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TITLE OF THE INVENTION: Energy-saving Service System

BACKGROUND OF THE INVENTION



1. Field of the Invention

159159

The present invention relates to an energy-saving service system in which power consumption is reduced by operating machines and equipment in an energy-saving mode.

2. Description of the Prior Art

Fig. 1 is a drawing indicating an example of the configuration of a conventional supply pump control system.

In Fig. 1, primary supply pumps 1 supply chilled water or hot water from return header 2 to primary supply header 4 via refrigerators or heaters or boilers 3.

Secondary supply pumps 5 are provided with inverters 6 and supply chilled water or hot water to secondary supply header 7 from primary supply header 4.

Flow sensor 8 measures the flow rate of chilled water or hot water supplied to return header 2 via two-way type control valves 9 and heat exchangers 11 from secondary supply header 7.

Pressure difference sensor 12 measures the differential pressure of chilled water or hot water between secondary supply header 7 and return header 2.

Operating number controller 13 issues operation commands to secondary supply pumps 5 so that the optimum number of operating pumps is obtained using values measured by flow sensor 8 and pressure difference sensor 12.

In the control system shown in Fig. 1, chilled water or hot water delivered from primary supply pumps 1 is supplied to heat exchangers 11 at the secondary use point by secondary supply pumps 5. The flow rate of the secondary circulating flow is variable because two-way type control valves 9 are controlled depending on the heat exchanging amounts required by heat exchangers 11.

In this case, operating number controller 13 issues operation commands to secondary supply pumps 5 so that the optimum number of operating pumps is obtained by detecting flow rate with flow sensor 8, and at the same time sends a rotational frequency control signal to inverters 6 so that the required pre-set differential pressure is obtained by detecting the differential pressure between secondary supply header 7 and return header 2 with pressure difference sensor 12. This reduces energy consumption due to pump driving.

The value for customers of an energy-saving system is the amount of money saved by introducing this system. However, control systems and their application programs for realizing energy-saving could not determine monetary value corresponding to the effects of energy-saving. For this reason, suppliers of energy-saving systems, in spite of their high added value, could not realize reasonable profits meeting the expectations of customers due to the principle of "one price (for one article)."

This is because, although the energy-saving effects are different depending on the scale of the objects to be controlled and the operating times, control actions (algorithms) themselves are completely the same.

In order to solve this problem, there is a system where the amount of money saved by a customer is shared equally with the service supplier

and the customer, based on the concept of supplying energy-saving services, not objects. However, this system is practiced in service business only and the manufacturers supplying product merchandise cannot enjoy its benefits.

SUMMARY OF THE INVENTION

The present invention is intended to solve the above-described problem and thus the object of the present invention is to realize an energy-saving service system where even manufacturers supplying product merchandise can obtain counter values corresponding to an energy-saving effect by implementing accounting according to the principle of "one price for one value" without using the conventional principle of "one price for one article."

BRIEF DESCRIPTION OF DRAWINGS

Fig. 1 is a drawing indicating an example of the configuration of conventional supply pump control systems.

Fig. 2 is a configuration drawing indicating an embodiment of the present invention.

Fig. 3 is a drawing illustrating the operation of the system shown in Fig. 2.

Fig. 4 is a configuration drawing indicating another embodiment of the present invention.

Fig. 5 is a drawing illustrating the operation of the system shown in Fig. 4.

Fig. 6 is a configuration drawing indicating a third embodiment of the present invention.

Fig. 7 is a configuration drawing indicating a fourth embodiment of the present invention.

Fig. 8 is a configuration drawing indicating a fifth embodiment of the present invention.

Fig. 9 is a configuration drawing indicating a sixth embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention will be described below in detail with respect to the drawings.

(A) Embodiment 1

Fig. 2 is a configuration drawing indicating an embodiment of the present invention.

In Fig. 2, ordinary control means 30 generates a control output "Con" for operating an object system in an ordinary mode based on an input signal for control and outputs the control output. The input signal for control is a detection signal from a sensor.

Energy-saving control means 40 generates a control output "Cos" for operating the object system in an energy-saving mode based on a detection signal from a sensor necessary for energy-saving control and outputs the control output. The above described detection signal from sensors necessary for energy-saving control is a detection signal obtained by adding a detection signal from another sensor to the detection signal from the sensor which is input to ordinary control means 30.

Selecting means 50 selects either one of the control outputs from ordinary control means 30 or energy-saving control means 40 and transmits the selected control output to the object system. Selecting means 50 functions as a switch.

In the example shown in Fig. 1, the input signal for control is a detection signal from the flow sensor. The detection signal from

sensors necessary for energy-saving control is, for example, a detection signal obtained by adding a detection signal from the pressure difference sensor to the detection signal from the flow sensor. The control output is a rotational frequency control signal to be transmitted to inverters. The object system consists of secondary supply pumps.

Permitting means 51 permits an energy-saving mode operation start instruction when an energy reducing function is purchased. The permitted operation start instruction is given to change-over controller 60. Permitting means 51 permits the energy-saving mode operation start instruction when a password, given if an energy reducing function is purchased, is input.

Change-over controller 60 changes over selecting means 50 corresponding to the energy-saving effect.

In change-over controller 60, converting means 61 determines energy consumption in the ordinary mode by converting control output "Con" of ordinary control means 30 to energy consumption "en" based on correlation table 62 that indicates correlation between control output and energy consumption. In an example shown in Fig. 1, correlation table 62 expresses the relationship between an analog signal from 4 to 20 mA which is transmitted to inverters and the pump driving electric power (kWh) in a table form.

Converting means 63 determines energy consumption in an energy-saving mode by converting control output "Cos" of energy-saving control means 40 to energy consumption "es" based on correlation table 62.

Difference calculating means 64 determines the difference ("en" - "es")

of two values of energy consumption determined by converting means 61 and 63.

Integrating means 65 determines integrated value $E_p = \sum("en" - "es")$ by integrating the difference determined by difference calculating means 64.

Setpoint maintaining means 66 holds set value E_{set} for an energy reducing amount. The held set value is a set value reflecting that there is an energy-saving effect. This set value is set when an energy-saving mode operation start instruction is given.

Clearing means 67 clears integrated value E_p of integrating means 65 if an energy-saving mode operation start instruction is given.

Comparing means 68 compares integrated value E_p with set value E_{set} and changes over selecting means 50 using a binary signal corresponding to a comparison result. When the energy-saving mode operation is started and the energy reducing amount reaches the relation $E_p > E_{set}$, control is returned to the ordinary mode from the energy-saving mode. In other words, when the energy reducing amount reaches the setpoint after the energy-saving mode is started, control is returned from the energy-saving mode to the ordinary mode, resulting in the energy-saving effect being achieved.

Operation of the system shown in Fig. 2 will be described.

Operation is started with the initial value of integrated value E_p set to infinity. This starts the operation in an ordinary mode.

When the energy reducing function is purchased, permitting means 51 permits setup of the energy reducing amount and the operation start instructions. Permission for setting up the energy reducing amount and

the operation start instruction is implemented according to a sequence protected by password input and the like. The password is received when the energy reducing function is purchased. A password corresponding to the energy reducing amount, controller identification number, operation start date, and the like is generated and issued. This processing is carried out by a password generating means not shown in the drawing.

When the energy reducing amount setup and the operation start instruction are permitted, clearing means 67 clears integrated value E_p in integrating means 65, and set value E_{set} corresponding to a purchased energy reducing amount is set to setpoint maintaining means 66. This is set by permitting means 51.

Change-over controller 60 continues to integrate the difference between energy consumption in the ordinary mode and energy consumption in the energy-saving mode. As soon as this difference-integrated value E_p exceeds set value E_{set} , the energy-saving mode is cut off and the mode returns to the ordinary mode.

If energy-saving is to be implemented again, the energy reducing function is again purchased, the password is input, and operation is started.

Fig. 3 shows a time chart indicating the status in which integrated value E_p changes.

As shown in Fig. 3 (a), if operation in the energy-saving mode is started at instant t_0 , integrated value E_p begins to increase with time. If integrated value E_p attains set value E_{set} at instant t_1 , the energy reducing function stops and the mode is returned to the ordinary mode from the energy-saving mode. The integrated value E_p is subsequently

maintained at Eset.

As shown in Fig. 3 (b), if the energy reducing function is repurchased and restarted at instant t2, integrated value Ep is cleared then begins to increase with time identical to the case shown in Fig. 3 (a). Examples of the energy reducing functions to be purchased are shown below.

	Reducing amount	Price
Password		¥500,000
XYZA	Up to 100 MWh	¥900,000
XYZB	Up to 200 MWh	¥2,000,000
XYZC	Up to 500 MWh	

The greater the reducing amount to be purchased, the higher the set value to be set to setpoint maintaining means 66. For example, if password "XYZA" is input to permitting means 51, permitting means 51 permits operation start instruction in the energy-saving mode because this password is a regular password. Permitting means 51 sets a set value corresponding to the reducing amount 100 MWh to setpoint maintaining means 66.

According to embodiment 1 of the present invention, the following effects are obtained:

(a) When the energy reducing function is purchased, operation in the energy-saving mode is permitted and the energy reducing amount in the energy reducing mode is integrated. The energy-saving mode is cut off when the integrated value reaches an amount corresponding to the amount paid. That is, if an energy-saving effect corresponding to the purchased sum is achieved, the energy-saving function is stopped at that time and operation is returned to normal operation. This makes it possible to rationally determine a price corresponding to the energy

reducing amount, and even manufacturers supplying product merchandise can obtain counter values corresponding to an energy-saving effect.

(b) Since the integrated value in the integrating means is cleared when the operation start instruction is given, the energy reducing amount in the energy-saving mode can be properly measured.

(c) Since operation in the energy-saving mode is started when an energy-saving mode operation start instruction is given to the change-over controller or an energy-saving mode operation start instruction is given periodically to the change-over controller, the system can enter the energy-saving mode either periodically or randomly.

(d) Since the set value to be set to the setpoint maintaining means is determined corresponding to a purchasing sum for the energy reducing function, rational counter values can be applied to the energy-saving effects.

(e) Since an energy-saving mode operation start instruction is permitted if a password (which is issued when the energy reducing function is purchased) is input, security in entering the energy-saving mode can be assured.

(B) Embodiment 2

Fig. 4 is a configuration drawing indicating another embodiment of the present invention. In Fig. 4, the components identical to those in previous figures are given the same signs.

In Fig. 4, periodic instruction means 70 periodically gives the energy-saving mode operation start instruction. Permitting means 51, when an energy reducing function is purchased collectively over a predetermined period, permits operation start instruction to be done by periodic instruction means 70 during the purchased predetermined

period. Operation start instruction permission is given to change-over controller 60. For example, if the energy reducing function for one year is collectively purchased, when the present time is in the relevant fiscal year, an operation start instruction is permitted. In the same manner as the embodiment shown in Fig. 2, permitting means 51 sets a set value to setpoint maintaining means 66 when the operation start instruction is permitted.

Logical sum means 71 implements a logical operation for a periodic operation start instruction or a random operation start instruction permitted by permitting means 51. At least one of either a periodic operation start instruction or a random operation start instruction is received, clearing means 67 clears integrated value E_p , and the energy-saving mode operation is started.

Fig. 5 shows a time chart indicating the status in which integrated value E_p changes.

As shown in Fig. 5, if operation in the energy-saving mode is started at instant t_0 , integrated value E_p continues to increase with time. If integrated value E_p attains set value E_{set} at instant t_1 , the energy reducing function stops and the mode is returned to the ordinary mode from the energy-saving mode. After that, if a periodic restart is instructed by periodic instruction means 70 at instant t_3 , integrated value E_p is cleared.

Even if integrated value E_p does not reach set value E_{set} , integrated value E_p is cleared by periodic restart as instructed at instant t_4 . In addition, if a random restart is instructed at instant t_5 , integrated value E_p is cleared.

In embodiment 2 of the present invention, since a periodic instruction

means that issues the energy-saving mode operation start instruction periodically is provided, the annual energy reducing amount is assured for customers, and manufacturers can obtain counter values collectively, including for future energy reducing amounts.

(C) Embodiment 3

Fig. 6 is a configuration drawing indicating a third embodiment of the present invention.

In Fig. 6, actual consumption measuring means 80 measures the actual energy consumption in the energy-saving mode. Measurement of actual consumption is performed by directly measuring, for example, the electric power consumed in inverter-controlled pumps with a power monitor.

In the embodiment shown in Fig. 6, the difference between the energy consumption determined by converting means 61 from the correlation table and the actual energy consumption directly measured by actual consumption measuring means 80 is calculated and this difference is integrated.

In embodiment 3 of the present invention, the energy-saving effect can be measured according to the present state of an object system because the energy reducing amount is determined based on actual consumed amount measured values in the energy-saving mode.

(D) Embodiment 4

Fig. 7 is a configuration drawing indicating a fourth embodiment of the present invention.

In Fig. 7, correcting means 81 corrects correlation table 62 based on the control output from energy-saving control means 40 and the actual energy consumption in the energy-saving mode measured by actual

consumption measuring means 80. In embodiment 4 of the present invention, since correlation table 62 is corrected based on the actual measured energy consumption, the energy reducing amount can be calculated taking into consideration the deterioration of pumps or the like due to secular change.

(E) Embodiment 5

Fig. 8 is a configuration drawing indicating a fifth embodiment of the present invention.

In Fig. 8, exchanging means 82 determines energy consumption in the ordinary mode using correlation data 83 indicating the correlation of an object system operating in the ordinary mode for energy consumption. Correlation data 83 shows the data indicating how much electric power is consumed by which object system being driven. Which object system is driven is known by the status signal that indicates the on/off states of the object system. In this embodiment, the difference between energy consumption determined by exchanging means 82 and actual energy consumption measured by actual consumption measuring means 80 is calculated and integrated.

In embodiment 5 of the present invention, when there is a plurality of object systems, since the energy reducing amount is determined using correlation data that give how much energy is consumed if which object system is operating, the energy-saving effect can be measured taking these operating object systems into consideration.

Further, an interrupting means may be provided, which interrupts operation in the energy-saving mode by changing over the selecting output of selecting means 50 during operation of the object systems in the energy-saving mode. This makes it possible to adjust the system

by returning the system temporarily to the ordinary mode. For example, if an object system is not operating as expected, the object system can be adjusted by interrupting the energy-saving mode.

Also, setup of a set value to setpoint maintaining means 66 and issuing of the energy-saving mode operation start instruction to change-over controller 60 may be carried out at different times. This makes it possible to enter the energy-saving mode after performing a trial run in the ordinary mode after the setting of a set value.

Furthermore, a displaying means that displays at least one of the current integrated values by integrating means 65, the set value, the difference calculated by difference calculating means 64 and the expected completion time of the energy-saving mode operation, may be provided. For example, a trend of integrated values by integrating means 65 may be displayed in a bar graph. This makes it possible to check the energy-saving effect easily.

In addition, a pre-alarm means may be provided, which gives previous notice that the operation in the energy-saving mode will soon be completed, before it actually is. This makes it possible to continue operation in the energy-saving mode smoothly.

(F) Embodiment 6

Fig. 9 is a configuration drawing indicating a sixth embodiment of the present invention.

In this embodiment, payment of the fee for the energy-saving effect is made using a deferred payment system.

In the embodiments described above, a set value is provided corresponding to the energy-saving effect and accounting is performed when the set value is made effective. In this case, payment is made

using an advance payment system.

In the embodiments shown in Fig. 4 and Fig. 8, the effects meeting the paid amount may not be obtained because the energy-saving mode operation start instruction is given in every period using the periodic instruction means. For example, if the energy reducing function of annual 150 MWh is purchased, the result of the actual energy reducing amount may possibly be less than 150 MWh.

Further, in the embodiments shown in Fig. 2, Fig. 6, and Fig. 7, it is difficult to predict the energy-saving operation completion time and it is troublesome that a new right must be purchased and set after once completing the energy-saving operation.

Counter to the above, in the embodiment shown in Fig. 9, accounting is performed based on the difference between the reducing amount integrated value on the previous closing day and the reducing amount integrated value on the present closing day. Payment is consequently carried out using a deferred payment system.

In Fig. 9, difference calculating means 64 calculates the difference between energy consumption in the ordinary mode determined by converting means 61 and energy consumption in the energy-saving mode determined by converting means 63. Integrating means 65 integrates the difference calculated by difference calculating means 64.

Accounting means 91 determines an accounting sum based on the integrated value by integrating means 65. The accounting sum is determined from the difference between the integrated value on the previous closing day and that on the present closing day.

Accounting means 91 sends out information on the determined accounting sum. Information on this accounting sum is sent via a network to a

customer's computer (not shown in the drawing), who has purchased energy-saving services.

Reduction permitting means 92 changes over selecting means 50. When entering the energy-saving mode, reduction permitting means 92 causes selecting means 50 to select the control output from energy-saving control means 40.

In the embodiment shown in Fig. 9, energy-saving operation is started by selecting the control output from energy-saving control means 40 by reduction permitting means 92. At this time selecting means 50 is changed over to the side where the control output of energy-saving control means 40 is selected. Accounting means 91 determines an accounting sum based on the difference between the integrated value on the previous closing day and the integrated value on the present closing day. Information on the determined accounting sum is sent to a customer's computer via a network. The customer pays the accounting sum fee. As mentioned above, accounting is implemented using a deferred payment system.

Further, it may also be acceptable that the integrated value in integrating means 65 is cleared when an accounting sum is determined, following which a reducing amount is newly started from zero. In this case, the accounting sum is determined using the integrated value itself in integrating means 65 without calculating the difference between the integrated value on the previous closing day and the integrated value on the present closing day.

Furthermore, the embodiment shown in Fig. 9 can also be configured to provide a reduction permitting timer which is started when accounting means 91 sends out the information on charging an accounted sum to a

customer, and the time is up when the timer operates to the end of a specified period. In this case, accounting means 91 resets the reduction permitting timer if notice of payment by the customer is received within the specified period. If the pre-set time of the reduction permitting timer is up because the payment notice from the customer is not received within the specified period, the control output of energy-saving control means 40 cannot be selected by selecting means 50. This stops the energy-saving mode.

According to embodiment 6 of the present invention, the following effects can be achieved:

(a) The accounting sum is calculated based on the energy reducing amount when a system is operated in the energy-saving mode. The fee is paid using a deferred payment system. This enables a customer to obtain energy-saving effects equivalent to the amount paid. In addition, it is not necessary for the customer to be aware of the completion time of the energy-saving operation.

(b) The energy-saving mode is continued or stopped depending on whether the accounting sum is paid within a specified period or not, by providing a reduction permitting timer. This makes it possible for the supplier to supply the energy-saving service while managing whether payment has been implemented by the time payment is due or not.

WHAT IS CLAIMED IS

1. An energy-saving service system in which an object system can be operated in either the ordinary mode or the energy-saving mode, permitting an energy-saving mode operation start instruction when the energy reducing function is purchased, operating said object system

based on said operation start instruction, integrating the difference between energy consumption in the ordinary mode and that in the energy-saving mode, and returning the energy-saving mode to the ordinary mode when the integrated value reaches a predetermined set value.

2. An energy-saving service system in which an object system can be operated in either the ordinary mode or the energy-saving mode, comprising:

an ordinary control means that generates and outputs the control output for operating an object system in the ordinary mode based on a detecting signal from a sensor,

an energy-saving control means that generates and outputs the control output for operating said object system in the energy-saving mode based on a detecting signal or detecting signals required for energy-saving control,

a selecting means that selects either the control output from said ordinary control means or the control output from said energy-saving control means and gives the selected output to said object system,

a permitting means that permits the energy-saving mode operation start instruction when the energy reducing function is purchased, and

a change-over controller that causes said selecting means to select the control output from said energy-saving control means if an operation start instruction permitted by said permitting means is given, integrates the difference between the energy consumption in the ordinary mode and the energy consumption in the energy-saving mode, and returns the selected output of said selecting means from the control output from said energy-saving control means to the control output from said ordinary control means when the integrated value reaches a predetermined

set value.

3. An energy-saving service system in accordance with claim 2, wherein said change-over controller comprises:

a first converting means that determines energy consumption in the ordinary mode by converting the control output from the ordinary control means into energy consumption based on a correlation table indicating the correlation between the control output and energy consumption,

a second converting means that determines energy consumption in the energy-saving mode by converting the control output from the energy-saving control means into energy consumption based on said correlation table,

a difference calculating means that calculates the difference of energy consumption between said first and second converting means, and

an integrating means that integrates the difference calculated by said difference calculating means.

4. An energy-saving service system in accordance with claim 2, wherein said change-over controller comprises:

an actual consumption measuring means that measures actual energy consumption in the energy-saving mode,

a converting means that determines energy consumption in the ordinary mode by converting the control output from the ordinary control means into energy consumption based on a correlation table indicating the correlation between the control output and energy consumption,

a difference calculating means that calculates the difference between energy consumption determined by said converting means and actual energy consumption measured by said actual consumption measuring means, and

an integrating means that integrates the difference calculated by said

difference calculating means.

5. An energy-saving service system in accordance with claim 2, wherein said change-over controller comprises:

an actual consumption measuring means that measures actual energy consumption in the energy-saving mode,

an exchanging means that determines energy consumption in the ordinary mode, using said correlation data indicating correlation between an object system operating in the ordinary mode and energy consumption, based on a status signal indicating which object system is operating,

a difference calculating means that calculates the difference between energy consumption determined by said exchanging means and actual energy consumption measured by said actual consumption measuring means, and

an integrating means that integrates the difference calculated by said difference calculating means.

6. An energy-saving service system in accordance with claim 2, wherein said change-over controller comprises:

an actual consumption measuring means that measures actual energy consumption in the energy-saving mode,

a converting means that determines energy consumption in the ordinary mode by converting the control output from the ordinary control means into energy consumption based on a correlation table indicating the correlation between the control output and energy consumption,

a difference calculating means that calculates the difference between energy consumption determined by said converting means and actual energy consumption measured by said actual consumption measuring means,

an integrating means that integrates the difference calculated by said difference calculating means, and

a correcting means that corrects said correlation table based on the control output from said energy-saving control means and the actual energy consumption in the energy-saving mode measured by said actual consumption measuring means.

7. An energy-saving service system in accordance with claim 2, which comprises a periodic instruction means that periodically gives the energy-saving mode operation start instruction, and wherein said permitting means, if the energy reducing function is purchased collectively over a predetermined period, permits the operation start instruction of said periodic instruction means in said predetermined period.

8. An energy-saving service system in accordance with claim 2, which comprises a clearing means that clears an integrated value in said integrating means when an energy-saving mode operation start instruction is given to said change-over controller or when an energy-saving mode operation start instruction is periodically given to said change-over controller by said periodic instruction means.

9. An energy-saving service system in accordance with claim 2, which comprises a setpoint maintaining means to which said set value is set when an energy-saving mode operation start instruction is given to said change-over controller or when an energy-saving mode operation start instruction is periodically given to said change-over controller by said periodic instruction means.

10. An energy-saving service system in accordance with claim 2, wherein said permitting means determines a set value to be set to said setpoint maintaining means corresponding to the amount paid for the energy reducing function.

11. An energy-saving service system in accordance with claim 2, wherein said permitting means permits an energy-saving mode operation start instruction if a password, issued when the energy reducing function is purchased, is input.

12. An energy-saving service system in accordance with claim 2, which comprises an interrupting means that interrupts operation in the energy-saving mode by changing over the selecting output of said selecting means during operation of an object system in the energy-saving mode.

13. An energy-saving service system in accordance with claim 2, which comprises a setpoint maintaining means to which said set value is set, and wherein setup of a set value to said setpoint maintaining means and issuing of the energy-saving mode operation start instruction to said change-over controller are carried out at different times.

14. An energy-saving service system in accordance with claim 2, wherein said change-over controller comprises:

a first converting means that determines energy consumption in the ordinary mode by converting the control output from the ordinary control means into energy consumption based on a correlation table indicating the correlation between the control output and energy consumption,

a second converting means that determines energy consumption in the energy-saving mode by converting the control output from the energy-saving control means into energy consumption based on said correlation table,

a difference calculating means that calculates the difference of energy consumption between said first and second converting means, and

an integrating means that integrates the difference calculated by said

difference calculating means;

and further comprising a displaying means that displays at least one of the current integrated values by said integrating means, said set value, the difference calculated by said difference calculating means and the expected completion time of the energy-saving mode operation.

15. An energy-saving service system in accordance with claim 2, wherein said change-over controller comprises:

a first converting means that determines energy consumption in the ordinary mode by converting the control output from the ordinary control means into energy consumption based on a correlation table indicating the correlation between the control output and energy consumption,

a second converting means that determines energy consumption in the energy-saving mode by converting the control output from the energy-saving control means into energy consumption based on said correlation table,

a difference calculating means that calculates the difference of energy consumption between said first and second converting means, and

an integrating means that integrates the difference calculated by said difference calculating means;

and further comprising a pre-alarm means which gives previous notice that the operation in the energy-saving mode will soon be completed, before it actually is.

16. An energy-saving service system in which an object system can be operated in either the ordinary mode or the energy-saving mode, operating said object system in the energy-saving mode based on said energy-saving mode operation start instruction, integrating the difference between energy consumption in the ordinary mode and that

in the energy-saving mode, and calculating an accounting sum based on said integrated value.

17. An energy-saving service system in which an object system can be operated in either the ordinary mode or the energy-saving mode, comprising:

an ordinary control means that generates and outputs the control output for operating an object system in the ordinary mode,

an energy-saving control means that generates and outputs the control output for operating said object system in the energy-saving mode,

a selecting means that selects either the control output of said ordinary control means or said energy-saving control means and gives the selected control output to said object system,

a reduction permitting means that causes said selecting means to select the control output of the energy-saving control means when entering the energy-saving mode,

an integrating means that integrates the difference between energy consumption in the ordinary mode and that in the energy-saving mode after entering the energy-saving mode, and

an accounting means that sends out information on the determined accounting sum based on an integrated value in said integrating means.

18. An energy-saving service system in accordance with claim 17, which comprises a reduction permitting timer, that starts when said accounting means sends out information on the accounting sum to a customer, and the time is up when the calculating operation is continued to the end of a specified period, and wherein said accounting means resets said reduction permitting timer if notice of payment by a customer is received by a supplier within said specified period, and if notice of payment

by a customer is not received by the supplier and thus the time is up for the reduction permitting timer, said accounting means does not cause said selecting means to select the control output of the energy-saving control means.