

"The submitted manuscript has been authored by a contractor of the U.S. Government under contract No. DE-AC05-96OR22464. Accordingly, the U.S. Government retains a nonexclusive, royalty-free license to publish or reproduce the published form of the contribution, or allow others to do so, for U.S. Government purposes."

CONF-960275 -- 1

FEEDBACK FROM USERS OF ENERGY EFFICIENCY INFORMATION ON THE INTERNET: ANALYSIS OF THE U.S. CADDET HOME PAGE

by Marilyn A. Brown and Melissa K. Voss
Oak Ridge National Laboratory*

SUMMARY

This paper describes the U.S. experience to date with providing energy efficiency information from the Center for the Analysis and Dissemination of Demonstrated Energy Technologies (CADDET) on the Internet. The paper begins by describing the way that information is displayed in the U.S. CADDET home page system. Statistics are then provided on numbers and types of users of the home page. Next we describe the frequency with which different types of CADDET information have been accessed and summarize the feedback provided by users. Drawing on this experience with the U.S. CADDET home page system, the authors conclude that energy efficiency information systems on the World Wide Web can contribute significantly to the goals of CADDET and other information outreach programs. However, to reach a wider range of audiences, Internet systems need to be supplemented by other dissemination efforts aimed at reaching individuals in countries and organizations that are not currently using Internet services. In addition, more personal and customized information sources are needed to provide users with the types of assistance and guidance that may be required to translate knowledge of a technology's technical and financial performance, into a decision to adopt the technology.

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

MASTER

FEEDBACK FROM USERS OF ENERGY EFFICIENCY INFORMATION ON THE INTERNET: ANALYSIS OF THE U.S. CADDET HOME PAGE

by Marilyn A. Brown and Melissa K. Voss

The use of inter-networked computers offers organizations the ability to reach potentially vast audiences with minimal effort, by taking advantage of the huge investments being made in electronic communications infrastructure worldwide. While on-line communications represents only a small fraction of today's domestic and international communications, they are expanding at an unprecedented pace and are transforming domestic and global information flows.

Many businesses and consumers are taking advantage of this communication potential by connecting to the Internet—a system by which computers can communicate with one another using commonly accepted protocols. According to a Nielsen Media Research (1995) survey, approximately 24 million people in the U.S. and Canada (or almost 11% of the 16-and-older population in North America) are Internet users. Every month, tens of thousands of businesses and households buy direct Internet connections or purchase subscriptions to on-line information and communication services. It has been estimated that by the year 2000 there will be 180 million Internet users worldwide (Verity and Hof, 1994).

Organizations place information on the Internet by creating home pages on the World Wide Web—a system that uses graphical interfaces to simplify the tasks of searching for and retrieving information. This paper describes the U.S. experience to date with the Internet home page for the Center for the Analysis and Dissemination of Demonstrated Energy Technologies (CADDET).

The paper begins by describing CADDET and the U.S. CADDET home page system. Statistics are then provided on users of the home page, including the number of times the home page has been accessed each month since its inception, and the types of users of the information—by country of origin and organizational affiliation. Next we describe the frequency with which different types of CADDET information have been accessed and the feedback provided by users who completed "electronic coupons." The paper ends with a discussion of its findings.

BACKGROUND ON CADDET

The Center for the Analysis and Dissemination of Demonstrated Energy Technologies was formed by the International Energy Agency in 1988 to collect and disseminate information on demonstration projects that have produced data on the successful economic and technical performance of energy-efficient end-use technologies. The

Center recognizes that the tangible evidence of technical and economic viability produced by demonstration projects can effectively accelerate the replication of successful technologies.

In 1993 CADDET was expanded and now has two branches—CADDET Energy Efficiency and CADDET Renewable Energy. In the United States, involvement with the CADDET Energy Efficiency Annex is coordinated by Oak Ridge National Laboratory for U.S. Department of Energy (DOE). The National Renewable Energy Laboratory provides technical support for U.S. involvement in the CADDET Renewable Energy Annex.

At the heart of the CADDET operation is a computerized Register of information on more than 1,600 energy technology demonstration projects. Each of the 15 countries that belong to CADDET have contributed Register entries describing demonstrations in their countries. A majority of these entries focus on technologies for increasing the efficiency of energy use in buildings and industrial processes. Agriculture, transportation, utilities, and other end uses are also represented, but to a lesser degree. A total of 358 entries describe U.S. demonstration projects.

CADDET also produces technical brochures, which provide expanded information on key technologies represented in the CADDET Register. Each brochure describes the technology being demonstrated, the setting, the cost of the project and the energy saved, other findings concerning the operation of the technology, and individuals who can be contacted for further information. The most in-depth of the CADDET products are the Analysis Reports. These reports use experts from all CADDET member countries to compare the technical and economic results of selected demonstration projects on a particular technology. Sixteen analysis reports have been produced to date. Finally, CADDET also produces quarterly Newsletters, which are currently distributed to over 10,000 subscribers world-wide. Each issue focuses on a specific technical topic and features international articles, news items, abstracts of recent publications, and meeting notices.

CADDET INFORMATION ON THE INTERNET

A range of traditional promotional techniques are employed by the DOE, ORNL, and the U.S. CADDET National Team to make potential audiences aware of the energy efficiency information available from CADDET. In addition, in November of 1994, the United States became the first CADDET member country to make CADDET information available on the Internet. The address for the the U.S. CADDET-energy efficiency home page is:

[HTTP://www.ornl.gov/CADDET/caddet.html](http://www.ornl.gov/CADDET/caddet.html)

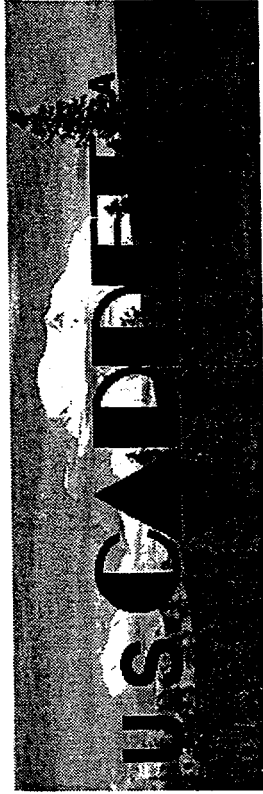
The U.S. CADDET home page (Figure 1) allows users to view all of their options before beginning a customized search. In particular, links to five additional pages are listed and described.

- By selecting the first page, "About CADDET," users are provided background information on CADDET, including an overview of the Center's goals, information products, and organizational structure (Figure 2).
- The second page introduces users to the CADDET database of information on demonstration projects (Figure 3). From there, the user can elect to conduct a query of the 358 entries that describe the technical and economic performance of energy efficiency technologies demonstrated in the U.S. For instance, a search for the term "motor" in the abstract of the U.S. entries identified 14 projects (Figure 4). From that point, the user could access the abstract and full documentation for each of these 14 entries.
- The third page provides an overview of CADDET brochures, including an explanation of the distinction between "CADDET demonstration brochures" and "CADDET results brochures" (Figure 5). A listing of all of these brochures can then be provided by clicking on either type of brochure (see Figure 6 for an example). At this time, users must contact ORNL to obtain copies of the individual brochures. (All of the brochures are available free-of-charge to U.S. users, but only the U.S. brochures are available for free to international users). The U.S. intends to place the text of all of its future brochures onto the Internet.
- CADDET analysis reports are the subject of the fourth page. Here, the user can obtain a list of the 16 analysis reports that have been published to date (Figure 7), along with information about how to purchase them. In addition, a short abstract of each report can be accessed, such as the summary of "Industrial Drying Technologies," which is shown in Figure 8.
- Finally, the user may elect to complete a CADDET End-user Form (Figures 9 and 10). This form, also called an "electronic coupon" asks users to provide feedback about CADDET information and offers them a chance to request additional information.

The pages shown in Figures 5 through 8 were added to the CADDET home page system on December 15. Thus, the usage figures for these pages presented below are based only on a half-month period of Internet accessibility.

Fig. 1

Welcome to



Center for the Analysis and Dissemination of Demonstrated Energy Technologies (CADDET)

CADDET is an International Energy Agency program responsible for collecting and disseminating information on demonstrated, energy-efficient and renewable energy technologies. The program focuses on demonstration projects on full-scale applications of new technologies. By utilizing information from this international information network, you can find out what energy-efficient and renewable energy technologies have worked in other countries and how you can benefit from their application. You can also submit projects on demonstrated energy-saving technologies to be reviewed as potential CADDET products.

There are two branches of CADDET: CADDET Energy Efficiency and CADDET Renewable Energy. Oak Ridge National Laboratory is the U.S. Support Office of CADDET Energy Efficiency and the National Renewable Energy Laboratory is the U.S. Support Office of CADDET Renewable Energy. There are currently 15 member countries participating in CADDET Energy Efficiency and 12 member countries participating in CADDET Renewable Energy. U.S. participation in CADDET is sponsored by the Department of Energy, Office of Technical and Financial Assistance.

About CADDET

The CADDET Database, The Register

The CADDET Brochure

The CADDET Analysis Reports

The CADDET End-user Form

Please send comments or inquiries about this information server to the E-mail address below. An E-mail form is also provided for your convenience. If sending comments about this document, please include title, URL, or other document descriptor.

info_servers@ornl.gov

Date posted 11/28/94 (jag)

Fig. 2

About CADDET

CADDET's objective is to broaden and improve the exchange of information on energy-saving technologies that have been demonstrated in applications in industry, buildings, transportation, utilities, and agriculture.

CADDET was founded in 1988, as a program focused on energy-efficient technologies. In 1993, CADDET expanded into two branches: CADDET Energy Efficiency and CADDET Renewable Energy. CADDET Energy Efficiency is based in The Netherlands and now has fifteen member countries: Australia, Belgium, Canada, Denmark, Finland, Italy, Japan, The Netherlands, New Zealand, Norway, The Republic of Korea, Sweden, Switzerland, the United Kingdom, and the United States. CADDET Renewable Energy is based in the United Kingdom and now has twelve member countries: Australia, Denmark, Finland, Japan, The Republic of Korea, The Netherlands, New Zealand, Norway, Sweden, Switzerland, the United Kingdom, and the United States.

Each CADDET member country contributes information on demonstrated energy-efficient and/or renewable energy technologies. Each CADDET Center then disseminates the results of these demonstrations back to the member countries via these products: brochures on individual projects, a quarterly newsletter, analysis reports, and a computer-based register of demonstration projects.

The U.S. Support Office for CADDET Energy Efficiency is Oak Ridge National Laboratory. The U.S. Support Office for CADDET Renewable Energy is the National Renewable Energy Laboratory. U.S. participation in CADDET is sponsored by the Department of Energy, Office of Technical and Financial Assistance.

Each CADDET member country has established a National Team. The U.S. National Teams for Energy Efficiency and Renewable Energy are comprised of representatives from technical and professional organizations, private industry, utilities, and local, state, and federal agencies. The U.S. Support Offices collaborate with the U.S. National Teams to facilitate marketing CADDET products and to gather information and leads on outstanding demonstrated energy technology projects. The U.S. Support Offices also respond to a continuum of requests for information regarding CADDET.

If you would like information sent to you on how to obtain CADDET products or how to submit project information for review as a potential CADDET product, please complete the CADDET End-user Form.

Please send comments or inquiries about this information server to the E-mail address below. An E-mail form is also provided for your convenience. If sending comments about this document, please include title, URL, or other document descriptor.

info_servers@ornl.gov

Date posted 11/28/94 (jag)

Fig. 3

CADDET (see description below)

Complete text search terms:

Fielded search terms

title:

abstract:

project:

brochure:

Description:

The CADDET Database, The Register

The CADDET Register is a user-friendly database of demonstration projects on energy-efficient and renewable energy technologies. The full Register contains almost 1700 records contributed by CADDET member countries. This partial listing contains the 358 U.S. contributed records to the Register. The Register is one of several CADDET products with an ultimate goal of increased replication of successful energy-efficient and renewable energy projects.

If you are interested in purchasing the entire database, please complete the [CADDET End-user Form](#).

The WAIS database on this server contains the following fields:

Title - Project title
Project - Project number
Brochure - CADDET brochure number
Abstract - Abstract of project

You may either search on any combination of the fields listed above, or perform a complete text search on the full text of the documents. If you need help in using this database, a tutorial on [Performing WAIS Searches](#) is available.

Please send comments or inquiries about this index to [CADDET End-user Form](#)

Fig. 4

Results from running query with: motor

To include the text of one of the following documents in another search, check the appropriate box(es) and then submit another query using the form at the bottom of this page.

- ☐ [Swine farm digester generates bio-gas to run a motor generator set \(HTML\) Score: 1000, Bytes: 1948](#)
- ☐ [Food processing company uses adjustable speed drives to control motor speed of blenders \(HTML\) Score: 848, Bytes: 4745](#)
- ☐ [Electric Induction Heating of Thermoset Adhesives in motor industry \(HTML\) Score: 744, Bytes: 4839](#)
- ☐ [Stirling engine goes commercial for mobile home auxiliary power \(HTML\) Score: 431, Bytes: 2337](#)
- ☐ [Energy analysis and implemented measures result in energy savings \(HTML\) Score: 413, Bytes: 8825](#)
- ☐ [Variable frequency adjustable speed drives control induced-draft fans in pulp and paper processes \(HTML\) Score: 379, Bytes: 4628](#)
- ☐ [Gas-fired rethermalising oven used for institutional and commercial high-volume food preparation \(HTML\) Score: 370, Bytes: 5153](#)
- ☐ [Capacity optimisation of HVAC system hydraulic flows in municipal buildings \(HTML\) Score: 369, Bytes: 5450](#)
- ☐ [Energy efficiency in Cold-Mixing \(HTML\) Score: 366, Bytes: 6164](#)
- ☐ [Office energy conservation project retrofit includes improved lighting and load management \(HTML\) Score: 361, Bytes: 5798](#)
- ☐ [Project ROSE Educates Public About Used Oil Collection and Recycling \(HTML\) Score: 359, Bytes: 6997](#)
- ☐ [New Rooftop Handling Units and a Two-Stage Air Filtration System Saves Energy in buildings \(HTML\) Score: 356, Bytes: 6467](#)
- ☐ [Georgia Dry Hydrant Program Improves Vehicle Energy Performance on Rural Roads \(HTML\) Score: 355, Bytes: 7344](#)
- ☐ [Agricultural Energy Conservation Through Conservation Tillage, Irrigation Management and Ecofallow \(HTML\) Score: 355, Bytes: 7721](#)
- ☐ [The SNOMAX\(R\) Enhanced Natural Thermal Storage \(SENTS\) Ice-Pond System \(HTML\) Score: 346, Bytes: 8008](#)
- ☐ [Query Report for this Search \(TEXT\) Score: 1, Bytes: 874](#)

CADDET

Fig. 5

CADDET BROCHURES

OCTOBER 1995

CADDET brochures present the results of demonstrations of selected energy technologies to highlight significant technological advances. Many of the brochures describe award-winning and highly cost-effective technologies.

Designed to assist end-users, each brochure gives a comprehensive description of the project illustrated with photographs and diagrams. The aims and background to the project are given with a description of the technology, how it is applied and a full breakdown of costs and savings. A concise summary and contacts for more information are also included.

More than 200 brochures are available to date, and approximately 40 of these describe U.S. technologies. U.S. National Team members recommend topics and provide supporting information for the preparation of these brochures. Brochures come in two different formats. Demonstration brochures contain preliminary results of a technology and therefore will not contain complete technical and economic performance values. Results brochures contain a full range of information on a technology. A listing of the brochure number, the country of origin, and the title of the brochure for CADDET Demonstration Brochures and CADDET Results Brochures is available.

Complimentary copies available from:

Melissa Voss, Energy Division
Oak Ridge National Laboratory
P.O. Box 2008
Oak Ridge, TN 37831-6070
Telephone: 423-574-1013
Fax: 423-574-9331
E-mail: vossmik@ornl.gov

Return to the [CADDET Home Page](#)

Fig. 6

CADDET Results Brochures

- Result 1 *NETHERLANDS*
Mechanical Vapour Recompression in an Evaporative Unit
- Result 2 *UNITED KINGDOM*
Heat Recovery in a Bakery
- Result 3 *NETHERLANDS*
Climate Control in a Cheese Warehouse
- Result 4 *UNITED STATES*
Energy Management Program at the World Bank
- Result 5 *NETHERLANDS*
Ventilation Heat Recovery in Social Housing
- Result 6 *UNITED STATES*
Energy Management at the Dubai/Beck Office Building
- Result 7 *NETHERLANDS*
Heat Recovery at a Flower Bulb Processing Plant
- Result 8 *UNITED STATES*
Ceramic Recuperator Recovers Heat from Exhaust Gas
- Result 9 *FINLAND*
High Speed Technology Provides Oil Free Compressors
- Result 10 *ACROMAT*
Reducing Whisky using Mechanical Vapour Recompression
- Result 11 *SWEDEN*
Sewage Water as a Heat Source for a District Heating System
- Result 12 *SWEDEN*
Energy Consumption can be Halved in Commercial Property
- Result 13 *SWEDEN*
Flue Gas Cleaning and Production of Electric Power and Heat
- Result 14 *DENMARK*
Energy Utilization in Waste Water Treatment Plants
- Result 15 *DENMARK*
Additional External Insulation of Apartment Blocks
- Result 16 *SWEDEN*
Heat Pump using Sewage Water as a Heat Source
- Result 17 *SWEDEN*
Saving of Energy in Factories for Potcelain
- Result 18 *DENMARK*
Wood Chip and Bark Fueled District Heating Plant
- Result 19 *SWEDEN*
LEB (Isac) System for Heating, Ventilation, and Air Conditioning
- Result 20 *SWEDEN*
Drying Paper with Infrared Radiation
- Result 21 *UNITED STATES*
Federal Methanol Fleet
- Result 22 *UNITED STATES*
Induction Heating and Melting
- Result 23 *UNITED STATES*
Foam Processing
- Result 24 *NETHERLANDS*
Space Heating with Cogeneration of Five Apartment Blocks
- Result 25 *ACROMAT*
Electricity Production by Heat Recovery at a Ferroalloy Plant
- Result 26 *DENMARK*
Considerable Savings in Electricity for Fluorescent Tubes
- Result 27 *NETHERLANDS*
Heat Recovery in the Chemical Industry
- Result 28 *SWITZERLAND*
Heat Recovery from Vapours

CADDET ANALYSIS REPORTS

GAADDET Analysis Reports provide in-depth assessments of selected energy-saving technologies. Using examples of successful, demonstrated energy-saving projects from around the world, the reports enable the reader to benefit quickly from the many lessons learned. The goal is to foster well informed decision making and increased implementation of energy-saving projects.

The Analysis Reports are structured to be read by both general management and technical experts. An executive summary outlines the main conclusions of the analysis. The technical report provides an explanation of the principles underlying the subject together with an in-depth appraisal of the selected demonstration technique. Finally, full background information is listed for each project.

Sixteen Analysis Reports have been published to date. Five of these are available from the American Council for an Effective Economy (ACEE).

- Small-scale Cogeneration**
Energy Efficient Lighting in Commercial Buildings
Energy Efficient Windows in Commercial Buildings
Energy Efficient Heating in Commercial Buildings
Industrial Drying Technologies

63-68-63-72-73-74-75-76-77-78-79-80-81-82-83-84-85-86-87-88-89-90-91-92-93-94-95-96-97-98-99-100-101-102-103-104-105-106-107-108-109-110-111-112-113-114-115-116-117-118-119-120-121-122-123-124-125-126-127-128-129-130-131-132-133-134-135-136-137-138-139-140-141-142-143-144-145-146-147-148-149-150-151-152-153-154-155-156-157-158-159-160-161-162-163-164-165-166-167-168-169-170-171-172-173-174-175-176-177-178-179-180-181-182-183-184-185-186-187-188-189-190-191-192-193-194-195-196-197-198-199-200-201-202-203-204-205-206-207-208-209-210-211-212-213-214-215-216-217-218-219-220-221-222-223-224-225-226-227-228-229-230-231-232-233-234-235-236-237-238-239-240-241-242-243-244-245-246-247-248-249-250-251-252-253-254-255-256-257-258-259-260-261-262-263-264-265-266-267-268-269-270-271-272-273-274-275-276-277-278-279-280-281-282-283-284-285-286-287-288-289-290-291-292-293-294-295-296-297-298-299-300-301-302-303-304-305-306-307-308-309-310-311-312-313-314-315-316-317-318-319-320-321-322-323-324-325-326-327-328-329-330-331-332-333-334-335-336-337-338-339-340-341-342-343-344-345-346-347-348-349-350-351-352-353-354-355-356-357-358-359-360-361-362-363-364-365-366-367-368-369-370-371-372-373-374-375-376-377-378-379-380-381-382-383-384-385-386-387-388-389-390-391-392-393-394-395-396-397-398-399-400-401-402-403-404-405-406-407-408-409-410-411-412-413-414-415-416-417-418-419-420-421-422-423-424-425-426-427-428-429-430-431-432-433-434-435-436-437-438-439-440-441-442-443-444-445-446-447-448-449-450-451-452-453-454-455-456-457-458-459-460-461-462-463-464-465-466-467-468-469-470-471-472-473-474-475-476-477-478-479-480-481-482-483-484-485-486-487-488-489-490-491-492-493-494-495-496-497-498-499-500-501-502-503-504-505-506-507-508-509-510-511-512-513-514-515-516-517-518-519-520-521-522-523-524-525-526-527-528-529-530-531-532-533-534-535-536-537-538-539-540-541-542-543-544-545-546-547-548-549-550-551-552-553-554-555-556-557-558-559-560-561-562-563-564-565-566-567-568-569-570-571-572-573-574-575-576-577-578-579-580-581-582-583-584-585-586-587-588-589-590-591-592-593-594-595-596-597-598-599-600-601-602-603-604-605-606-607-608-609-610-611-612-613-614-615-616-617-618-619-620-621-622-623-624-625-626-627-628-629-630-631-632-633-634-635-636-637-638-639-640-641-642-643-644-645-646-647-648-649-650-651-652-653-654-655-656-657-658-659-660-661-662-663-664-665-666-667-668-669-670-671-672-673-674-675-676-677-678-679-680-681-682-683-684-685-686-687-688-689-690-691-692-693-694-695-696-697-698-699-700-701-702-703-704-705-706-707-708-709-710-711-712-713-714-715-716-717-718-719-720-721-722-723-724-725-726-727-728-729-730-731-732-733-734-735-736-737-738-739-740-741-742-743-744-745-746-747-748-749-750-751-752-753-754-755-756-757-758-759-760-761-762-763-764-765-766-767-768-769-770-771-772-773-774-775-776-777-778-779-780-781-782-783-784-785-786-787-788-789-790-791-792-793-794-795-796-797-798-799-800-801-802-803-804-805-806-807-808-809-810-811-812-813-814-815-816-817-818-819-820-821-822-823-824-825-826-827-828-829-830-831-832-833-834-835-836-837-838-839-840-841-842-843-844-845-846-847-848-849-850-851-852-853-854-855-856-857-858-859-860-861-862-863-864-865-866-867-868-869-870-871-872-873-874-875-876-877-878-879-880-881-882-883-884-885-886-887-888-889-890-891-892-893-894-895-896-897-898-899-900-901-902-903-904-905-906-907-908-909-910-911-912-913-914-915-916-917-918-919-920-921-922-923-924-925-926-927-928-929-930-931-932-933-934-935-936-937-938-939-940-941-942-943-944-945-946-947-948-949-950-951-952-953-954-955-956-957-958-959-960-961-962-963-964-965-966-967-968-969-970-971-972-973-974-975-976-977-978-979-980-981-982-983-984-985-986-987-988-989-990-991-992-993-994-995-996-997-998-999-1000-1001-1002-1003-1004-1005-1006-1007-1008-1009-1010-1011-1012-1013-1014-1015-1016-1017-1018-1019-1020-1021-1022-1023-1024-1025-1026-1027-1028-1029-1030-1031-1032-1033-1034-1035-1036-1037-1038-1039-1040-1041-1042-1043-1044-1045-1046-1047-1048-1049-1050-1051-1052-1053-1054-1055-1056-1057-1058-1059-1060-1061-1062-1063-1064-1065-1066-1067-1068-1069-1070-1071-1072-1073-1074-1075-1076-1077-1078-107

the mainstay. A natural beauty can be purchased from the Netherlands

- Heat Transformers in Industrial Processes**
New Technologies for Heating And Cooling Supply in Office Buildings
Thermal Transfer: Moving Heat Around in Buildings
Natural Gas as a Vehicle Fuel
Energy Efficient Retrofitting of Office Buildings
Industrial Ventilation
Process Heating in The Metals Industry
Transportation Management and Traffic Engineering
Advanced Houses of the World
Energy Efficient HVAC Systems In Office Buildings
Gas Heaters in Agriculture

ANDRE ENRIQUEZ
P.O. Box 17
51304A Street
The Netherlands

Industrial Drying Technologies

Industrial drying is an important component of many manufacturing processes. The energy intensive nature of this activity has highlighted the need for greater energy efficiency, and a further stimulus is now being provided by current emissions legislation.

The range of energy-saving measures which can be applied to the industrial drying process is considerable. Some of the more modern techniques being applied today use direct heating and electric heating technologies to achieve enhanced levels of energy efficiency and more rapid drying. There are also numerous ways in which the energy efficiency of more conventional dryers can be improved. Waste heat recovery and control are particularly important in this respect, although associated measures such as mechanical deaerating, dryout

This report examines each of the main approaches to more energy efficient industrial drying. It assesses the technical and economic merits of each technology and illustrates its conclusions by reference to specific case studies.

The Academy is based on mutual cooperation amongst within the scientific community, and on the mutual support and assistance of its members. The Academy is directed mainly at the senior engineers in industry who are responsible for drying National Teams. It is directed to stimulate the wider consideration - and application - of energy efficiency opportunities and is intended to stimulate the industrial drying field.

Full Report Available from:

ACHER
STUN
THE CHAMPION

04117 JPN/ JOURNAL OF PHYSICAL AND CHEMISTRY, 1972, 76(12), 2553-2557. 12P. 12 refs.
 400000-400001-400002, 400003-400004, 400005-400006, 400007-400008, 400009-400010, 400011-400012, 400013-400014, 400015-400016, 400017-400018, 400019-400020, 400021-400022, 400023-400024, 400025-400026, 400027-400028, 400029-400030, 400031-400032, 400033-400034, 400035-400036, 400037-400038, 400039-400040, 400041-400042, 400043-400044, 400045-400046, 400047-400048, 400049-400050, 400051-400052, 400053-400054, 400055-400056, 400057-400058, 400059-400060, 400061-400062, 400063-400064, 400065-400066, 400067-400068, 400069-400070, 400071-400072, 400073-400074, 400075-400076, 400077-400078, 400079-400080, 400081-400082, 400083-400084, 400085-400086, 400087-400088, 400089-400090, 400091-400092, 400093-400094, 400095-400096, 400097-400098, 400099-400100, 400101-400102, 400103-400104, 400105-400106, 400107-400108, 400109-400110, 400111-400112, 400113-400114, 400115-400116, 400117-400118, 400119-400120, 400121-400122, 400123-400124, 400125-400126, 400127-400128, 400129-400130, 400131-400132, 400133-400134, 400135-400136, 400137-400138, 400139-400140, 400141-400142, 400143-400144, 400145-400146, 400147-400148, 400149-400150, 400151-400152, 400153-400154, 400155-400156, 400157-400158, 400159-400160, 400161-400162, 400163-400164, 400165-400166, 400167-400168, 400169-400170, 400171-400172, 400173-400174, 400175-400176, 400177-400178, 400179-400180, 400181-400182, 400183-400184, 400185-400186, 400187-400188, 400189-400190, 400191-400192, 400193-400194, 400195-400196, 400197-400198, 400199-400200, 400201-400202, 400203-400204, 400205-400206, 400207-400208, 400209-400210, 400211-400212, 400213-400214, 400215-400216, 400217-400218, 400219-400220, 400221-400222, 400223-400224, 400225-400226, 400227-400228, 400229-400230, 400231-400232, 400233-400234, 400235-400236, 400237-400238, 400239-400240, 400241-400242, 400243-400244, 400245-400246, 400247-400248, 400249-400250, 400251-400252, 400253-400254, 400255-400256, 400257-400258, 400259-400260, 400261-400262, 400263-400264, 400265-400266, 400267-400268, 400269-400270, 400271-400272, 400273-400274, 400275-400276, 400277-400278, 400279-400280, 400281-400282, 400283-400284, 400285-400286, 400287-400288, 400289-400290, 400291-400292, 400293-400294, 400295-400296, 400297-400298, 400299-400300, 400301-400302, 400303-400304, 400305-400306, 400307-400308, 400309-400310, 400311-400312, 400313-400314, 400315-400316, 400317-400318, 400319-400320, 400321-400322, 400323-400324, 400325-400326, 400327-400328, 400329-400330, 400331-400332, 400333-400334, 400335-400336, 400337-400338, 400339-400340, 400341-400342, 400343-400344, 400345-400346, 400347-400348, 400349-400350, 400351-400352, 400353-400354, 400355-400356, 400357-400358, 400359-400360, 400361-400362, 400363-400364, 400365-400366, 400367-400368, 400369-400370, 400371-400372, 400373-400374, 400375-400376, 400377-400378, 400379-400380, 400381-400382, 400383-400384, 400385-400386, 400387-400388, 400389-400390, 400391-400392, 400393-400394, 400395-400396, 400397-400398, 400399-400400, 400401-400402, 400403-400404, 400405-400406, 400407-400408, 400409-400410, 400411-400412, 400413-400414, 400415-400416, 400417-400418, 400419-400420, 400421-400422, 400423-400424, 400425-400426, 400427-400428, 400429-400430, 400431-400432, 400433-400434, 400435-400436, 400437-400438, 400439-400440, 400441-400442, 400443-400444, 400445-400446, 400447-400448, 400449-400450, 400451-400452, 400453-400454, 400455-400456, 400457-400458, 400459-400460, 400461-400462, 400463-400464, 400465-400466, 400467-400468, 400469-400470, 400471-400472, 400473-400474, 400475-400476, 400477-400478, 400479-400480, 400481-400482, 400483-400484, 400485-400486, 400487-400488, 400489-400490, 400491-400492, 400493-400494, 400495-400496, 400497-400498, 400499-400500, 400501-400502, 400503-400504, 400505-400506, 400507-400508, 400509-400510, 400511-400512, 400513-400514, 400515-400516, 400517-400518, 400519-400520, 400521-400522, 400523-400524, 400525-400526, 400527-400528, 400529-400530, 400531-400532, 400533-400534, 400535-400536, 400537-4005

Return to the listing of the CADET Analyst's Reports

Fig. 9

The CADET End-user Form

We would like to promote success stories that result from CADET products. Please let us know if your organization benefits from CADET information by completing the information below.

1.) Name:

2.) Organization:

3.) Address:

4.) Phone:

5.) Fax:

6.) E-mail:

7.) Success Story:

Fig. 10

7.) Success Story:

8.) I would like additional information sent to me on:

To send your request, press the "SUBMIT" button.

To clear the form to start over, press the "CLEAR" button.

If you would like additional information sent to you on how to obtain CADET products, please complete the above information skipping Number 7.

Please send comments or inquiries about this information server to the E-mail address below. An E-mail form is also provided for your convenience. If sending comments about this document, please include title, URL, or other document description.

info_servers@ornl.gov

Date printed 11/28/94 (rev)

USERS OF THE U.S. CADDET HOME PAGE

From January 1, 1995, to December 31, 1995, there have been more than 10,000 "hits" on the U.S. CADDET home page system. These "hits" have increased from approximately 550 in January to 1200 in December. The steady growth in the usage of the U.S. CADDET home page is shown in Figure 11.

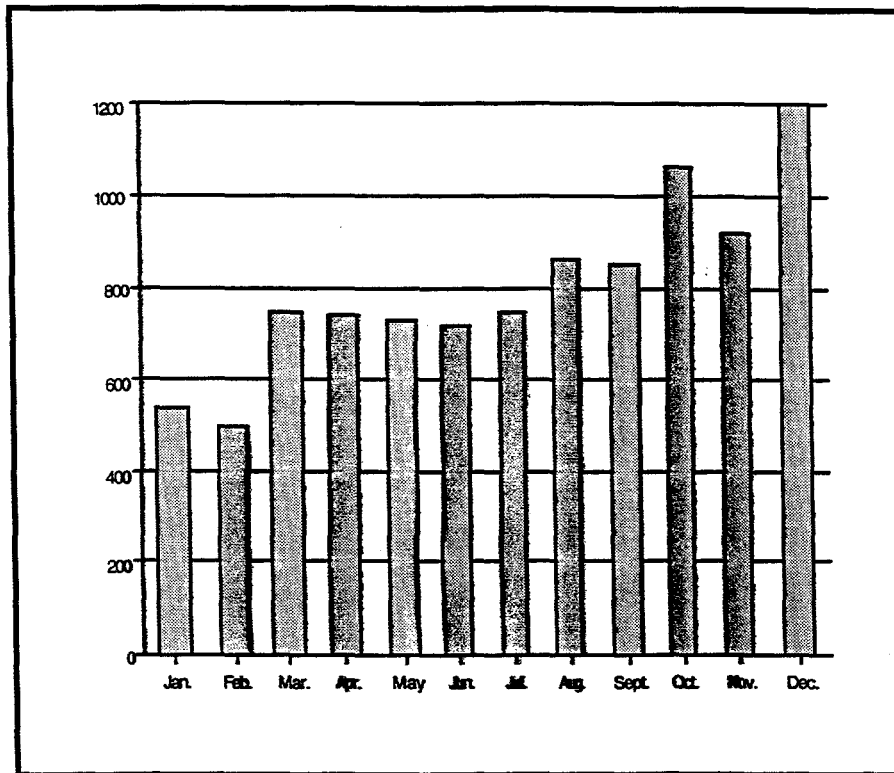


Figure 11. "Hits" on the U.S. CADDET Home Page in 1995

More than three-quarters (specifically, 4,703) of these hits were from the United States, and 1,371, or 23%, were from other countries. Countries accessing the home page span the globe, but the greatest numbers of users outside of the U.S. are from Canada and Europe.

Table 1 presents the number of hits on the U.S. CADDET home page by country in December 1995. Countries are divided into three categories, based on the classification developed by Nazem (1995) to reflect world telecommunications infrastructure. "Industrialized Countries" lead the development and deployment of modern communication technology on the domestic front, and they provide both capital and know-how to facilitate infrastructure development in countries abroad. "Countries of Eastern Europe and the former Soviet Union" enjoy a high degree of literacy and have seen considerable technological growth, but they suffer from historical obstacles to the

free flow of information. The third group of countries ("Developing Countries") is perhaps the most diverse group, and it contains some of the world's most populous and rapidly growing countries that will be accounting for an increasing share of the world's energy consumption. It is comprised of countries that currently lag furthest behind in telecommunications infrastructure and have insufficient resources to invest in significantly upgrading this infrastructure in the near term.

Table 1. "Hits" on the U.S. CADDET Home Page,
by Country, in December 1995*

| Industrialized Countries | | Countries of Eastern Europe and the Former Soviet Union | | Developing Countries | |
|--------------------------|------------|---|----------|----------------------|-----------|
| Australia | 15 | Slovenia | 5 | Indonesia | 2 |
| Belgium | 2 | | | Malaysia | 2 |
| Canada | 61 | | | Mexico | 7 |
| Denmark | 21 | | | | |
| Finland | 7 | | | | |
| Germany | 2 | | | | |
| Japan | 6 | | | | |
| Netherlands | 14 | | | | |
| Norway | 43 | | | | |
| Portugal | 1 | | | | |
| Spain | 6 | | | | |
| Sweden | 3 | | | | |
| Switzerland | 16 | | | | |
| United Kingdom | 21 | | | | |
| United States | 724 | | | | |
| Total | 942 | Total | 5 | Total | 11 |

*In addition, Brazil accounts for three hits, Israel for two hits, and South Africa for three hits. The location of these countries in the classification by Nazem (1995) is unclear. Further, the country origin of 234 hits during December 1995 could not be determined.

The results shown in Table 1 (and statistics on users from previous months) suggest that users in industrialized countries are accessing the U.S. CADDET information much more extensively than are users elsewhere in the world. Thus, overall these statistics indicate that the CADDET databases on the Internet can reach a large number of users with information about energy-efficient technologies. However, these same statistics also underscore the need to supplement the Internet with other forms of outreach that better meet the needs of users in countries of Eastern Europe, the Former Soviet Union, and the developing world.

Affiliations for 719 of the 724 United States users (in December 1995) could be determined from their e-mail address extensions. Government agencies account for more than a third (37%) of the users. However, if the usage of just one of these organizations is removed (the 105 hits from the National Renewable Energy Laboratory), this percentage drops substantially to 27%. The next most frequent users are commercial organizations, which comprise 30% of the users in December. Educational institutions account for 15%, and non-profit organizations account for 2%. The remaining 16% of the users accessed the U.S. CADDET home page via a network service, which does not allow identification of organizational affiliations.

To the extent that these affiliations are representative of both international and domestic users, we can conclude that U.S. CADDET home page is being used by many of the audiences that are being targeted. However, it is also likely that small, resource-constrained businesses, educational organizations, government agencies, and non-profit organizations are under-represented within the large categories of users described above.

A recent survey of Internet users in North America found that Web users typically are upscale (25% have incomes of more than \$80,000), educated (64% with at least college degrees), and professionals (50% are professional or managerial) (Nielsen Media Research, 1995). These same segments are likely to be more receptive than many other groups to information about newly demonstrated energy efficiency technologies. However, until the Internet has penetrated beyond these early adopters to broader segments of the population, the Internet will only partially meet the marketing needs of CADDET. As Hummel (1995, pp. 1-2) concluded in his analysis of the potential for utilities to provide customer services and marketing on the Internet, "Radio, television, telephone, print advertising, and mail service are still the predominant media for communicating with customers, [although] the technology of inter-networked computers is promising to make a quantum leap in usage."

TYPES OF INFORMATION ACCESSED BY USERS

The nature of the information accessed by users in December 1995 is portrayed in Figure 12. This graphic indicates that many users are probing the CADDET information in considerable detail.

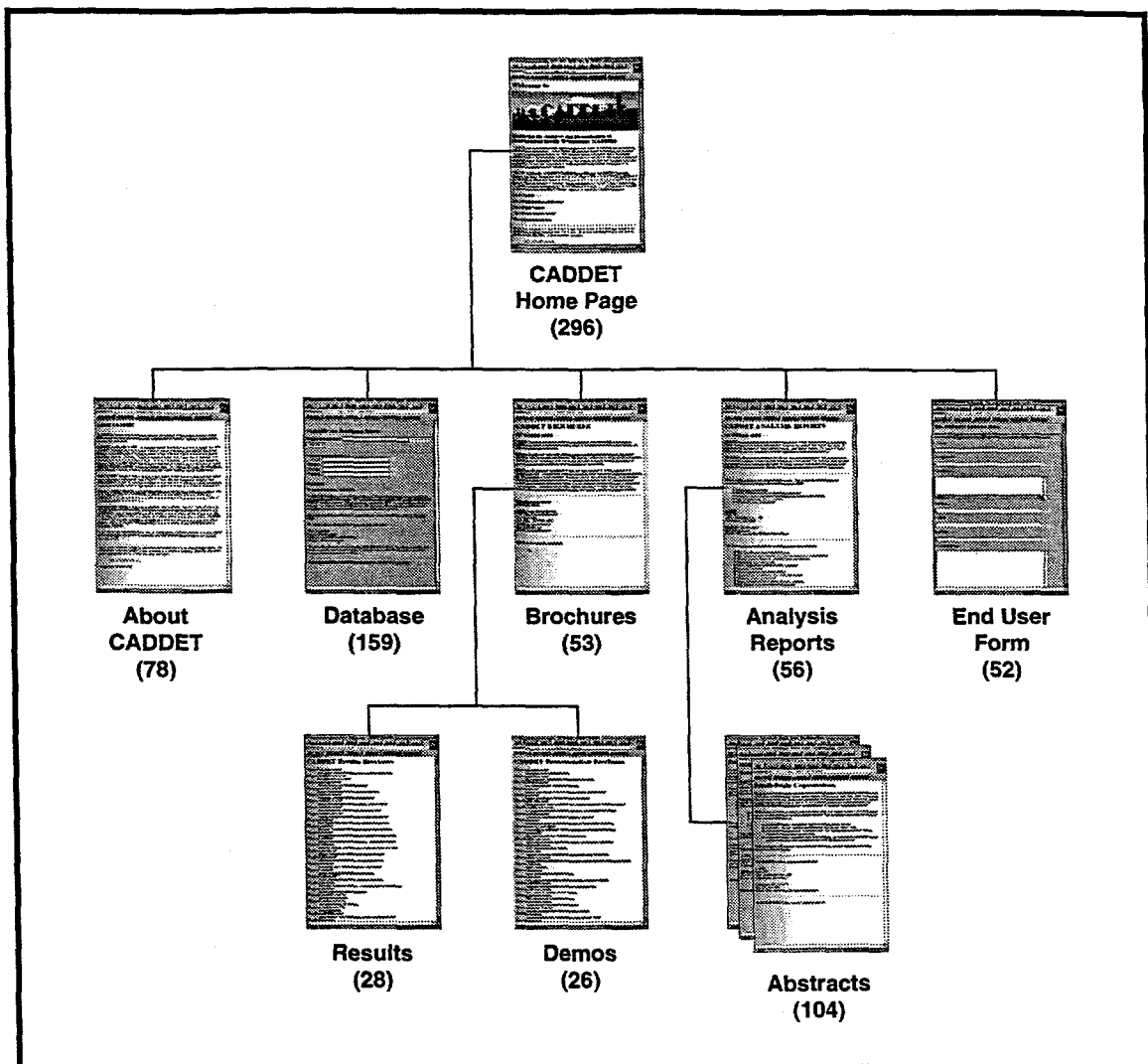


Figure 12. "Hits" on the U.S. CADDET Home Page System, in December 1995

Most users probably entered the CADDET home page system by first opening the home page. (If a user had previously opened this home page and moved on to other pages of CADDET information, they might choose to mark one of these subsequent pages—such as the one that enables database searches—and return to it when they next seek CADDET information. This is likely to become more prevalent as users become more familiar with CADDET.)

From the home page, 78 links were made to "About CADDET," 159 links were made to the CADDET database, 53 to the overview of brochures, 56 to the list of analysis reports, and 52 to the end-user form. Many users went beyond these pages to examine the titles of brochures and the abstracts of analysis reports (Table 2). In

addition, 3 individuals completed the end-user form.

Table 2. "Hits" on Abstracts of CADDET Analysis Reports During December 1995

| Report No. | Report Title | No. of Hits |
|--------------|---|-------------|
| 1 | Small-Scale Cogeneration (revised) | 17 |
| 2 | Heat Transformers in Industrial Processes | 5 |
| 3 | New Technologies for Heating and Cooling Supply in Office Buildings | 6 |
| 4 | Thermal Storage: Managing Electrical Loads in Buildings | 4 |
| 5 | Compressed Natural Gas as a Vehicle Fuel | 4 |
| 6 | Energy Efficient Lighting in Commercial Buildings | 11 |
| 7 | Controls to Reduce Electrical Peak Demands in Commercial Buildings | 10 |
| 8 | Energy Efficient Retrofitting of Office Buildings | 6 |
| 9 | Gas-Turbine-Based CHP in Industry | 4 |
| 10 | Industrial Ventilation | 4 |
| 11 | Process Heating in the Metals Industry | 5 |
| 12 | Industrial Drying Technologies | 5 |
| 13 | Transportation Management and Traffic Engineering | 7 |
| 14 | Advanced Houses of the World | 6 |
| 15 | Energy Efficient HVAC Systems in Office Buildings | 6 |
| 16 | Heat Exchangers in Aggressive Environments | 4 |
| Total | | 104 |

The pattern of usage shown in Table 2 suggests that many users viewed the abstract of only the first report. Further, the reports on lighting and controls in commercial buildings were of greatest interest to users in December 1995.

FEEDBACK FROM USERS

This section summarizes the information collected from those users who elected to complete the end-user form, which is an "electronic coupon" containing questions about CADDET, requests for information, and comments about the home page. As of December 31, 1995, 59 coupons were received from users in 12 different countries, with an average of approximately four coupons per month. Users from the United States constituted the largest block, comprising 70% of the total number of respondents. Other countries include Austria, Belgium, Canada, Croatia, Italy,

Mexico, Portugal, Slovenia, South Africa, South Korea, and the United Kingdom. Most of these respondents were from the private sector (48%) or universities (26%).

Almost half of the individuals who completed the "electronic coupon" requested additional information about energy-efficiency (N=15) or renewable energy (N=14) technologies, research, or data. Another 13 individuals requested copies of specific CADDET products. The remaining respondents sought other types of information or provided comments on the U.S. CADDET home page.

CONCLUSIONS

Based on the pattern of usage of the energy-efficiency information that the United States has placed on the Internet, the authors conclude that energy efficiency information systems on the World Wide Web can contribute significantly to the goals of CADDET and other information outreach programs. The low cost of reaching large numbers of users via the Internet suggests that this information outreach tool is a cost-effective mechanism. However, to reach a wider range of audiences, Internet systems need to be supplemented by other dissemination efforts aimed at reaching individuals in countries and organizations that are not currently using Internet services. In addition, more personal and customized information sources are needed to provide users with the types of assistance and guidance that may be required to translate knowledge of a technology's technical and financial performance, into a decision to adopt the technology.

REFERENCES

Hummel, P. 1995. *Customer Service and Marketing on the Internet* (Palo Alto, California: Electric Power Research Institute), EPRI TR-105664, November.

Nazem, S. M. 1995. "World Telecommunications Infrastructure in the Emerging Information Society," *Journal of Technology Transfer*, 20 (1): 23-30, April.

Nielsen Media Research. 1995. *The Commercenet/Nielsen Internet Demographics Survey* (Dunedin, Florida: Nielsen Media Research), October.

Verity, J., and R. Hof. 1994. "The Internet," *Business Week*, November 14, pp. 80-88

*Managed by Lockheed Martin Energy Research Corp., for the U.S. Department of Energy under Contract DE-AC05-96OR22464.