

Direction for
Territory Infrastructure Development
Kharkiv Regional Public Enterprise

Summary Report

Ukraine

Pilot Survey for Disseminating SME's
Technologies for Biomass Pellet
Manufacturing Machine and
Biomass Boiler

August, 2015

Japan International Cooperation Agency
Asuka Green Investment Co., Ltd.

1 BACKGROUND

In Ukraine, people use gasses for fuel, and the heat is supplied to communal facilities and houses by the public sector. Since the price of gasses and its procurement cost depend on the political relationship with Russia, Ukraine has pursued the policy of promoting renewable energy as one of the priorities to limit the dependence on gasses. Kharkiv state, which is our survey site, has attempted to decrease the dependency on gasses and obtain a steady supply of fuels at a low cost by producing agricultural residue briquettes. However, the energy efficiency is low because the boilers use mixed fuels of low-grade coal and timber and have been operated for over 20 years. In addition, since Ukrainian heat suppliers face financial difficulties such as escalating gas price and restraining price of heat supply, fuel conversion projects have not worked out as intended.

2 OUTLINE OF THE PILOT SURVEY FOR DISSEMINATING SME'S TECHNOLOGIES

(1) Purpose

The purpose of the survey is to propose solutions for promoting renewable energy by using effective Japanese technologies of biomass resources. This can further contribute to communal societies and business activities by spreading these technologies in the near future.

(2) Activities

a. Business environment study

Before installing the equipment, the business environment, such as energy demand and supply conditions in Ukraine, briquette quality, its production volume, capacities of local technicians, and competitiveness of the proposed documents, was studied.

b. Feasibility analysis

Pellet manufacturing equipment (pellet granulating machine and crushing machine) was installed for producing pellets from briquettes. A biomass pellet boiler was also installed in place of the existing gas boiler for providing heat. Then the task were clarified by examining the following: 1) operation and maintenance methods, 2) comparative advantages of the existing systems (considering medium and long-term outlook for other energies such as natural gas and coal), and 3) business model for future evolution (economics and financial analysis, and cost/performance balance of the products in other countries, mainly EU countries).

c. Operation and maintenance support

Counterparts received technical supervision (SV) such as maintenance technique to be followed as per the levels of the technicians as well as a study tour in Japan. The operation and maintenance methods necessary for demonstrating sustainable and efficient energy use cycle were also supported.

d. Promoting activities

Considering the challenges for future business dissemination based on the feasibility analysis, the survey team reported the operation result and presented the advantages of the proposed equipment to the state government and the Central government in order to expand the future opportunities.

(3) Information on Product/ Technology to be Provided

1) Pelletizer

Characteristics	<ol style="list-style-type: none"> 1. This product is developed as a small-type machine, and it reduces operating costs by simplifying its maintenance. 2. Even the rollers are consumable supplies, and the roller shaft is also reusable.
Specifications	<ol style="list-style-type: none"> 1. Input : 31.45 kW (200 V) 2. Weight : 3 ton (Pellet granulating machine, raw materials supplying equipment, pellet storage tank, crushing machine, etc.) 3. Size : 2,665 mm (width) × 4,965 mm (depth) × 4,270 mm (height) 4. Raw materials fracturing ability : 300 kg/h 5. Pellet granulation ability : 200 kg/h 6. Pellet storage tank : 2 m³ 7. Accessories : Raw material supplying equipment, pellet conveyor, and crushing machine

2) Biomass boiler

Characteristics	<ol style="list-style-type: none"> 1. Since the non-pressure open-ended type is adopted, the boiler examination and other special qualification acquisition are not required.
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	<ol style="list-style-type: none"> 2. Fully-automatic combustion with each sensor can adjust to load changes. 3. Dust collection cyclone is installed at the exit of exhaust fumes to reduce the soot and dust concentration of exhaust fumes.
Specifications	<ol style="list-style-type: none"> 1. Output : 581.4 kW (500,000 kcal/h) 2. Fuel consumption : 149 kg/h 3. Input (Consumed power) : 6.6 kW (200 V) 4. Weight : 5,300 kg 5. Size : 2,450 mm (width) × 4,400 mm (depth) × 2,960 mm (height) 6. Boiler heating surface area : 41.6 m² 7. Amount of retained water : 2,200 l

(4) Counterpart Organizations

Direction for Territory Infrastructure Development (DRIT),
Kharkiv Regional Public Enterprise

(5) Target Area and Beneficiary

(Target area) Kharkiv state, Eastern Ukraine

(Beneficiary) Elementary school students in Kharkiv

(6) Duration

From November, 2013 to September, 2015

(7) Progress Schedule

Progress Schedule		2013			2014												2015									
Work item		10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	
Procurement	Conclusion of a contract																									
	On-site review· Sample acquisition		□ 11/1					4/15							10/15											
	Pelletizer																									
	Fragmentation test· Designing		1 month																							
	Manufacturing· Test					2 months																				
	Product inspection· Pre-shipment inspection						□																			
	Cross-checking before shipping						□																			
	Shipping														□ 2 months											
	Transportation																									
	Unpacking· Installation· Assembling· Adjustment· Commissioning																□									
	Primary stage operation coaching· Investment guidance																									
	Acceptance inspection																▼									
	Operation																									
	Hand-over																									4/15
	Boiler																									
	Designing· Manufacturing																									
	Product inspection· Pre-shipment inspection																									
	Cross-checking before shipping																									
	Shipping																									
	Transportation																									
	Unpacking· Installation· Assembling· Adjustment· Commissioning																									
	Primary stage operation coaching· Investment Guidance																									
	Acceptance inspection																									
	Operation																									
	Hand-over																									
	Field work	Pelletizer installation																								
		Boiler installation (Opening· Discharge, Closure)																								
Field work management	Total management																									
	Pelletizer																									
	Foundation construction																									
	Unpacking· Installation· Assembling· Adjustment																									
	Commissioning· SV coaching																									
	Acceptance inspection																									
	Boiler																									
	Foundation construction																									
	Unpacking· Installation· Assembling· Adjustment																									
	Commissioning· SV coaching																									
Acceptance inspection																										
Business activities	Conclusion of a contract with counterpart																									
	1 . Business environment study																									
	① Brief session of survey to local parties		○																							
	② Research for briquette quality		▮																							
	③ briquette raw procurement trend study		▮																							
	④ Macro trend (Policy· Energy price) Survey		▮																							
	⑤ Summarizing					▮																				
	2 . Feasibility analysis																									
	① Feasibility analysis of existing machines					▮																				
	② Feasibility analysis of existing machines (Summarizing)					▮																				
	③ Feasibility study of demonstration equipment																									
	④ Feasibility study of demonstration equipment (Summarizing)																									
	⑤ Studying of comparative advantage																									
	⑥ Topic management for promotion																									
	3 . Operation and maintenance support																									
	① Local technician hearing																									
	② Field technical supervision (SV) : Pelletizer																									
	② Field technical supervision (SV) : Boiler																									
	③ Training in Japan (Plant tour· Technical guidance@Kochi prefecture																									
	④ Regular meeting (Operational report· Audio conference)																									
4 . Promoting activity																										
① Reporting of validation result (DRIT Dergachi city)																										
② Project introduction (DRIT other cities· Investment authority· etc)																										
5 . Business trip (Japan-Ukraine)																										
6 . Reporting																										
		▼ Business plan			▼ Progress report									▼ Progress report							▼ Completion report(Draft)				▼ Completion report	

(8) Manning Schedule

Manning Schedule																						
Operation	Name	2013y			2014y						2015y											
		10	11	12	Winter (Boiler operation) period			Spring of a work			Winter (Boiler operation) period			1	2	3	4	5	6	7	8	9
Field management																						
Total management							4/15															
Installation· Commissioning· Technical guidance· Acceptance inspection	Sergey GNATYUK																					
Installation· Commissioning· Technical guidance· Acceptance inspection	Nagayuki KURITA																					
Installation· Commissioning· Technical guidance· Acceptance inspection	Hideki Kidani																					
Installation· Commissioning· Technical guidance· Acceptance inspection	Takefumi MAYUMI																					
Installation· Commissioning· Technical guidance· Acceptance inspection	Yuji NAKAGAWA																					
Installation· Commissioning· Technical guidance· Acceptance inspection	Akira FURUYA																					
Business activity																						
Conclusion of a contract with counterpart																						
1. Business environment study																						
①Brief session to local parties	Nagayuki KURITA																					
Same as above	Nobuya URYU																					
②Researching for briquette quality	Elena LYMAR																					
③Briquette raw procurement trend survey	Elena LYMAR																					
④Macro trend (Policy· Energy price) survey	Elena LYMAR																					
⑤Summerizing	Nagayuki KURITA																					
2. Feasibility analysis																						
①Feasibility analysis of existing machines	Oleg POKIDKO																					
②Feasibility analysis of existing machines (Summerizing)	Nagayuki KURITA																					
③Feasibility analysis of demonstration equipment	Sergey GNATYUK																					
④Feasibility analysis of demonstration equipment (Summerizing)	Kinuko KAKEGAWA																					
⑤Studying of comparative advantage	Kinuko KAKEGAWA																					
Same as above	Hideki Kidani																					
Same as above	Takefumi MAYUMI																					
⑥Topic management for promotion	Nobuya URYU																					
Same as above	Hideki Kidani																					
Same as above	Takefumi MAYUMI																					
3. Maintenance support																						
①Local technician hearing	Oleg POKIDKO																					
Same as above	Hideki Kidani																					
Same as above	Takefumi MAYUMI																					
②Field technical supervision (SV):Pelletizer	Rakhimov AZIZ																					
②Field technical supervision (SV): Pelletizer	Kinuko KAKEGAWA																					
②Field technical supervision (SV):Boiler	Nagayuki KURITA																					
③Training in Japan (Plant tour· Technical guidance@Kochi prefecture)	Kinuko KAKEGAWA																					
④Regular meeting (Investment report· Tel-conference)	Elena LYMAR																					
④Regular meeting (Investment report· Tel-conference)	Oleg POKIDKO																					
4. Promoting activity																						
①Reporting of validation result (DRIT Dergachi city)	Nagayuki KURITA																					
	Oleg POKIDKO																					
②Project introduction (DRIT other cities· Investment authority· etc)	Nagayuki KURITA																					
	Elena LYMAR																					
5. Business trip (Japan-Ukraine : Kiev· Kharikov) *Transfer Narita<->Kiev : 3 days· Kiev<->Kharikov : 1 day																						
-	Nagayuki KURITA																					
-	Nobuya URYU																					
-	Rakhimov AZIZ																					
-	Kinuko KAKEGAWA																					
-	Hideki Kidani																					
-	Yuji NAKAGAWA																					
-	Akira FURUYA																					
Business trip by Kiev staff	Oleg POKIDKO																					
Business trip by Kiev staff	Elena LYMAR																					
Business trip by Kiev staff	Sergey GNATYUK																					
6. Interpretation in Ukraine *Suit to length of stay																						
-	-																					
7. Car expense in Ukraine																						
-	-																					

--- as planned
 Activities in Ukraine
 Activities in Japan

(9) Implementation Structure

Asuka Green Investment Co., Ltd. coordinated with stakeholders such as the local counterpart and the Japanese manufacturers to share the responsibility for equipment installation operation and reporting.

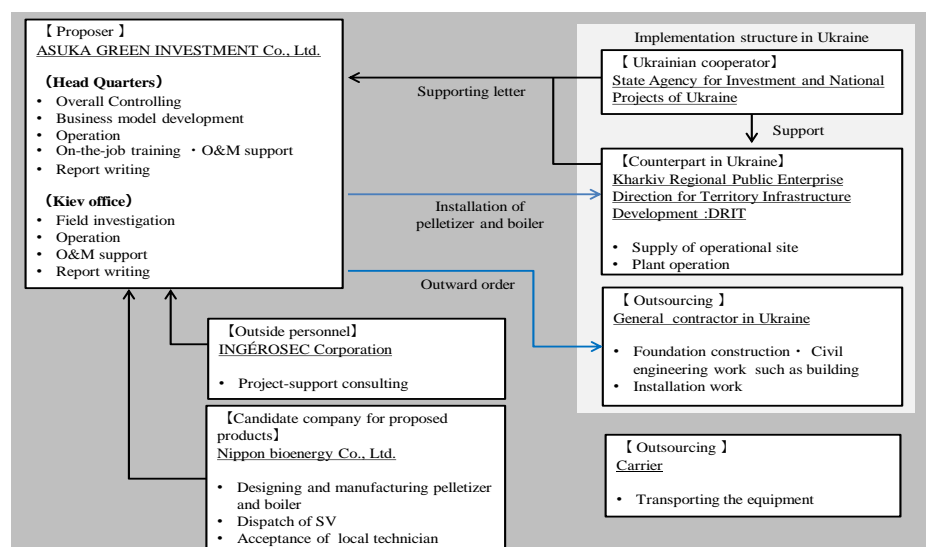
Smooth communication with all Ukrainian parties was the most important issue for implementing the survey. Asuka Green Investment Co., Ltd. has an office in Kiev, Ukraine to work on projects in the Commonwealth of Independent States (CIS) regions. All the three full-time employees in the Kiev office were engaged in global warming issues, including renewable energy projects inside and outside of Japan, for about 2 to 10 years. These employees have reported technical findings related to improvement in energy devices and have gained experiences of collaboration with business operators. Therefore, the company could communicate effectively and establish a good relationship with all stakeholders.

INGÉROSEC Corporation, which has gained experiences in Official Development Assistance projects, also provided their insight into this survey.

Nihon Bioenergy Co., Ltd. has the largest market share in pelletizers and pellet boilers in Japan.

The counterpart, DRIT, suggested the operation site and supported the implementation of this survey. The State Agency for Investment and National Projects of Ukraine presented a supporting letter and fully cooperated with this survey.

JICA was responsible for observing the progress of the activities and then make effective and timely responses to each party.



3 ACHIEVEMENT OF THE SURVEY

(1) Outcomes of the Survey

The pelletizer was set up at the designated site in November, 2014, and it started producing pellets from January, 2015 onwards. The biomass boiler, installed in February, 2015, supplied the heat energy to the community.

The below tables show the actual performances of the natural gas boiler in January, 2015 and the biomass boiler in March, 2015. This data was collected from DRIT and other organizations.

Equipment	Income		Operational cost	
	Annual gross income (179 days per year)	Per Gcal	Annual gross income (179 days per year)	Per Gcal
Natural Gas Boiler	① 8,148,706 JPY (1,459,970 UAH)	9,420 JPY	② Fee for fuel gas 9,407,038 JPY (1,685,429 UAH)	10,875 JPY
			③ Operation fee Labor 652,320 JPY Electricity 201,747 JPY Maintenance 720,000 JPY Subtotal 1,574,067 JPY	1,820 JPY

Equipment	Income		Operational cost	
	Annual gross income (179 days per year)	Per Gcal	Annual gross income (179 days per year)	Per Gcal
			Total 10,981,105 JPY	12,695 JPY
Annual projection of Balance of Payments of Natural Gas Boiler (①-②-③)			Profit ▲2,832,399 JPY	▲3,274 JPY

Biomass Boiler	① 6,594,910 JPY (1,224,245 UAH)	12,690 JPY	② Fee for Pellet 3,586,163 JPY	6,900 JPY
			③ Operation fee	3,103 JPY
			Labor 652,320 JPY	
			Electricity 240,348 JPY	
			Maintenance 720,000 JPY	
			Subtotal 1,612,668 JPY	
			Total 5,198,831 JPY	10,003 JPY
Annual projection of Balance of Payments of Biomass Boiler(①-②-③)			Profit 1,396,079 JPY	2,686 JPY

The tables are summarized as follows. We have assumed that the annual profit projection of the natural gas boiler is approx. 2,832,399 JPY (approx. 23,330 USD) in deficit. It may get worse due to the exchange loss and prolongation of souring of relations with Russia. On the other hand, the biomass boiler is approx. 1,396,079 JPY (approx. 11,670 USD) in surplus. Therefore, the potency of the fuel shift from the natural gas boiler into the biomass boiler includes stabilization of the fuel supply and cost saving of approx. 33,330 USD per year.

a. Business environment study

We investigated and studied the local business environment such as the local conditions of supply and demand of the energy, the property of briquette, production volume, local technical level, and competitiveness of the products to be provided.

b. Feasibility analysis

After the installation of pelletizer and biomass boiler, the operational and

maintenance manner, comparative superiority based on other energies (natural gas, coal, etc.), examination of business model for the future, and extraction of any issues on product dissemination were confirmed.

c. Operation and maintenance support

SV works were provided to the counterpart organizations along with a training course in Japan. In addition, the means of operation and maintenance support was established.

d. Promoting activities

Considering the agendas of dissemination, the results were reported and the product superiority was also shared with the concerned parties (i.e. the state government and the Central government) for the sake of expansion opportunities of product dissemination.

④ Self-reliant and Continual Activities to be Conducted by Counterpart Organization

Firstly, with an emphasis on not having experiences in using the supplied machines, the manuals in the Russian language were distributed within DRIT in order for them to introduce voluntary inspection.

Since DRIT installed the pelletizer in the existing briquette factory and the biomass boiler in the existing boiler house, the workers could operate and control the existing machine and the new one in parallel. In addition, training of operation and control were provided to respective administrators, who in turn provided operation and control training to each worker. As a result, no incident or problem occurred while using the machines during the demonstration period. This helped DRIT to perform self-reliant and continual activities after the survey period.

3) FUTURE PROSPECTS

(1) Impact and Effect on the Concerned Development Issues through Business Development of the Product/ Technology in the Surveyed Country

Through the business development, we can assume that the efficient use of biomass resources would take the lead in various measures since the risk of energy supplement is obvious due to the current political conditions in Ukraine. In addition, the dissemination of renewable energy should be enhanced.

We can also assume that the development in handling the pelletized fuels will lead to the dissemination of the biomass resources that will provide an economic benefit for those who produce the pellet. This can help Ukraine to establish itself as the market leader in Europe. We believe it also works for heat supply independent of natural gas, and the agricultural residues can be used efficiently if the machines can be disseminated.

We observed that the biomass boiler was less competitive because of its high price. This can be solved by following a few steps. First, the boilers belonging to DRIT should be replaced with new ones in collaboration with DRIT and other Japanese companies so that they can locally produce the machines. This can make the biomass boiler more price competitive in the market. In addition, the Japanese and Ukrainian companies, besides DRIT and Ukrainian domestic market, can jointly start exporting the boilers to the neighboring countries on a commercial basis. It would also be helpful to collaborate with a local manufacturer to produce the required machines locally by providing them with our technical know-how.

(2) Lessons Learned and Recommendations

A simplified method should be developed for customs procedures for importing into Ukraine as too much time and money are consumed even in starting operations in the Ukrainian market. For example, sometimes exporters are required to pay the prohibitive price as duty, which could be beyond our limits.

Secondly, an appropriate business environment should be secured. If the business environment gets worse, it leads to a decrease in people's motivation to invest. Therefore, it is more than important to provide heat suppliers with the appropriate environment to offer new commodities and services.

Project for Dissemination and Demonstration of Biomass Pelletizer and Boiler in Ukraine

Company and site information

- Proposer: Asuka Green Investment Co., Ltd.
- Proposer's location: Chiyoda-ku, Tokyo
- Site Location: Kharkiv region, Ukraine
- Implementing agency in Ukraine: Heat supply public corporation in Kharkiv (Direction for Territory Infrastructure Development Kharkiv Regional Public Enterprise)
- Project execution period: From Nov., 2013 to Sep., 2015



➤ **Switch to renewable energy**

Since supply and prices of gases depend on political relations with Russia, Ukraine promotes policy to shift over into renewable energy to obtain fuels with lower price.

➤ **Efficiency improvement of biomass energy usage**

Briquette made by agricultural residues is manufactured, but energy efficiency remains low due to old style boiler and it co-combusts low-grade coal and wood.

➤ **Biomass pellet (fuel from agricultural residues) manufacturing equipment**

By simplifying operation and maintenance, no- specific technique is needed and it leads to low running cost of pellet manufacturing.

➤ **Biomass pellet (fuel from agricultural residues) boiler**

Because open pressured type that is easy to be checked and treated is adopted, problems such as corrosion caused by quality of water no longer exist. The unique structure bring pellet burning to high efficiency and clean.

Contents of disseminate and realize project (JICA project)

- By using pellet manufacturing equipment and biomass boiler as previously described, verification activity is conducted to establish efficient and sustainable use of biomass energy and its cycle as follows.
Unused biomass resources • Existed briquette → Pellet manufacture → heat supply with using the pellet
- Dissemination activities are conducted to make the announcement to counterpart, other cities and relevant ministries.



Biomass pellet boiler

The result of disseminate and realize project

Both pellet manufacturing equipment and biomass boiler were procured and made shipment. After arriving, SV (installation, commissioning and running confirmation) was done.

Developing a business

- (Short-term) Popularization and expansion of the equipment.
- (Long-term) Promote business cooperation with local firm and local-produced business with Japanese manufacturer to produce equipment on site.

Impact on development issues

Expand the use of renewable energy with domestic energy to deal with supply risks.