SUBCONTRACTED ACTIVITIES RELATED TO TES FOR BUILDING HEATING AND COOLING

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ORNL IS MANAGING THE DOE/STOR PROGRAM IN THERMAL ENERGY STORAGE FOR BUILDING HEATING AND COOLING

SUBCONTRACT PROGRAM ELEMENTS

- UTILITY LOAD MANAGEMENT
- SOLAR APPLICATIONS
- CONSERVATION

THE FY 79 (LTTES) PROGRAM INCLUDED SUBCONTRACTS IN THE UTILITY LOAD MANAGEMENT APPLICATION AREA

FY 79 ACTIVITIES

- LIFE AND STABILITY TESTING OF PACKAGED LOW COST ENERGY STORAGE MATERIALS

  UNIVERSITY OF DELAWARE (IEC)

LIFE AND STABILITY TESTING OF PACKAGED LOW COST ENERGY STORAGE MATERIALS (PROPRIETARY GLAUBERS SALT-CLAY MIXTURE IN "CHUBS")

CONTRACTOR

UNIVERSITY OF DELAWARE – IEC

OBJECTIVE

- VERIFY INTEGRITY OF CHUB PACKAGING SYSTEM
- VERIFY LIFE AND STABILITY OF PACKAGED PC MATERIAL

APPROACH

- DETERMINE WATER VAPOR RETENTION OF FILM
- EXPOSURE TO TEMPERATURE EXTREMES
- EXPOSURE TO VIBRATION AND DROP TESTS
- ACCELERATED AND DIURNAL THERMAL CYCLING

LIFE AND STABILITY TESTING OF PACKAGED LOW COST ENERGY STORAGE MATERIALS (PROPRIETARY GLAUBERS SALT-CLAY MIXTURE IN "CHUBS") (CONT'D)

STATUS

- FINAL REPORT COMPLETE EXCEPT FOR REVISIONS BY THE CONTRACTOR
- CHUBS DELIVERED FOR EVALUATION
  - ORNL
  - VARICUS UTILITIES
- ABOVE OBJECTIVES WERE MET
- EFFECT OF CYCLING ON CHUB HEAT OF FUSION DETERMINED

UTILITY LOAD MANAGEMENT WILL BE THE MAJOR APPLICATION AREA IN FY 80

- DEVELOPMENT OF TES SYSTEM FOR RESIDENTIAL SPACE COOLING

  RFP

- RESISTANCE STORAGE HEATER COMPONENT DEVELOPMENT

  RFP

- DEVELOPMENT OF TES TEST FACILITY*

  ANL (PURDUE UNIVERSITY)

- DEMONSTRATION OF STORAGE HEATER SYSTEMS FOR RESIDENTIAL APPLICATIONS

  ANL

- SIMULATION AND EVALUATION OF LATENT HEAT TES-HEAT PUMP SYSTEMS

  RTI

DEVELOPMENT OF TES SYSTEMS FOR RESIDENTIAL SPACE COOLING

- MAJOR PART OF SUBCONTRACT FUNDING IN FY 80 WILL BE FOR THIS EFFORT

OBJECTIVE

- DEVELOP STORAGE SYSTEMS AND COMPONENTS UTILIZING PCM
- DESIGN PROTOTYPE OF UNITS WITH STRONG POTENTIAL FOR COMMERCIALIZATION
- DEFINE INTERACTION BETWEEN COOL STORAGE ECONOMICS AND PREDICTED ELECTRIC RATE STRUCTURES FOR SYSTEMS DEVELOPED

APPROACH

- SOLICIT PROPOSALS VIA RFP

DEVELOPMENT OF TES SYSTEMS FOR RESIDENTIAL SPACE COOLING (CONT'D)

SCOPE

- 1 1/2 – 2 1/2 YEAR PROGRAM
- PHASE I – R&D ON STORAGE CONCEPT
- PHASE II – PROTOTYPE DESIGN, SPECIFICATION AND COSTING
- PHASE II – BASED ON PHASE I RESULTS OR ALREADY DEVELOPED TES CONCEPTS
- MULTI-AWARD PROGRAM

SCHEDULE

- CBD NOTICE OF INTENT HAS BEEN ISSUED
- RFP, DECEMBER '79
- CONTRACT AWARD, MAY '80

RESISTANCE STORAGE HEATER COMPONENT DEVELOPMENT

OBJECTIVE

- DEVELOP AND TEST COST EFFECTIVE CERAMIC BRICKS PRODUCED FROM OLIVINE OR OTHER SUITABLE DOMESTIC REFRACTORY FOR APPLICATION TO RESISTANCE STORAGE HEATERS
- DEVELOP AN IMPROVED BRICK DESIGN
- DEVELOP MANUFACTURING TECHNIQUES

APPROACH

- SOLICIT PROPOSALS VIA RFP

RESISTANCE STORAGE HEATER COMPONENT DEVELOPMENT (CONT'D)

SCOPE

- DETERMINATION OF CRITERIA FOR PERFORMANCE OF CERAMIC BRICKS FOR STORAGE HEATERS
- DEVELOP AND TEST PROTOTYPE BRICKS OF OLIVINE OR OTHER SUITABLE DOMESTIC REFRACTORY
- DEVELOP MANUFACTURING TECHNOLOGY AND DETERMINATION OF MANUFACTURING COSTS
- MANUFACTURE OF QUANTITIES OF BRICKS FOR FIELD TESTS

SCHEDULE

- RFP, FEBRUARY '80
- CONTRACT AWARD, JULY '80
- PERFORMANCE PERIOD 3 YEARS

DEMONSTRATION OF STORAGE HEATER SYSTEMS FOR RESIDENTIAL APPLICATIONS

CONTRACTOR

ANL

OBJECTIVE

- VALIDATE IMPACT ON UTILITIES COST EFFECTIVENESS AND CUSTOMER ACCEPTANCE OF COMMERCIALLY AVAILABLE TES UNDER US OPERATING CONDITIONS
- IDENTIFY AND DEFINE AFTER-THE-METER R&D NEEDS

APPROACH

- TWO DEMONSTRATIONS
  - VERMONT – 23 DEMONSTRATIONS; 19 CONTROLS
  - MAINE – 10 DEMONSTRATIONS; 8 CONTROLS

STATUS

- DATA FROM FIRST WINTER SEASON HAVE BEEN COLLECTED (SECOND SEASON 79-80 WILL BE CONTINUED)
- SURVEY OF CUSTOMER ATTITUDES HAS BEEN COMPLETED

SIMULATION AND EVALUATION OF LATENT HEAT TES – HEAT PUMP SYSTEMS

CONTRACTOR

RTI

OBJECTIVE

- DERIVE THE RELATIVE VALUE OF TES FOR HEAT PUMPS AS A FUNCTION OF STORAGE TEMPERATURE, MODE OF STORAGE, GEOGRAPHIC LOCATION AND TIME-OF-USE UTILITY RATE STRUCTURE

APPROACH

- CARRY OUT COMPUTER SIMULATION STUDY USING AVAILABLE MODELS AND DATA BASES

STATUS

- THERMAL LOAD SIMULATION MODEL OPERATIONAL
- INPUT DATA BEING COMPILED
- SIMULATION SITES, MODEL BUILDING DESIGN AND WEATHER DATA HAVE BEEN DEFINED

APPLICATION OF TES FOR SOLAR APPLICATIONS PRESENTLY A SECONDARY EFFORT

FY 79 SUBCONTRACTS

- DEVELOPMENT OF AN OPTIMUM PROCESS FOR EB CROSSLINKING OF HDPE TES PELLETS

  UNIVERSITY OF DAYTON
- DEVELOPMENT OF HIGH TEMPERATURE PCM

  UNIVERSITY OF DELAWARE (M.E.)
- TES SUBSYSTEMS FOR SOLAR HEATING APPLICATIONS

  GENERAL ELECTRIC
- DIRECT CONTACT HEAT TRANSFER PCM

  CLEMSON UNIVERSITY

FY 80 SUBCONTRACTS

- DEVELOPMENT OF TECHNOLOGY FOR INCORPORATION OF PCM INTO RESIDENTIAL BUILDING MATERIALS FOR BUILDING HEATING

  RFP

DEVELOPMENT OF OPTIMUM PROCESS FOR EB CROSSLINKING OF HDPE TES PELLETS

CONTRACTOR

UNIVERSITY OF DAYTON

OBJECTIVE

- DEVELOP AN OPTIMUM EB PROCESS FOR CROSSLINKING COMMERCIALLY AVAILABLE HDPE PELLETS TO OBTAIN THE HIGHEST HEAT OF FUSION

APPROACH

- TEST VARIOUS HDPE PELLETS PREPARED UNDER DIFFERENT IRRADIATION CONDITIONS

STATUS

- THE OPTIMUM PROCESS HAS BEEN IDENTIFIED
  - DOSE OF 8 MEGARADS
  - DUPONT 7040 HDPE
- A 250-LB BATCH OF PELLETS IS PREPARED FOR EVALUATION BY THE UNIVERSITY OF DAYTON
- PHASE CHANGE TEMPERATURE OF PELLETS 130-145°C
- COST OF CROSSLINKING OF PELLETS 1¢/LB

TES SUBSYSTEMS FOR SOLAR HEATING APPLICATIONS

CONTRACTOR

GENERAL ELECTRIC

OBJECTIVE

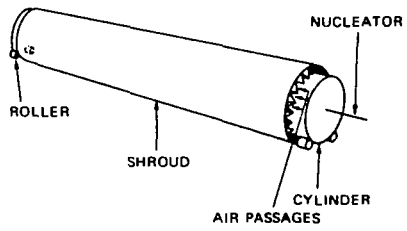
- DEVELOP THE ROLLING CYLINDER HEAT STORAGE CONCEPT USING GLAUBERS SALT

APPROACH

- INTERNAL AND EXTERNAL HEAT TRANSFER STUDIES
- PERFORMANCE TESTING WITH GLAUBERS SALT
- CORROSION TESTING
- DEVELOPMENT OF MATHEMATICAL MODEL
- SELECTION AND DESIGN OF CONCEPT

STATUS

- SELECTED PROTOTYPE DESIGN OF THE ROLLING CYLINDER CONCEPT
- RECOMMENDED CONFIGURATION AS FOLLOWS



DEVELOPMENT OF TECHNOLOGY FOR INCORPORATION OF PCM INTO RESIDENTIAL BUILDING MATERIALS

OBJECTIVE

- IMPROVEMENT OVER SENSIBLE HEAT SYSTEMS
  - REDUCED WEIGHT, VOLUME
  - FLATTENED DIURNAL TEMPERATURE SWING
  - INCREASED ARCHITECTURAL OPTIONS

APPROACH

- SOLICIT PROPOSALS VIA RFP

SCOPE

- SURVEY TO DEVELOP THERMAL COMFORT CRITERIA
- R&D PROGRAM UTILIZING PROMISING CONCEPTS
- EVALUATION TESTING

SCHEDULE

- ISSUE RFP BY OCTOBER '80

TES APPLIED TO CONSERVATION IS THE THIRD PROGRAM ELEMENT

FY 79 SUBCONTRACTS

- APPLICATION OF TES TO PROCESS HEAT AND WASTE HEAT RECOVERY IN THE ALUMINUM INDUSTRY*
  ROCKET RESEARCH COMPANY
- TWIN CITIES DISTRICT HEATING, TES STUDY
  GENERAL ELECTRIC

FY 80 SUBCONTRACTS

- APPLICATION ANALYSIS AND TECHNOLOGY ASSESSMENT OF TES FOR CONSERVATION APPLICATIONS
  TRW
- APPLICATION OF TES TO PROCESS HEAT AND WASTE HEAT RECOVERY IN THE ALUMINUM INDUSTRY (PHASE II)*
  ROCKET RESEARCH COMPANY

TWIN CITIES DISTRICT HEATING

CONTRACTOR

GENERAL ELECTRIC

OBJECTIVE

- EVALUATE THE TECHNICAL AND ECONOMIC FEASIBILITY OF INCORPORATING TES COMPONENTS INTO THE PROPOSED TWIN CITIES DISTRICT HEATING PROJECT

STATUS

- THIS ACTIVITY HAS BEEN COMPLETED
- POTENTIAL BENEFITS ARE FOUND TO BE SUBSTANTIAL IN

  ENERGY CONSERVATION
  FAVORABLE ECONOMICS
  REDUCED AIR AND THERMAL POLLUTION

- FINAL REPORT IN PUBLICATION

APPLICATION ANALYSIS AND TECHNOLOGY ASSESSMENT OF TES

CONTRACTOR

TRW

OBJECTIVE

- INVESTIGATE TES SYSTEMS PERFORMANCE, ENERGY CONSERVATION AND ECONOMICS FOR
  - INCREASED THERMAL CAPACITANCE WITHIN RESIDENTIAL STRUCTURES
  - STORAGE FOR WASTE HEAT RECOVERY AND USE FROM FLUE GASES OF RESIDENTIAL FOSSILE FUELED FURNACES

SCOPE

- DEVELOP TES SYSTEMS BASELINES
- ANALYZE FOR SEASONAL IMPACT IN VARIOUS REGIONS OF THE COUNTRY
- ESTIMATE MARKET PENETRATION
- ESTIMATE FUEL CONSERVATION

SCHEDULE

- EFFORT IS JUST STARTED