

D 5000794

**COMBAT RATION NETWORK  
FOR  
TECHNOLOGY IMPLEMENTATION**

**Installation of STOCK 1100 Retort**

**Final Technical Report STP 1006**

**Results and Accomplishments (February 1997 through September 1999)**

**Report No: FTR 103**

**CDRL Sequence: A004**

**February, 2000**

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**CORANET CONTRACT NO. SP0300-96-D-0016**

Sponsored by:  
DEFENSE LOGISTICS AGENCY  
8725 John J. Kingman Rd.  
Fort Belvoir, VA 22060-6221

Contractor:  
Rutgers, The State University of New Jersey  
THE CENTER FOR ADVANCED FOOD TECHNOLOGY\*  
Cook College  
N.J. Agricultural Experiment Station  
New Brunswick, New Jersey 08903

Principal Investigator:  
Henderikus. B. Bruins

Dr. John F. Coburn  
Program Director

TEL: 908-445-6130  
FAX: 908-445-6145

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# 1. Results and Accomplishments

## 1.1. Introduction and Background

This final report describes the work that was performed under Short Term Project (STP) #1006 which was a delivery order under the CORANET Base Contract, SPO 103-96-D-0016. The objective of this project was to install a production-size retort at the CORANET DEMO Site with the necessary control and ancillary equipment and to integrate it into the Computer Integrated Manufacturing (CIM) Demonstration Site.

The Demonstration Site for the CORANET Program needed a production-size retort to support high-speed filling during development runs of packaged foods, so that the filling cycle could be sustained for at least the time required to retort more than one retort cage of product. The use of existing Government owned equipment that is being held as stand-by was a cost avoidance measure, preferred over investing other funds to provide balanced production capability. The previous retort at the site was on loan, and needed to be located elsewhere, so a replacement retort was being brought in.

As this project progressed, the need to support the production of polymeric trays became clear. Therefore a significant portion of this contract was dedicated to design, development and testing of such rack.

The objectives of this Short Term Project were:

- 1) To coordinate with DSCP Industrial Preparedness Planning personnel the details of delivery of a designated 1100 STOCK retort to the site
- 2) To receive, accept and install the 1100 retort at the demonstration site
- 3) To integrate the 1100 retort into the Demo Facility
- 4) To develop and acquire retort racks for the Polymeric Half Steam Tray

## 1.2. Results and Conclusions

The installation of the retort ran into significant delay due to missing and lost parts. The retort arrived on February 1997 and was finally commissioned in August 1997. Due to this delay in start up, recommendations were made to DSCP to start up all remaining GFE retort equipment, especially those retorts which have 5 year free installation clause. Based on this recommendation, the Government awarded Rutgers a second contract (STP#1011) to install, validate and upgrade seven additional STOCK 1100 retorts. The learning's from this project became a valuable asset in that project to make the retorts truly "plug and play".

The second major component of this project was the design and development of a retort rack for the Polymeric Half Steam Table Tray. Via a sub-contract with STOCK AMERICA INC (SAI), an injection mold was developed that can produce these retort racks. The tooling was constructed to provide three different final rack sizes. These sizes are for the STOCK Model 1100, STOCK Model 1300, and a third size configuration capable of being used in several other retort manufacturer's retort vessels. The rack can be used in various retort process modes including full water immersion, partial water immersion, traditional water cascading spray (shower type), saturated steam spray (water mixed with steam), and steam only processes. The rack is designed to be used in either a rotary or a static process, and can be loaded with the container lid facing up or down. Material selection for this rack became an issue early on when it became clear that the normally used rack materials had a tendency to sag under the heavy weight of a polymeric tray (~ 6 lbs) in other than a full water immersion retort. The final rack is based on a proprietary recipe formulation developed by SAI. Many of the key recipe components are strictly confidential to SAI and are not available for publication. The base material recipe formulation is comprised of a polypropylene resin enhanced by a glass fiber filling for providing the structural rack strength to meet the demanding requirements of the polymeric half steam table tray. A complete set of these racks was acquired at the end of this project for the STOCK 1100 retort.

### **1.3. Recommendations**

An early recommendation was made to start up all remaining GFE STOCK retorts that were still covered under a free installation policy. The Department of Defense (DoD) has already reacted positively toward this recommendation and a second STP was awarded to install, upgrade and start up seven additional STOCK 1100 retorts. This contract was recently amended to include similar work on three STOCK 1300 retorts.

Due to the dimensional difference between the metal half steam table tray and the polymeric half steam table tray, approximately 33% retort load capacity is lost. This can have a significant effect on the Industrial Base capacity during emergency situation when retort capacity becomes limited. It is recommended that DoD supports a project that studies the effect of rotational retort processes in an effort to reduce retort cycle times and therefore gain back retort capacity that is lost due to the change over to the polymeric can.

## **2. Program Management**

The original project was awarded on February 19 1997 for a four month period 4 month with a total funding of \$74,100.

The following modifications were issued under this contract:

- Mod 1: June 18, 1997: No cost extension from June 18, 1997 to December 18, 1997
- Mod 2: December 18, 1998: No cost extension from December 18, 1997 to April 18, 1998
- Mod 3: April 16 1998: Extension with additional task order (task #6): Polymeric Tray Rack Design with \$77,600 extra funding. The project was extended till November 18, 1998
- Mod 4: November 10 1998: No cost extension from November 18, 1998 to March 31 1999
- Mod 5: February 26 1999: No cost extension from March 31, 1999 to 31 May 1999
- Mod 6: May 28, 1999: No cost extension from May 31, 1999 to July 31, 1999
- Mod 7: July 30, 1999: No cost extension from July 31 to 30 Sep 1999

## **3. Short Term Project Activities**

### **3.1. Planning and Coordination (4.2.1)**

The relocation of retorts required the coordination of truckers, riggers, plumbers and electricians so that the retorts could be off loaded and moved into the retort room without any delay. The retort (serial number 64028) was moved from STAR Foods in San Antonio and shipped to Rutgers University where it arrived on 2/24/97. Many items were missing with the original shipment such as the control cabinet, retort cages and sensor. These items needed to be identified and separated at STAR Foods from three other retorts that were stored at that facility. The remaining items were received on 6/13/97. An inventory of items received was documented in two memos send to Jesse Burns at DSCP and is attached as Appendix 1 and Appendix 2.

### **3.2. Installation and Acceptance (4.2.2)**

The retort was installed in the retort room right after the receipt on 2/24/97. Due to lack of parts, the service technician from STOCK AMERICA Inc. (SAI) was not called till after the delivery of the items on 6/13/97. SAI performed the installation of the controls and wiring between the control cabinet and the retort. Two pressure sensors and the housing for the water level sensor in the processing drum which were missing, were purchased under this contract. The loading ramp for the retort crates was incompatible with the retort dollies delivered with the machine and was replaced by SAI at no cost. At a later date SAI performed temperature distribution studies on this retort to validate the proper functioning of this retort for MRE production requirements.

### **3.3. Controller Integration (4.2.3)**

The controller was integrated in the building network by installing the necessary network card and network software. The retort uploads the retort programs now from the buildings file server and downloads the retort cook data to the same file server.

### **3.4. Rack Loader Retooling (4.2.4)**

The retort rack loaders (2) were modified by Precision Automation Co. Inc in Cherry Hill NJ. Purchase Order was placed on 10/23/97. The original scope of the work was defined as follows:

- Make a new wheel guide for the retort dollies,
- Lowering of the rack loader by 4" and raise wheel stops
- Move skirts lower and wider to meet basket height
- Reposition Barcode Scanner mounting bracket

The above modification cost of both units was quoted for \$5,700. Additional work was however required mechanically, hydraulically and electrically to make the units function properly which was quoted at a cost of \$5,980. This increased cost was negotiated down to \$2,990, making the total cost of modification \$8690.

### **3.5. MRE Pouch Racks (4.2.5)**

A total of 230 MRE racks were ordered on 7/22/97 from SAI . The rack dimension is 26.50" x 30.00" x 0.95" and has 18 pockets. Each retort crate will hold 29 racks and each retort load can hold 4 crates per cycle. The cost of the rack at this quantity was \$48.25 ea, at a total cost of \$11,097.50. No alternate supplier could be identified for these racks.

### **3.6. Polymeric Tray Racks (4.2.6)**

This task was funded under modification 0008/03 on 16 April 1998 which added task #6 for the design and acquisition of polymeric tray racks for the amount of \$77,600. Rutgers prepared a tray specification and sent a request for proposal to STOCK AMERICA Inc.(SAI) on September 29, 1998 (Appendix #3). On October 24, 1998 a proposal was received from SAI, appendix #4, and a subcontract with SAI was fully executed on December 21, 1998. Rexham tray drawings as well as tray samples were sent to SAI in order to develop an injection mold that would produce retort racks for this polymeric tray. Late December. a meeting was held at the FMT facility with SAI and the design engineers for the injection mold to discuss the various features that needed to be built into the mold. Final drawings for the injection mold were received and approved on January 26,1999 (Drawing ID 7333A/B). An injection mold flow analysis was conducted in February which indicated that a four drop design would be needed to reduce material stresses in the rack. The design and construction of injection mold was completed in April and the first prototype samples were produced on April 16 1999. The tooling was constructed to provide three different final rack sizes. These sizes are for the STOCK Model 1100 (7333A), STOCK Model 1300 (7333B), and a third size configuration capable of being used in several other retort manufacturer's retort vessels (7333C).

The following protocol was used to evaluate the racks:

- Check the dimensions of the rack before retorting
- Check the rack for any blemishes, nicks, etc.
- Expose the rack to 260 F retort condition for 1 hr
- Measure dimension of retort rack after the retort proces
- Conduct Temperature Distribution study with Rack at various angles to water flow

The first racks that were received were made from a polypropylene based material with talc filling (formula code: W041699MFP). The overall dimensions of the rack was 30 1/16" x 24 7/8" x 2 1/4" before retorting and 29 7/8" x 24 11/16" x 2 1/4" after retorting (about 0.6% shrinkage). A STOCK 1100 retort will accommodate easily 12 of these racks in each crate. The capacity per retort load is therefore 192 polymeric cans per cycle (four trays per rack and four crates per retort). With some minor changes in the mold, racks can also be produced for a STOCK 1300 retort with 25" crate. This STOCK 1300 retort crate will accommodate easily 14 of these modified racks. The capacity per STOCK 1300 retort is therefore 280

polymeric cans per cycle (four trays per rack and five crates per retort). The actual capacity in terms of containers per hour depends on the batch cycle time which is dependent on retort conditions and product characteristics. The racks are designed to accommodate rotational retort conditions. This can greatly reduce the cycle time for some products. Rotation improves the flow of heating media over the container and therefore the heat transfer rates into the container. Rotation can also improve the heat transfer rates within the container by creating induced convection flows. The impact of rotation on heat transfer is however beyond the scope of this project but it is recommended that it is addressed in a follow up short term project.

A set of racks was also sent to Stegner Foods for their evaluation and to support their pre-production contract requirements. Their retort was however a spray retort, and in this heating mode the container is not buoyant, but the full weight of the container needs to be supported by the rack under retort temperatures. The material used for the rack becomes soft at these temperatures and due to the weight the container, the rack had a tendency to sag.

Based on observations that were made both at our facility as well as at the Stegner facility, recommendations were made to SAI to improve the rack in the following areas:

- Correct a wobble in the rack that was from unequal height of the rack
- Correct a few nicks and flashing that could cause container damage
- Reduce pocket size for container so that the tray would have less movement during retorting
- Reinforce rack so that it would not sag under non- buoyant conditions
- Overall strengthening of the rack to withstand plant conditions

A second set of racks were produced and received by mid May. These racks were tested at the FMT facility. The racks were corrected for the wobble and for all nicks and flashing. Also the rack was reinforced by heavier wall thickness and special reinforcement in the corners. The overall dimensions were the same as the first version with the exception of the pocket of the rack. The shrinkage of the rack was similar to the first version. The racks were also evaluated in a water spray retort mode and it was determined that the strengthening of the rack had insufficient impact on the tendency of the rack to sag.

Temperature distribution studies were executed in the beginning of June to study the water flow between the containers by determining the required time to reach retort temperatures at all locations within a retort load. Best results were obtained when the rack was rotated perpendicular to the flow of the water in a static mode or when the retort crate was rotating during the process.

Based on observations that were made both at our facility as well as at the Stegner facility, recommendations were made to SAI to improve the rack in the following areas:

- Either modify the rack design or to change the material properties to make it stronger.

SAI performed complete finite element analysis studies to determine structural requirements of the rack as it was impacted by the various material formulations. These studies were computer modeled to determine their performance under various retort operating conditions. These results were then evaluated and incorporated in the final mold design changes. SAI molded several racks from the newly selected material which is polypropylene based resin enhanced by a glass fiber filling for structural strength (formula code: B06199PFG). This new material has a significant higher stiffness at retort temperatures. Racks were evaluated end of June in both a full water immersion and in a water spray retort mode with no significant sagging of the container pocket in either mode. Shrinkage rates of this rack material both during the injection molding process, as well as during the retort process was significantly less than experienced with the previous material (polypropylene based with mineral filling for structural strength). Injection mold adjustments needed to be made to compensate for this different behavior.

The following observations were made on the third set of racks:

- Racks were larger and did not fit in most retort crates
- No sag in full immersion retort
- Minimal sag (less than 2mm) in spray cook

- Rack dimensions
  - Overall dimension before retorting: 30 6/16" x 25 1/16" x 2 1/4"
  - Overall dimension after retorting: 30 5/16" x 25 1/16" x 2 1/4"
  - Pocket dimension before retorting: 11 11/16" x 9 4/16"
  - Pocket dimension after retorting: 11 10/16" x 9 4/16"

The injection mold was adjusted in July to compensate for different rack shrinkage rate due to a change in the material used for molding the rack. The full set of racks was received end of July and was evaluated in August. Special top plates for these racks were also made received beginning of August. Both the modified rack and the top plates were found to be acceptable.

- Rack dimensions
  - Overall dimension before retorting: 29 7/8" x 24 5/8" x 2 3/16"
  - Overall dimension after retorting: 29 7/8" x 24 5/8" x 2 3/16"
  - Pocket dimension before retorting: 11 1/2" x 9 1/8"
  - Pocket dimension after retorting: 11 1/2" x 9 1/8"

Temperature distribution studies were conducted on this last set of racks. Best performance was again obtained with the racks rotating or when the racks were perpendicular to the water flow in the retort. Based on these results, it is recommended to rotate the racks during the "Come-Up" phase of the retort from a straight up to a vertical position and then to process the product either "up-side down" (as current tray pack product is processed) or in a rotating retort. However, it is recommended that the rotating heating mode is further evaluated to document the benefits and draw backs of this mode on various products.

Companies who would like to order a set of racks for there own use can do so by contacting:

STOCK AMERICA Inc.  
 995 Badger Circle  
 Grafton, WI 53024  
 Tel 414-375-4100  
 Att: Scott Williams

An engineering drawing of the rack with the main dimensions is attached as Appendix #5

### **3.7. Multiple Cycle Capacity (4.2.7)**

This task was not funded

## **4. Appendix**

Attachment #1: Memo to Jesse Burns regarding STOCK 1100 inventory items, dated 2/26/97

Attachment #2: Memo to Jesse Burns regarding STOCK 1100 inventory items, dated 7/15/97

Attachment #3: Memo to STOCK AMERICA regarding Specification for Polymeric Tray Rack, dated September 29, 1998

Attachment #4: Proposal STOCK AMERICA Inc.

Attachment #5: Engineering Drawing Retort Rack and pictures of Injection Molding Tool & Rack

Attachment #1

STOCK 1100 Inventory Items

2/26/97



CENTER FOR  
ADVANCED  
FOOD  
TECHNOLOGY

Food Manufacturing Technology Facility  
120 New England Avenue  
Piscataway, NJ 08854  
908/445-6130 FAX: 908/445-6145

February 26, 1997

Commander  
ATTN:DPSC-HSS/Jesse Burns  
2800 South 20th Street. Bldg. 6-1-D  
Philadelphia, PA 19145

Re: Stock 1100 retort

Dear Jesse:

The following items were received on 2.24/97

Stock SRI-4/1100 Rotary Retort, serial number 64028/1 (bottom vessel) and 64028/2 (top vessel).

Included with this unit were the following:

Bayonet Type Door, Manual Type  
Stock Energy/Water Saving System  
Completely insulated process and storage drum with sheet metal cladding installed  
RTD in Storage Vessel  
Tools and lubrication kits

0603390	special tool for rotor removal
0603230	special tool for rotor removal
0600110	special tool for rotor removal
0602120	special tool for rotor removal
1000286	bolts (4)
1002067	valve packing
1002066	valve packing
1002063	valve packing
1000091	break pin (5)
0502010	brass valve
0101060	Tego Silicon Paste
0900250	Optimol high temperature grease
0900160	Grease Gun Cartridge (2)
0683250	Clamp Down Plate Handle

Detachable crane lifting eye

Fully proportional valves (vent valve SV, PV, pressure control SV, heating PV)

Cage Pulling Rod

Operational Manuals (3)

Not included in this shipment were the following items:

Safety valves (2)

Hot Galvanized 1100 Size Perforated Retort Cages with Lift Plates (8)

Hot Galvanized 1100 Size Wheeled Under Carriages (8)

3 mm Spacer Mats (50)

ICON 2000 Control Cabinet (1) with Allen Bradley series 5 PLC and Xycom Industrial Computer

Wire Harnesses with quick disconnects between Control Cabinet and Wire Panel at Retort (2)

February 26, 1997  
Re: Stock 1100 Retort  
Page 2

Printer (1)  
Printer Cable (1)  
Analog Water Level Sensor and sight glass for working drum (1)  
PV Temperature Transmitter (1)  
Temperature Probes for PV Temperature Transmitter (1)  
P.V. RTD (1)  
S.V. Temperature Transmitter (1)  
Pressure Transmitter (2)  
Warning Lamp (1)  
KT Card (1)  
KT Cable (1)  
2 Pen Taylor Recorder (1)  
MIG Thermometer (1)  
Additional Manuals. (other than Stock's Operational Manual)  
Additional Tools (other than the items identified above)

Sincerely,



Rieks Bruins, Manager  
Food Process Development

RB:d  
cc: Russell Eggers

Attachment #2

STOCK 1100 inventory items

7/15/97



CENTER FOR  
ADVANCED  
FOOD  
TECHNOLOGY

Food Manufacturing Technology Facility  
120 New England Avenue  
Piscataway, NJ 08854  
908/445-6130 FAX: 908/445-6145

July 15, 1997

Commander  
ATTN:DPSC-HSS Jesse Burns  
2800 South 20<sup>th</sup> Street, Bldg. 6-1-D  
Philadelphia, PA 19145

Re: Stock 1100 retort

Dear Jesse:

The following items were received on 6/13/97:

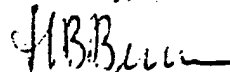
Safety valves (2)  
Hot Galvanized 1100 Size Perforated Retort Cages with Lift Plates (8)  
Hot Galvanized 1100 Size Wheeled Under Carriages (8)  
3 mm Spacer Mats (50)  
ICON 2000 Control Cabinet (1) with Allen Bradley series 5/10 PLC and Xycom Industrial  
Computer  
Wire Harnesses with quick disconnects between Control Cabinet and Wire Panel at Retort (2)  
Printer (1)  
Printer Cable (1)  
Endress & Hansen. Analog Water Level Sensor (1)  
P.V. Temperature Microprocessor. brand name Adalet (1), with RTD  
Signal Transmitter (3), brand name Triad  
Warning Lamp (1)  
KT Card (1)  
KT Cable (1)  
2 Pen Taylor Recorder (1), w/o tubing for pressure input  
MIG Thermometer (1)

Not included in this shipment were the following items:

Sight glass assembly for working drum (1)  
Pressure sensor (2) Note: I received Triad transmitters but are unable to locate the pressure to  
voltage transducers nor any enclosures for these sensors  
The wheeled under carriages (dollies) which were shipped don't fit the retort loading ramp that  
was supplied with the retort  
The sight glass of the storage drum is broken and needs to be replaced

I have contacted Stock America to get resolution both for the missing items as well as the problem  
with the dollies. Stock informed me that they will replace the retort loading ramp to match the dollies.

Sincerely,

  
Rick Bruins, Manager  
Food Process Development

RB:d  
cc: Russell Eggers  
John Coburn  
Scott Williams, Stock America

Attachment #3:

Specification for Polymeric Tray Rack



CENTER FOR  
ADVANCED  
FOOD  
TECHNOLOGY

Food Manufacturing Technology Facility  
120 New England Avenue  
Piscataway, NJ 08854  
908/445-6130 FAX: 908/445-6145  
New Area Code - 732

September 29, 1998

Mr. Scott Williams  
Stock America, Inc.  
3808 West Elm Street  
Milwaukee, WI 53209

Dear Scott:

RE: Polymeric Tray Rack Proposal

Please provide us with a detailed proposal for one hundred (100) retort racks that can be used for the processing of polymeric half steam table trays in our Stock Rotomat SRI 1100-4-BV-ES Retorts.

The following specifications and guidelines are given:

1. The polymeric half steam table tray for which the retort rack is designed, is made by Rexham Containers, 70 West Park Road, Union, MO 63084 (1-800-933-42200) and is referred to be Rexham as Institutional Coex Tray 12.75 x 10.38. This container can either have squared corners or rounded corners. Limited samples of either tray are available.
2. If the racks are manufactured using an injection mold, the injection mold should have the capability to produce retort racks for both the Stock 1100 regular size crate as well as the 25 inch short crate for the Stock 1300 retort as supplied by Stock with the retorts sold to the Government. It is envisioned that this can be accomplished by either "blocking part" in the injection mold or by supplying spacer parts for the crates which would take up the excessive space in the crate. If the proposal relies on the spacer parts to adjust the crate dimensions, then the proposal should include the drawing/sketch of these parts and assurance that these parts will not interfere with automatic retort crate loading equipment.
3. Each retort rack should accommodate four trays.
4. The number of trays per crate should be optimized in regard to the number of layers per crate without sacrificing the temperature distribution within the retort.
5. The retort rack needs to facilitate easy loading and unloading of the trays with the lid stock in either the up or down position. It is envisioned that this can be accomplished by a "double sided rack," and that rack will be turned up-side-down to facilitate the up-side-down loading. The area of the rack that is in contact with the lid stock should be smooth and not contain ridges that can leave a permanent imprint on the lid stock.
6. The retort rack should supply adequate support to the tray during a full water immersion rotating or still retort cycle and not cause defects on either the lid stock, seal area, or tray body.

Mr. Scott Williams  
September 29, 1998  
Page Two

The proposal should also address:

1. SAI experience in the design and manufacturing of new racking systems for this type container
2. Deliverables and responsibilities of SAI
3. Sketch and/or description of the proposed rack
4. Materials used for the retort rack and the expected life cycle of the rack under continuous retort conditions (4 cycles per day, 5 days per week)
5. Cost of racks for Stock Rotomat 1300 Retort
6. Volume discounts
7. Payment terms
8. Ownership of the injection mold, any storage fees and insurance cost for the mold while in SAI's or one of its subcontractor's possession, any license royalty fees for use of the mold by others than combat ration producers, and customer ability to take physical possession of the mold.

Sincerely,



Rieks Bruins

c: John Coburn  
Candace Grace

Attachment #4

Proposal STOCK AMERICA Inc.

October 24, 1998

Mr. Rieks Bruins  
Center For Advanced Food Technology  
Food manufacturing Technology facility  
120 new England Avenue  
Piscataway, NJ 08854

Re: Polymeric Tray Rack Proposal  
Letter Dated September 29, 1998

Dear Rieks,

Thank you for the opportunity to provide a proposal for the Polymeric Tray Rack Program. We have reviewed your specification in detail and provide the following information and proposal for your consideration.

STOCK America has been in the business of designing, engineering, and manufacturing custom injection molded engineered thermoplastic trays for sterilization systems for well over 11 years. STOCK is a single source supplier for these types of programs and provides turn-key responsibility for all phases from, design, engineering, tooling, mold fabrication, prototyping, and production molding. Our unique experience in the field of thermal process establishment insures parameters such as heat distribution, heat penetration, process flow media are maximized. Our designs assure container integrity is maintained, cosmetic blemishes are virtually eliminated, handling ergonomics are optimized, and application specific needs are addressed. STOCK is the only supplier to provide the full spectrum of services and guarantee all aspects of the program. Over the years we have developed several specific recipes of engineered thermoplastic materials and resins specifically for the harsh retorting environment. A great deal of time and expense has been spent on these proprietary formulations. We will not divulge recipe specific information.

Because of the substantial volume of sterilization racks our company manufactures for the industry, we have established a program called *Fast-Track* for new project development. Currently our lead-times for this project would run 8 weeks from receipt of order and downpayment to completion of tooling. Prototypes would then be provided for your approval. Production will follow prototype approval by 2 weeks maximum. Typical lead-times in the mold manufacturing area run 3-4 weeks design, 14-16 weeks tooling, and 4 weeks production; totaling 21 - 24 weeks from start to finish. Our *Fast-*

**Retorts PLUS ...**

*A joint venture between Stock America, Inc. and Allpax Products, Inc.*

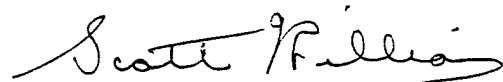
*Track* program will complete this project in 10-11 weeks (pending timely approvals from CAFT).

Over the years many sterilization racks have been developed for the food and pharmaceutical industry. To the best of our knowledge, all of these tools except three have been produced by our team. The other three projects were divided up into several sections, one company did design, one company produced the mold, another supplied the material, while a fourth ran the production. Our approach has been to centralize all aspects of the program into one experienced team.

Enclosed please find our proposal, detailed concept drawings, design scope, response to your specification, and a few examples of sterilization trays, racks, divider sheets, pouch carriers, and spacer mats we have manufactured for our customers. Please do not hesitate to contact us should questions arise.

We look forward to working with you on this project.

Sincerely,

A handwritten signature in cursive script that reads "Scott Williams". The signature is written in dark ink and is positioned above the printed name.

T. Scott Williams

# CUSTOM ENGINEERED CONTAINER HANDLING SOLUTIONS

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## The STOCK America Program

### Overview

STOCK America has been a leader in the design and manufacturing of injection molded retort racks for well over 11 years, and is currently the only manufacturer in North America dedicated to the engineering and manufacturing of these custom products. As a turnkey supplier of custom material handling products, we are the only vendor able to effectively manage your program from start to finish, with complete CAD/CAM engineering, CNC tooling fabrication, and production molding facilities, and thermal processing experts. Our tray, rack, and mat programs have been supplied for processing glass jar, vial, plastic bottles, semi-rigid plastic containers, steel cans, pressurized aluminum beverage containers, and pouch processing applications. Our products have been supplied to processors in the food, pet food, infant formula, and pharmaceutical industries, and are currently employed in systems that utilize steam, steam/air, spray, and full water immersion processes.

### The Staff

We have a complete design, engineering, product development, manufacturing, and thermal processing team to support our clients. We have a solid understanding of thermoprocessing parameters and environments, applications / design experience, material handling background, and materials engineering to provide the proper resins/recipes for each application.

### Material Selection

The development and selection of the proper plastic resins for the retort and sterilization racks has required considerable time and effort. Thermoplastic resins (materials that are formed under heat and pressure, and which can be reformed again through the application of heat) offer a broader selection of mechanical properties than thermoset resins (materials that can only be formed once, via a catalytic reaction) and additionally offer superior price points and complete recyclability. However, for usage in the rigorous field of thermoprocessing, the selection of a thermoplastic resin must take into account several factors, which include:

- Heat deflection
- Flexural modulus
- Hydroscopic resistance
- Chemical resistance
- FDA approval

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Typically, the majority of thermoplastics would start to experience some measure of deflection when exposed to the temperatures normally encountered during the thermoprocess. It is only through the introduction of certain reinforcing materials, including fiberglass, talc, and calcium carbonate, that the heat deflection temperature of a thermoplastic is raised to the required level. With the introduction of certain reinforcements, the flexural modulus, or ductility, of a specific resin can be greatly altered. STOCK America has developed two (2) families of resins, based on this affect. The first resin is quite rigid and dimensionally stable, and is groomed for use in automated handling systems, where full trays may be lifted by their exteriors, and where little human handling and abuse is encountered. The second resin is more ductile in nature, allowing for a higher level of operator abuse as is often witnessed in manual loading and handling systems. Both of these resins are engineered to perform at upwards of 300 degrees F., taking into account the specific loading and support of each application. Some applications have excellent impact resistance, but many of them are hydroscopic in nature, meaning that they have an ability to absorb moisture. The most common of these resins would be nylon. Through repeated thermal processing exposures in a moist environment, materials like nylon can experience "wicking" affect, where portions of their basic chemical make-up are affected, causing the material to be rigid and brittle. Both of the resins that we have developed for thermoprocessing applications are non-hydroscopic, maintaining their original mechanical properties through hundreds of exposures.

Materials used on retorting and sterilization processes may encounter a variety of water make-ups, including exposure to chlorine, bromine, and sodium xelite. Under normal water treatment conditions, our specially formulated, crystalline-based plastic resins will remain impervious to their environment.

Finally, our specially formulated resins are engineered with no hazardous materials, making them FDA approvable, and increasing the end-users level of assurance, when the issue is safety.

## SCOPE OF WORK

1. Rack will be designed to accommodate the polymeric ½ steam table tray manufactured by Rexham Containers.
2. The tooling will be constructed to mold two different size trays. One size will fit the STOCK Model 1100 Retort (standard cage size), while the other will accommodate the STOCK Model 1300 Retort (special 25" depth cage – 5 cage retort version). The racks will differ in only one direction. No spacer will be required in the cages for use of these racks. Spacers would inhibit automating the loading and unloading process and could cause problems with the hydraulic lift mechanisms.
3. Each rack will accommodate 4 trays.
4. Cage capacity will be maximized thru the use of integrated flow channels molded into the floor of the tray. This will minimize the total tray height as well as the stack-up height in a full retort cage. It is our intent to add approximately 3/8" height to the tray height to establish maximum rack height.
5. The rack will maximize open area for optimizing process media flow.
6. The rack will be designed to process either the trays in an upright position (lidstock up), or upside down (lidstock facing bottom).
7. Finished trays will not require post mold trimming. Both tray sizes will be molded to final tray size (trays will not be molded to the larger size and then "cut down" to the smaller size prior to shipment).
8. The retort rack will be designed to provide full support to the polymeric tray to enable use in either rotary or static process modes.
9. The retort rack will be designed to eliminate defects caused by the process cycle to the lid stock, seal area, or tray body.
10. Though STOCK is not the owner of the mold, all applicable storage fees, insurance, and handling costs will be supplied by STOCK at no expense to the customer.
11. Should other potential customers for use of this mold become available (through the STOCK worldwide organization), STOCK will consult CAFT / Defense Department for permission to utilize the mold for a royalty fee (paid to CAFT / Defense Department).

To: Center For Advanced Food Technology

Retorts PLUS ...

120 New England Avenue  
Piscataway, NJ 08854

PROPOSAL #2264-98

ISSUE DATE: October 28, 1998

EXPIRATION DATE: December 28, 1998

ATTN: Mr. Rieks Bruins

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We are pleased to offer the following proposal for your consideration.

**ITEM NO. 1 (Engineering and Injection Mold Tooling)**

Engineering, Manufacturing labor and materials to provide (1) single cavity, insertable, aluminum, water cooled mold, capable of producing retort racks for the polymeric 1/2 steam table tray and provide (2) sample parts from production tooling for approval.

TOTAL ITEM NO. 1 .....

**ITEM NO. 2 (Initial 100 Piece Production Run)**

100 Molded Retort Racks For Polymeric 1/2 Steam Table Tray  
For STOCK Model 1100 Rotomat Standard Cage Size .....

100 Molded Retort Racks For Polymeric 1/2 Steam Table Tray  
For STOCK Model 1300 Rotomat Special Cage Size .....

**ITEM NO. 3 (Volume Discounts Applied For Larger Production Runs)**

200 Molded Retort Racks For Polymeric 1/2 Steam Table Tray  
For STOCK Model 1100 Rotomat Standard Cage Size .....

200 Molded Retort Racks For Polymeric 1/2 Steam Table Tray  
For STOCK Model 1300 Rotomat Special Cage Size .....

500 Molded Retort Racks For Polymeric 1/2 Steam Table Tray  
For STOCK Model 1100 Rotomat Standard Cage Size .....

500 Molded Retort Racks For Polymeric 1/2 Steam Table Tray  
For STOCK Model 1300 Rotomat Special Cage Size .....

1,000 Molded Retort Racks For Polymeric 1/2 Steam Table Tray  
For STOCK Model 1100 Rotomat Standard Cage Size .....

1,000 Molded Retort Racks For Polymeric 1/2 Steam Table Tray  
For STOCK Model 1300 Rotomat Special Cage Size .....

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**GENERAL NOTES:**

- 1) All plastic components to be molded from 100% virgin materials. No regrind of pre-molded parts will be used.
- 2) Color - Natural

**DELIVERY:**

Engineering Completion: 1-2 weeks after Engineering Start.  
Production Tooling  
Completion and Samples: 7 weeks after Production Tooling Start.  
Production: 2 weeks after Prototype Sample Approval.

**PAYMENT TERMS:**

Tooling:

- 60% - Down payment with purchase order (Note: all prices are in US dollars)
- 40% - Upon Receipt of Prototype

Production:

NET 30

**FRIEGHT:**

F.O.B. Shipping Point, pre-paid and added.

Attachment #5

Engineering Drawing Retort Rack  
Pictures of Injection Molding Tool  
Pictures Retort Rack  
Picture Top Plate



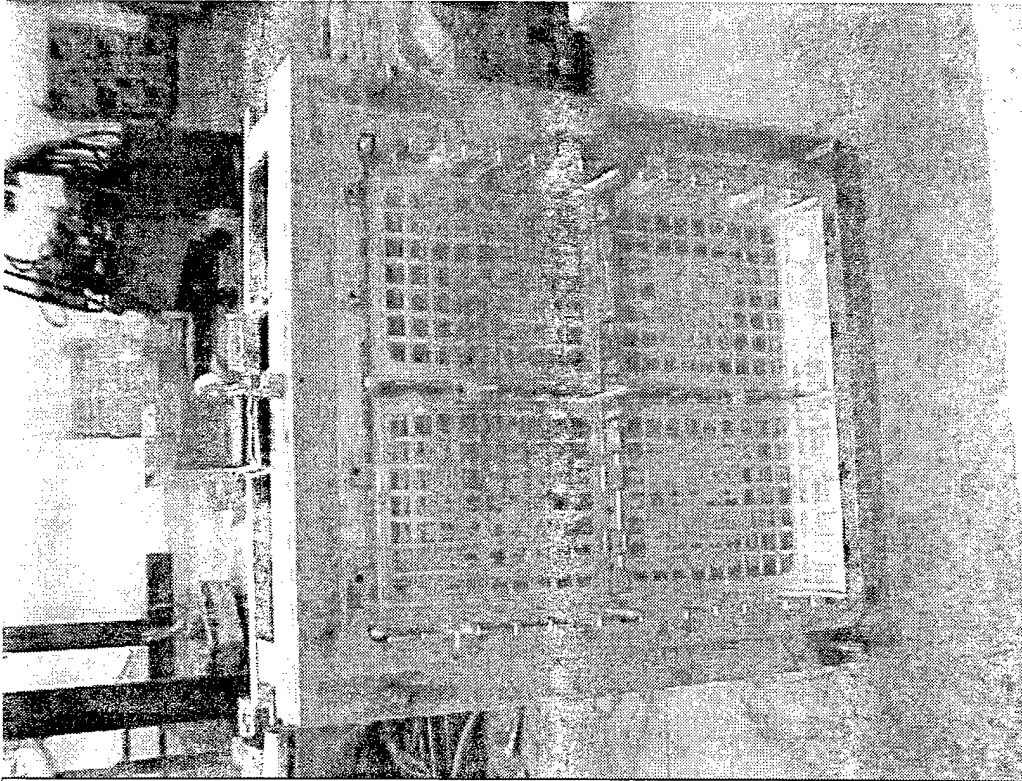


Figure 1: Top Injection Mold

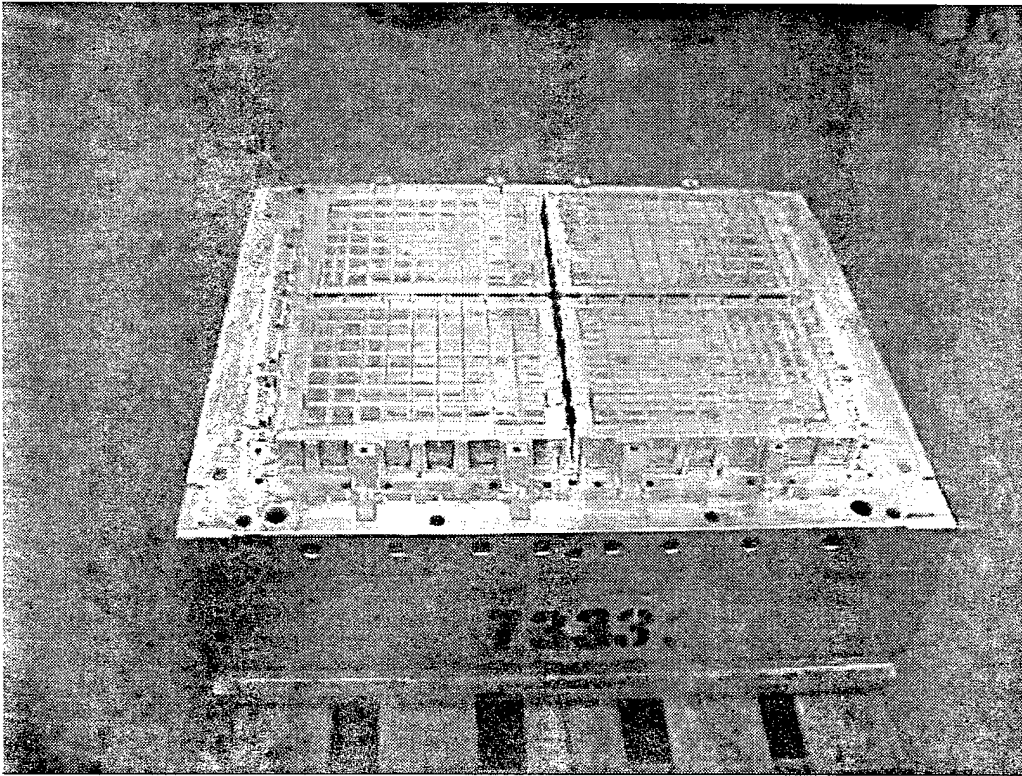


Figure 2: Bottom Injection Mold

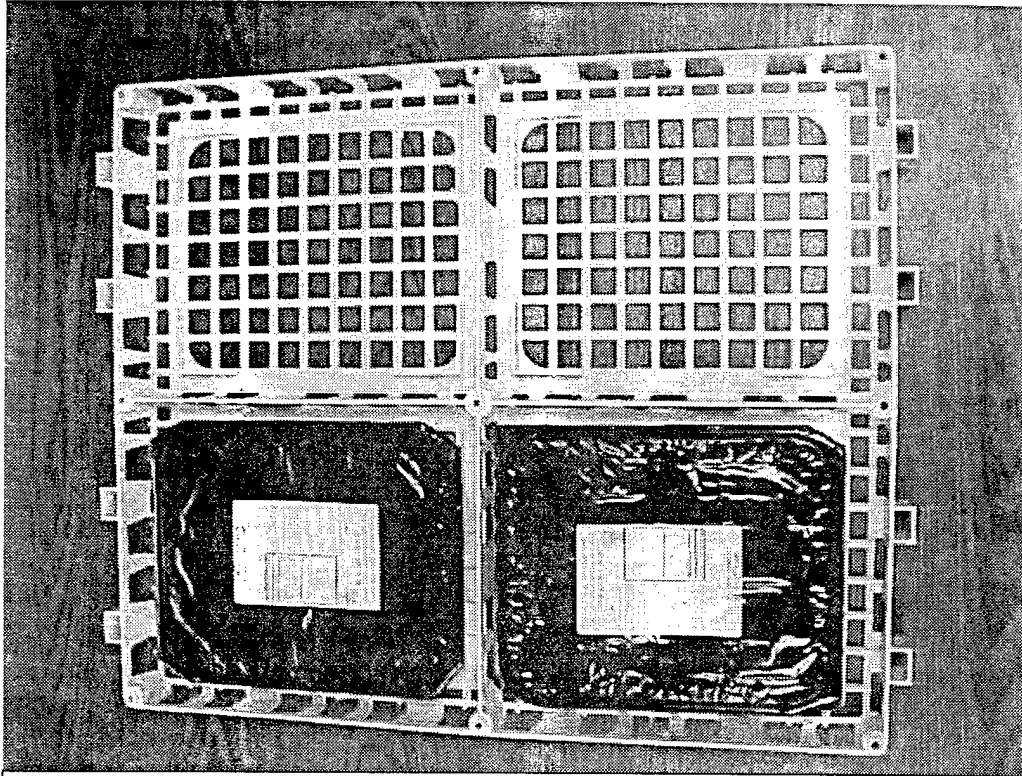


Figure 3: Top View Rack

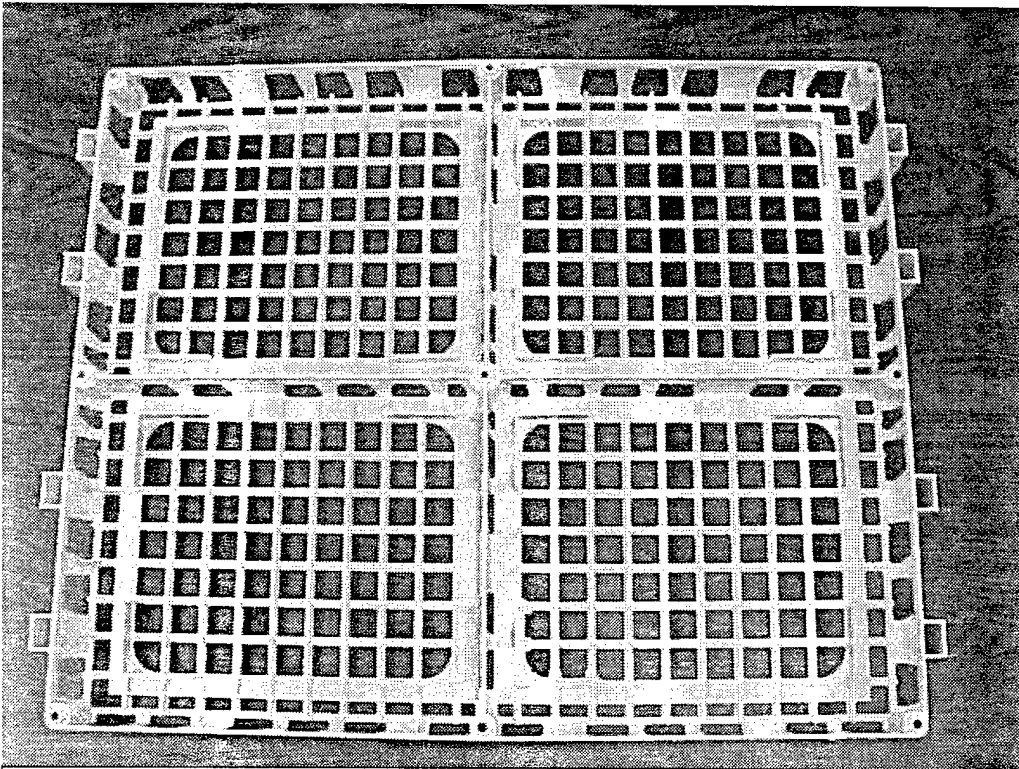


Figure 4: Top View Rack

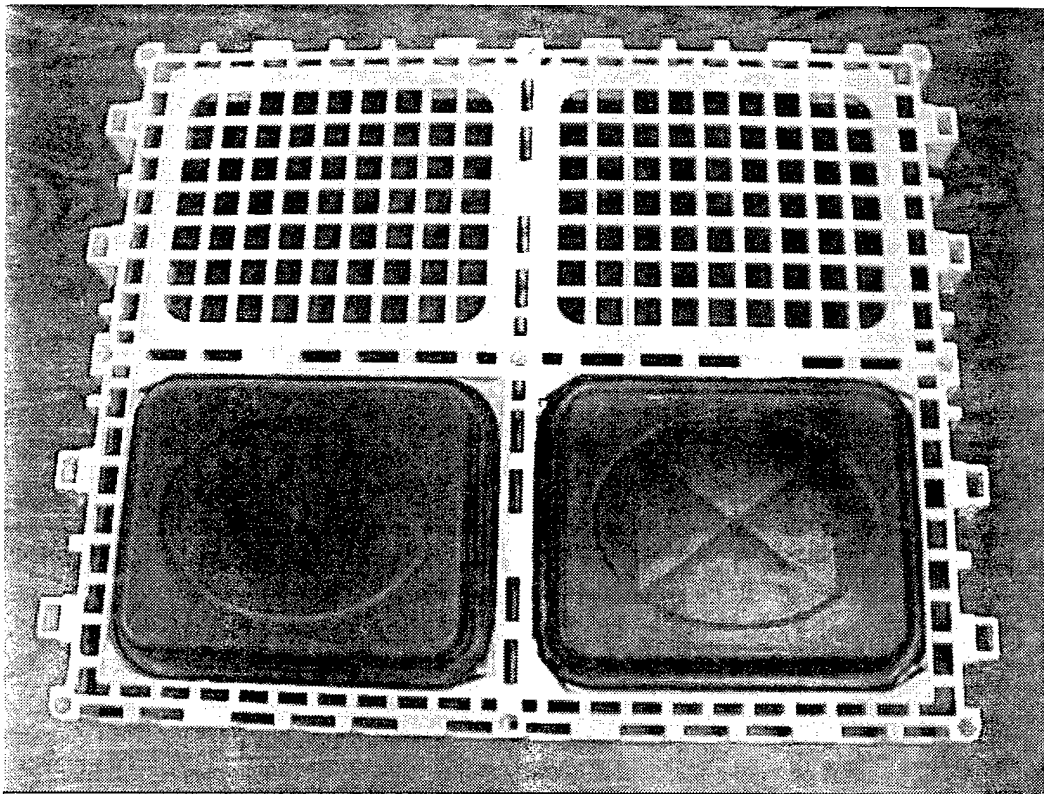


Figure 5: Bottom View Rack

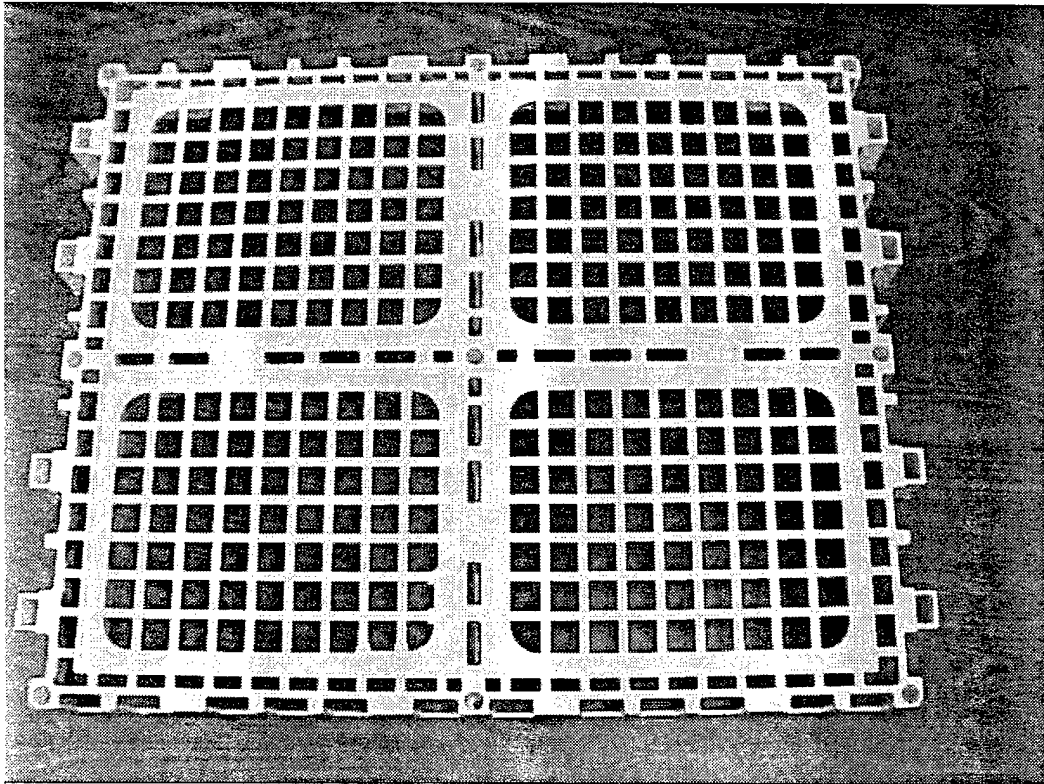


Figure 6: Bottom View Rack

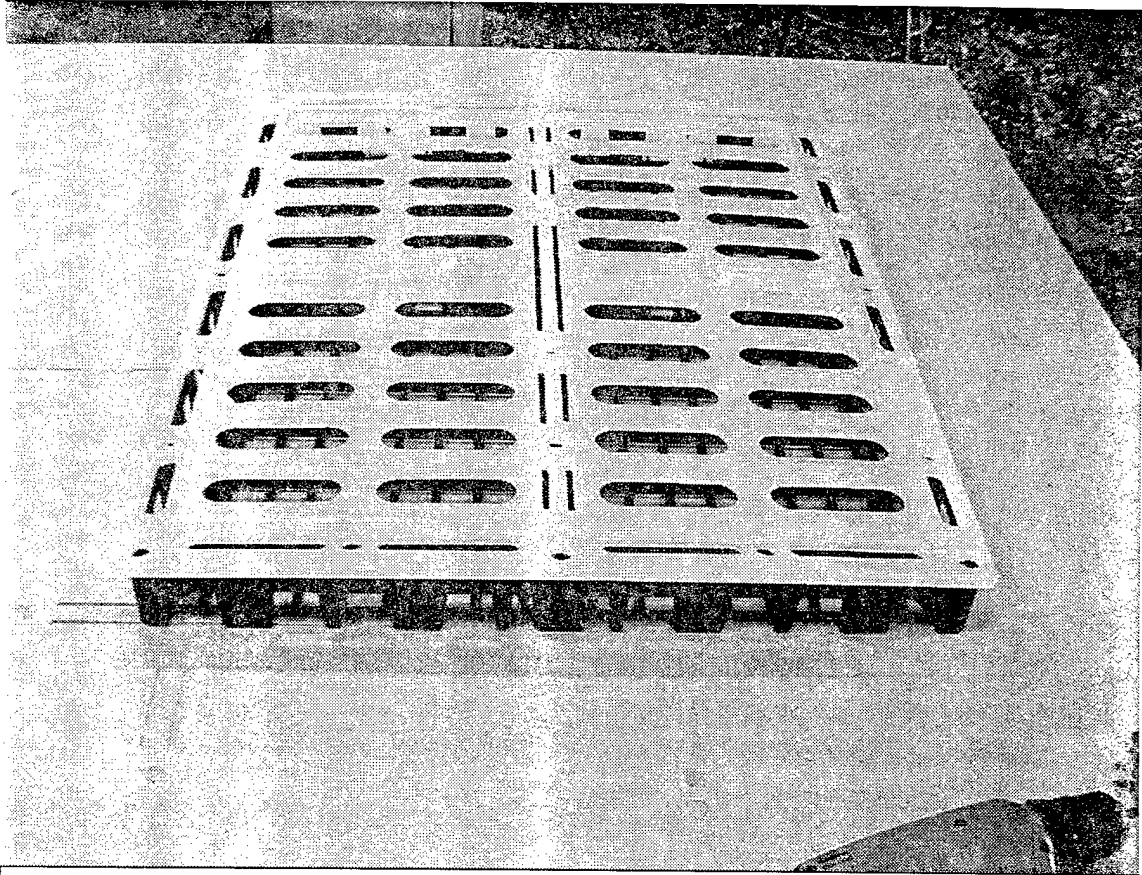


Figure 7: Top Plate