KOMATSU
Newsletter
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CUSTOMER SUPPORT

Energy-Efficient Operation

Increasing Safety and Reducing Environmental Load through Training in Energy-Efficient Operation Methods

Aerial view of Komatsu Techno Center

Today, there is increasing demand for reduced environmental burden around the world. Environmental awareness is progressively growing not only at corporations but also among individuals. In response to rising fuel costs and reducing CO_2 emissions, Komatsu is offering training courses in energy-efficient operation methods for users that propose effective utilization of energy.

Constructed in a spacious area totaling 156,000 m^2 (1,679,184 ft^2) in Izu City, Shizuoka Prefecture, Japan in July 1990, the Komatsu Techno Center provides training courses on hydraulic excavators, wheel loaders, dump trucks and bulldozers primarily for domestic customers at their GEMBA (work site). Since starting to provide training in 2002, the center has held training sessions 74 times in total for 1,097 participants from 479 companies. Training programs for employees of Komatsu's overseas subsidiaries and distributors are also available at the center.

Voices of Training Participants

- Before taking the training course, I believed energy-saving operation meant keeping the fuel cost low. I learned that in case of construction equipment, fuel-efficient operation means higher productivity.
- I thought I was doing fine as long as I didn't put too much load on the machine, but I learned the full utilization of levers and a subtle adjustment of the bucket angle would lead to higher operational efficiency.
- Watching other operators work, I realized I had the tendency to raise the boom too high.
- Good operators never stop the bucket movement and make unnecessary moves.
- I learned through the training that fully extending the machine arm, albeit slowly, leads to very inefficient operations in terms of fuel economy.
- Efficient operations became possible by having the machine automatically coordinate the optimum engine-pump matching.

Importance of Proper and Energy-Saving Operation

The Komatsu Techno Center provides training on energy-saving operation for each piece of equipment requested. The effects of energy-saving operation are evident in figures following training. To further boost effects, the Komatsu Techno Center takes the following steps as well.

- Emphasize guidance that proper operation equals energy-saving operation at equipment delivery.
- Remind customers to have an interest in energy-saving operation throughout the GEMBA and for all equipment they own.

Proper operation and raising awareness lead to a safer GEMBA. Methods of energy-saving operation that make effective utilization of fuel lead to reductions in fuel consumption and CO_2 emissions.

The center will continue to engage in activities that will lead as many customers as possible to properly undertake energy-saving operations.

Training on Energy-Efficient Operation

Here, we introduce a portion of training programs for hydraulic excavators and wheel loaders.

In the case of construction equipment, the question is how to do the same amount of work using less fuel. Fuel-efficient operation means improving fuel productivity, or in other words, increasing the amount of work done per unit of fuel consumption (tonne or m^3/ℓ).

To confirm the quantitative effect of energy-efficient operation both before and after training, Komatsu measures fuel consumption and the amount of work during ordinary operation regardless of the machine.

Hydraulic Excavator

■ Energy-saving operation of equipment

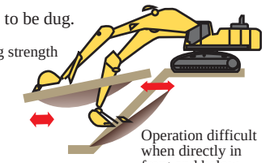
The training course emphasizes guidance on selecting the work mode and switch as well as operation method.

■ Operation to enhance fuel efficiency

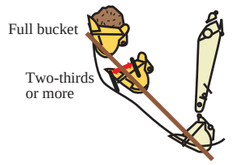
Examples of efficient ways of digging and loading taught during training are as follows.

1. Digging

Confirm the area that needs to be dug.

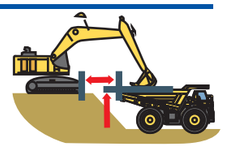


Efficiently fill the bucket.

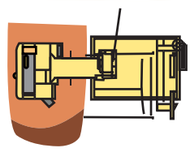


2. Loading

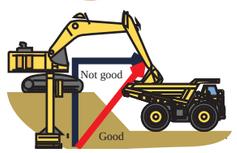
Optimally position the bed of the dump truck and bench height.



Place the dump truck in the optimum position so that the turn angle of the hydraulic excavator is kept to a minimum.



Avoid unnecessary bucket movement.



■ Eliminate waste and overwork

1. Prevent unnecessary idling operation
2. Avoid hydraulic relief*

* Condition as the pressure adjustment valve opens and oil returns to the oil tank when hydraulic pressure exceeds the upper limit of the hydraulic circuit. This mechanism prevents breakdown caused by continued overwork.

Increase equipment fuel efficiency by around 22% on average through one-day training

(Figure may differ due to operation by trainee.)

Wheel loader

■ Energy-saving operation of equipment

The training course emphasizes guidance on driving using partial acceleration as well as not operating the lever more than necessary.

■ Operation to enhance fuel efficiency

Examples of efficient ways of loading taught during training are as follows.

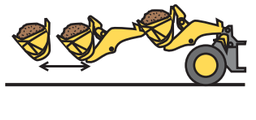
1. Digging

When approaching an object to be dug, pay attention to acceleration and the front angle of the bucket.

1 m (3.3 yd) in front of foot of slope

When digging, pay attention to boom lift operation and frequency of bucket tilts.

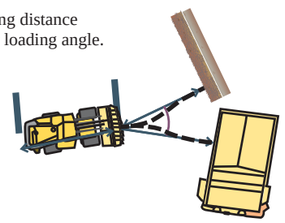
When moving backward after digging, pay attention to load spill prevention and position of boom.



When approaching dump truck, pay attention to left brake operation and acceleration.

2. Loading

Shorten the loading distance and minimize the loading angle.



■ Eliminate waste and overwork

1. Prevent unnecessary idling operation
2. Prevent slippage
3. Avoid hydraulic relief and torque converter stalling*

* Condition where the vehicle with a torque converter stops due to an external force as it tries to move forward but the engine keeps rotating

Increase equipment fuel efficiency by around 19% on average through one-day training

(Figure may differ due to operation by trainee.)

Analysis via KOMTRAX data

We recommend energy-saving operation based on an analysis of how the equipment is being used.

Hydraulic excavator demonstration at Komatsu Techno Center

Reference Example [Hydraulic Excavator]

KOMTRAX

Energy Saving Operation Report

Created Date 2013/09/10

Customer Name: [redacted]

Reporting Machine	Report Period	Working Days	Working Hour	SMR at the end of period
[redacted]	2013/08/01- 2013/08/31	17Day	129.9H	2700.0H

Fuel Consumption Information

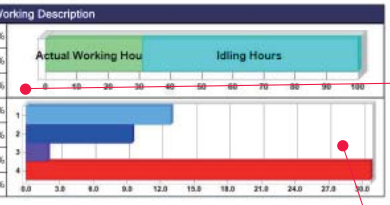
Accumulated Fuel Consumption	1285.9L	Avg. Fuel Consumption	9.9L/H	Fuel Consumption in Actual Working	24.1L/H	CO2 Emissions (total)	3.3ton

*CO2 emissions equals to Fuel Consumption multiplied by the constant (2.58 ton/kl).Displayed fuel data is approximate. There could be difference between actual amount because of operation condition(fuel, weather, operation and etc.)

NOTE:

Working Description

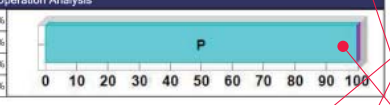
Usage	1	Working Hour	129.9H	100%
	2	Actual Working Hours	40.3H	31.0%
	3	Idling Hours	89.6H	69.0%
Operation Hours	1	Digging Hours	5.2H	12.9%
	2	Hoist Hours	3.8H	9.4%
	3	ATT Hours	0.8H	1.9%
	4	Travel Hours	12.4H	30.7%



It is effective for fuel efficiency to decrease idle hours and travel hours.
* Display values are ratio to actual working hours.

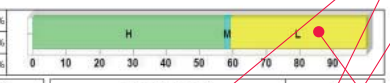
Operation Analysis

Working mode ratio	1	E-mode	0.0H	0.0%
	2	P-mode	40.3H	100.0%
	3	B-mode	0.0H	0.0%
	4	L-mode	0.0H	0.0%



E-mode operation enable to decrease fuel consumption

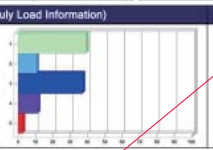
Travel mode ratio	1	Hi	7.1H	57.7%
	2	Mi	0.2H	1.6%
	3	Lo	5.0H	40.6%



Avg. Fuel Dial Position (Period)	99.0%	E-mode (max in period)	50

Machine Load Map(July Load Information)

Hyd Press. Map	1	Idling Hours	39.1%
	2	Very light	10.4%
	3	Light	36.9%
	4	Heavy	11.1%
	5	Very heavy	2.4%



Hyd Relief Hours (total)	49.1min	2.0%

Energy Saving Guidance

Guidance Record

1	Long time idling	172Times
2	Hyd Relief Control	48Times
3	E mode Recommendation	90Times
4	Partial throttle travel recommendation	11Times

Company Name	Name	Contact Address

KOMATSU

Avoid unnecessary engine idling.

Avoid relieving hydraulic pressure as much as possible.

Select E-mode during operation.

Return fuel dial by one-third when driving.

Follow-Up to Training

Komatsu confirms the effect of energy-saving efforts on equipment via data from the KOMTRAX machine tracking system in areas where the system has been introduced. In case efforts do not lead to the intended effects in energy savings, we recommend taking the training again to learn the methods for energy-saving operation.

In this article, only a few examples of fuel-efficient operation are introduced. Other operating techniques, detailed operating methods and values to measure effects are taught as part of the “fuel-efficient operation training course” at the Komatsu Techno Center.


Staff members of Komatsu Techno Center

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