

Field test of heat-fed washing machines and laundry dryers

By Frank Zegers, Utrecht/the Netherlands, and Hans Hof, Arnhem/the Netherlands *)

Zusammenfassung des Berichts

Feldtest von mit Wärme versorgten Waschmaschinen und Trocknern

Um den Anwendungsbereich der Fernwärme zu vergrößern, wurden Waschmaschinen und Wäschetrockner entwickelt, deren Wärmebedarf nicht mit Strom sondern mit Fernwärme bereitgestellt werden kann. Nachdem Prototypen dieser Geräte entwickelt worden sind, haben 7 niederländische Energieversorgungsunternehmen einen Feldtest begonnen, bei dem die technische Betriebsweise dieser Geräte in der Praxis erprobt und die Anwendungsmöglichkeiten dieser Geräte abgeschätzt werden soll.

Der Feldtest soll nachweisen, daß

- die fernwärmeversorgten Geräte in gleicher Weise betrieben werden können wie herkömmliche Geräte,
- die Benutzerfreundlichkeit nicht eingeschränkt wird,
- die berechnete Energieeinsparung erreicht wird,
- eine für das Fernwärmenetz entsprechende Auskühlung des Fernwärmewassers erreicht werden kann und
- der Wärmeverlust zwischen Verteilsystem/Hausanlage und den Geräten akzeptabel werden kann.

0 General

Washing machines and laundry dryers supplied with heat from a district heating system are being developed as part of a wider drive to develop new heat applications and to save energy. At a preliminary stage, prototypes were developed of a washing machine and a laundry dryer which are identical in terms of quality to their electric counterparts. The object of the field test is to determine the technical

performance of a trial series in practical situations, and to establish user appreciation of the appliances in question. 7 energy distribution companies have ordered a total of 13 sets (washing machine and laundry dryer) and are responsible for the acquisition of households in the area to be covered. Once satisfactory ways have been found of connecting the appliances in the various situations, they will be converted and installed at the 13 households by a national installation contractor. During the field test, the technical performance of the appliances will be monitored technically, while user appreciation will be monitored by means of surveys conducted by a market research agency. Reference measurements will be carried out on conventional machines so that primary energy savings can be determined in relation to conventional appliances.

1 Heat-fed washing machines and laundry dryers

Washing machines and laundry dryers supplied with heat from a district heating system (DH) are being developed as part of a wider drive to create new heat applications. On the one hand, this will lead to an increased heat demand from district heating systems, thereby improving operating results, while on the other hand, savings can be made on primary energy. A »win-win« situation may evolve for energy distribution company, customer and the environment alike. Application of heat-fed washing machines and laundry dryers makes it possible to not only utilize heat from a heat supply network, but also heat from other sources, such as central heating systems (CH), heat pumps, solar domestic hot water systems, etc. The project is therefore of interest to gas and electricity companies as well as to heat distribution companies.

At a preliminary stage, prototypes were made of a heat-fed washing machine and laundry dryer. These prototypes are appliances equivalent in quality to the electric versions [1;2;3].

The object of the field test is to obtain information on the practical performance of the heat-fed washing machines and laundry dryers. This article will discuss the field test in terms of object, parties involved (table 1), and structure and planning.

2 The object of the field test

The field test is to demonstrate that:

- the heat-fed washing machines and dryers function just as well in practice as standard appliances,
- they are as convenient as standard equivalents,
- calculated energy saving is achieved,
- required degree of cooling is accomplished with regard to the heat supply network,
- heat loss between distribution cabinet/CH system and the appliances is acceptably low.

EnergieNed is the principal of the project co-ordinator and Ecofys is the principal of the parties implementing the project (figure 1).

3 Project set-up

3.1 Construction of heat-fed washing machines and laundry dryers

The project involves the conversion of existing appliances. 14 sets will be converted, 13 of which will be allocated to households and one will serve as a reserve set. In the event of any faults, the reserve set can be used for quick replacement of the defective appliance. The energy distribution companies involved will be asked to work out satisfactory ways of connecting the appliances in the various situations (district heating networks, central heating systems).

The development of connection solutions and the construction/conversion of the washing machines and laundry dryers will be the responsibility of Van Holsteijn & Kemna engineering consultants, who developed the prototypes at the preliminary stage. The energy distribution companies concerned will bear the immediate construction/conversion costs.

Table 1. Involved companies

Tafel 1. Beteiligte Unternehmen

Financing:	
• EnergieNed, Novato, Gasunie	
• other energy distribution companies	
• E.ON Energy, ENW, Gasunie, NEM, PNM, Rijn	
Project co-ordinator:	
Ecofys energy and environment	
Project implementation:	
• design/manufacture	Van Holsteijn & Kemna
• installation contractor	Gasunie
• technical measurement	Gasunie, PNM, Rijn
• user evaluation	ENW
• reference measurements	ENW, PNM

*) F. Zegers, is senior consultant at Ecofys energy and environment, Utrecht/the Netherlands and H. Hof is staff official at EnergieNed, Arnhem/the Netherlands.

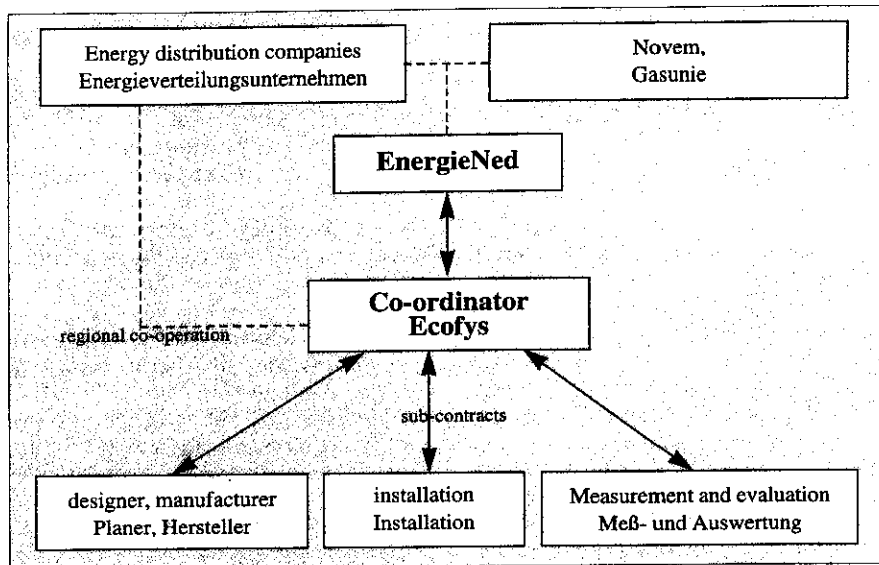


Figure 1. Communication line between the involved companies

Bild 1. Koordinationsschema der beteiligten Unternehmen

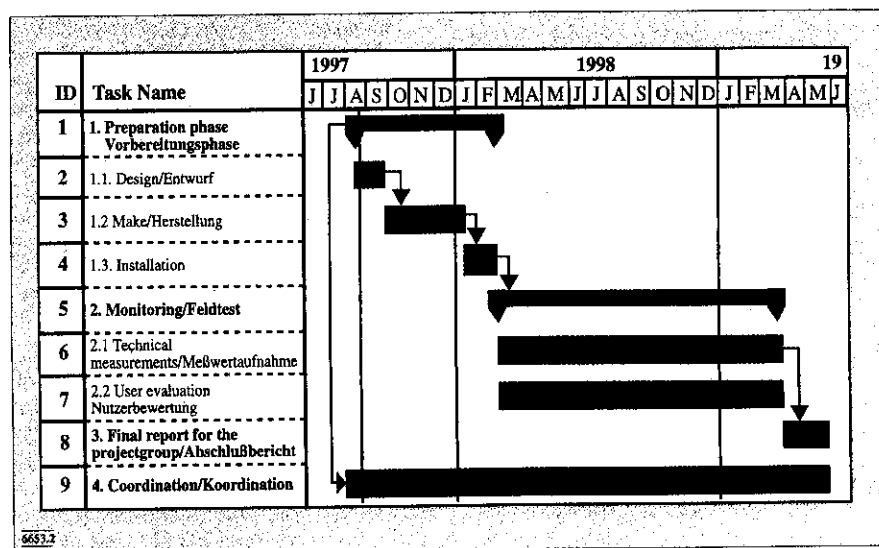


Figure 2. Timetable of the field-test

Bild 2. Zeitplan des Feldversuches

3.2 Installation of heat-fed washing machines and laundry dryers

A national installation contractor will install the appliances at all the households in question on the basis of the connection methods developed.

3.3 Technical monitoring

In consultation with the project co-ordinator and appliance constructor, the engineer responsible for the measurements will equip the appliances with monitoring devices which will record technical performance in practice in such a way that the technical questions formu-

lated in the field test object can be answered afterwards. The measurement engineer will provide and install this equipment, and will be responsible for proper measurement for a period of thirteen months (including one trial month). The engineer will furthermore submit (processed) measurement data to the project co-ordinator after one month and then every two months, and will produce a final report.

3.4 User evaluation

A user evaluation will be carried out to afford insight into non-technical aspects. The aim of this evaluation will be to record the level of acceptance and appre-

ciation among the households concerned. Such aspects include perception of convenience, washing and drying performance, and nuisance due to faults, leakage and/or noise. In addition, the user evaluation will serve to support technical monitoring. For instance, the users may be asked to keep a log with regard to their washing and drying behaviour.

3.5 Reference measurements

During the field test, the practical performance of the heat-fed washing machines and laundry dryers will be established. To be able to interpret the measurement results properly, a comparison will be made with reference quantities for conventional machines calculated for each household. To be able to make such calculations, measurements will be made in the laboratory on conventional appliances of the same type.

3.6 Project co-ordination and assessment

Ecofys is responsible for overall co-ordination, for contracting and supervising subcontractors (the manufacturers of the appliances, the measurement engineer, the agency that carries out the user evaluation, the installation contractor), as well as for analysis, assessment and reporting. Central consultation between the project co-ordinator, the energy distribution companies concerned and the financing parties will take place via EnergieNed by means of project group meetings.

4 Timetable

The timetable of the project is shown in figure 2.

5 Literature

- [1] District heating »kitchen«. Technical and economic feasibility study, Van Holsteijn & Kemna, phases 1 and 2, Delft (1994).
- [2] District heating »kitchen«. Technical feasibility study phase 3a: measurement reports on washing machine Miele W957 and laundry dryer Miele T557C, Van Holsteijn & Kemna, Delft (1996).
- [3] DH heat exchanger for the washing machine and the condensing laundry dryer. Phase 3b »Test and optimization«, Van Holsteijn & Kemna, Delft (1996).

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