of the current and voltage to reverse the meter (effective for the three-phase meter).

### **3. The method for changing the mechanical parameters of watt-hour meter**

Drilling a small hole in the top of the meter and inserting a nail or other object to turn the meter when stealing electricity. The disk is stuck or increasing the counter-rotating moment, and making the meter less metering.

Adjusting the brake magnet to increase the braking torque and slow down the speed of meter, and it achieves stealing electricity.

Adjusting the transfer gap between the axial gear and the meter gear, clearance adjustment makes the transfer resistance increasing, the rotor resistance, speeding slowly, increasing the axial gear. Although the wheel rotation is normal, when the meter gear does not turn, the meter calculated electricity is reduced. The cleverness of this method is that it uses the working principle of the meter to conceal the fact of stealing electricity in the form of manufacturing faults. changing the gear ratio of the counter, and watt- hour mete measuring doubled is reduced.

This method is the thief's secret weapon. This is done by replacing a meter with a smaller capacity to bigger one. For example, a meter with 5 (10) A 1800r /KWH is replaced to 10 (20) A 900r /KWH. Since the current coil and voltage coil of the meter have not changed, the aluminum disk speed does not change. The calculated amount of electricity is half. The key point of this method is to use the same manufacturer of electricity meter, it can be interchangeable meter, otherwise the mechanical size can not be corresponding. At the same time, a meter is sacrificed. Do not replace the meter panel during operation, and the power supply personnel will not be able to identify it. This method of stealing electricity is the highest means of all the above methods, even if

the meter checks the calibration room, it can not identify. Because the current and voltage coils remain unchanged, the meter wheel turns normally, but the gear speed ratio of the meter is changed. The electricity measured does not correspond to the actual electricity consumption by the meter. The methods used to check the accuracy of current watt-hour meter revolutions, it cannot detect errors, and even the meter is taken apart, it is difficult to detect flaws.

#### **4. The stealing electricity method of strong magnets**

Recently, a strong magnet is adsorbed on the metering box near the position of the electricity meter to steal electricity, the method is hidden, it is easy to remove, and spreading trend forms, this method has a strong concealment, the calibrator can not verify the stealing electricity nature, it is the most harmful. Therefore, it is great significance to study the principle and preventive measures of stealing electricity by strong magnets.

In order to test the influence degree of the strong magnet for watt-hour meter, we use captured strong magnet in the different position of watt-hour meter for different categories different models of watt-hour meter in the laboratory to error watt-hour meter verification, it found that strong magnets affect all negative errors for watt-hour meter, watt-hour meter measurement is less. The influence of strong magnets on electricity meters is analyzed.

1) Induction watt-hour meter makes the magnetic circuit saturated and less metering

2) For the electronic watt-hour meter, it saturates the core of the power frequency transformer (single phase watt-hour meter has one transformer, three three-phase watt-hour meter has three transformers) or the magnetic core of the high-frequency transformer (one) in the power supply part, DC power supply is reduced until disappears, resulting in less or no metering in the watt-hour meter.

3) The current transformer and voltage transformer are used for secondary transformation inside, the electronic watt-hour meter shall saturate its magnetic circuit, the output is reduced and even disappeared, resulting in less metering of watt-hour meter.

4) For a pulse watt-hour meter, the strong magnetic field makes the stepper motor magnetic circuit of the pulse meter stop with saturation, resulting in less metering of the watt-hour meter.

5) Power frequency transformer and secondary voltage transformer are used in combination with the electricity meter. The high magnetic field saturates the magnetic circuit of transformer, and it affects both the DC power supply and secondary voltage.

#### **5. Preventive measures of strong magnet stealing electricity**

Firstly, Reasonable design of measuring box

Strengthening the magnetic shielding of transformers and electricity meters. Because stainless steel does not conduct magnetism, it should be measured in stainless steel, and a layer of magnetic iron plate sheet can shield most of the magnetic field inside the cabinet.

A bracket is arranged on the back of the electricity meter in the measuring box. The electricity meter is a certain distance from the bottom of the meter box to reduce the influence of magnetic field. The test shows that the distance of the magnet from the watt-hour meter is more than 20cm, the influence can be within the error range after 20cm.

Secondly, for the measurement of the load management terminal, transformer is installed in a dry reed pipe near the watt-hour meter. When magnetic anomalies, dry reed tube is closed, and a remote communication signal is sent to load management terminal, load management center issues a warning information, electricity inspectors is reminded to investigate and punish, or instructions are issued to disconnect load switch by the load management main, it is shown in Fig.1.

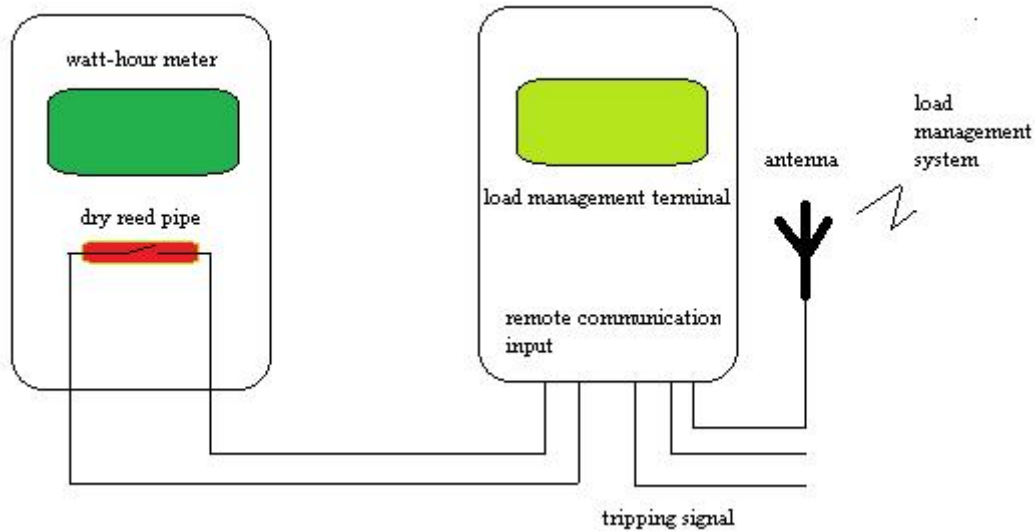


Fig.1 One of the preventing strong magnet stealing electricity devices

Thirdly, for the metering cabinet without load management terminal, the reed tube shall be used. When a strong magnetic field approaches, and alarm sound shall be given out firstly. In this case, if the stealing electricity user takes away the magnet, a metering device will automatically reverts, it is shown in Fig. 2.

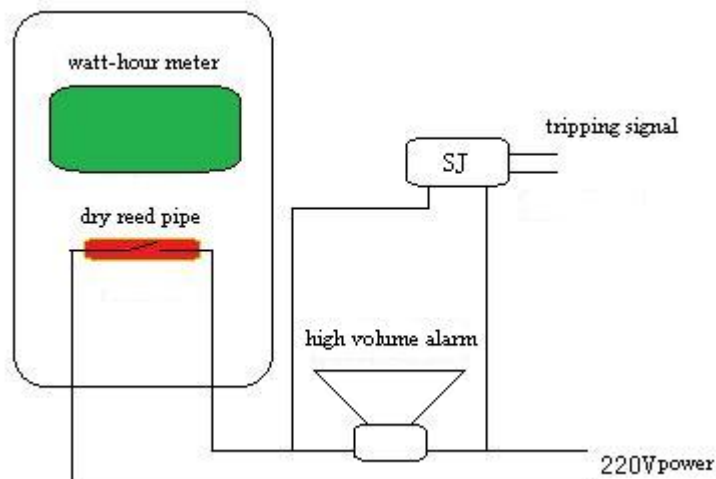


Fig.2 The other preventing strong magnet stealing electricity devices

Finally, Improved design of watt-hour meter manufacturers

Magnetic shielding is strengthened, and the core of the watt-hour meter with magnetic materials are shielded such as iron sheet.

The power supply design of single-phase watt-hour meter is improved, capacitor step-down power supply is adopted, or capacitor step-down and power-frequency transformer step-down is combined to supply.

The power supply design of three-phase watt-hour meter is improved, power frequency transformers of three power sources at different positions inside the watt-hour meter is arranged, such as three corners of the circuit board, or power frequency transformer step-down is used to combined with high-frequency transformer DC-DC transformation to supply.

The measurement storage part of the watt-hour meter is used to supply power independently. When the supply voltage drops, the alignment display, setting, communication and other part of the circuit power supply shall be cut off, the measurement and storage is maintained in part of the circuit power supply.

For single-phase watt-hour meter, the transformer of secondary transformation is canceled, and

resistance is used to extract voltage, the current is drawn to shunt by manganese copper.

For the three-phase watt-hour meter, the voltage is extracted by partial voltage of resistance. The reed tube is added. When the magnetic field is abnormal, the starting time of the magnetic field is recorded anomaly in time, the basis is provided for power recovery.

## **6. Conclusions**

As the improvement of anti-stealing technology and measures, the means of anti-stealing will continue to improve, so the problem of anti-stealing is an eternal topic, the need for professional personnel continues to study and crack. For some methods of stealing electricity, the methods of stealing electricity listed are integrated from the actual situation and demonstrated in the laboratory, the purpose of stealing electricity methods are revealed to improve the anti-stealing technology, so that the power supply department knows each other, the occurrence of stealing electricity is reduced.

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