HYDRODYNE

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In order that this report might stand by itself, a brief description of its goals is as follows. The equipment to tenderize meat by immersing the meat in water in which a small amount of high explosive is detonated was to be designed, fabricated and tested. The equipment was then to be shipped and installed near the ARS Meat Science Laboratory in Beltsville, MD. There further testing was to be done to establish performance characteristics. It was to be shown as an operating plant to meat producers who were potential customers.

DESIGN

As of this date, the design and drawings are completed. The drawings remain to be checked and approved by Pius Chao PhD PE, our consultant in San Leandro, CA. The design is a result of collaboration with Dr. Chao and Don Waits who is Chief Engineer of Allied Engineering and Production Corp in Alameda, California. Before a stress analysis of the equipment could be accomplished, it was necessary to know more exactly the physical results of the two part explosive which is used. These tests were done in Riverton Kansas by Universal Tech Corp. Research Laboratory. The tests established the initial velocity of the shock wave, the shape of the wave, and the pressure at the tank wall. These results were different from the data used in the original design, which was based upon data derived from experiments using TNT. This new information permitted a different and simpler method of equipment support and shock mitigation, and the result was an entirely new design for what was described in the original report as the "Water Deflecting Cone". The new design still deflects water back into the tank, but is not suspended by a hydraulic shock absorber. This design resembles a large automobile muffler which serves to suppress noise as well as contain all of the water thrown upward from the explosion. This part has been named "The Shroud".

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A HYDRODYNAMIC METHOD FOR TENDERIZING MEAT

MASTER

NEW PATENT

Our patent attorney, Mr. Sheridan Neimark, of Washington D.C. is of the opinion that the design of The Shroud has novelty and is patentable. As required in the Grant Document, the DOE patent department has been notified of the development. It is our desire that the patent work be done by our attorney.

FABRICATION

Materials for the entire unit have been ordered through Allied Engineering Corp. Material for the large stainless steel tank has arrived, and machine work on it has started. It is estimated that fabrication will be completed in late March or the first week in April for all of the equipment.

TESTING OF THE UNIT

During my initial trip to California to finalize the design of the equipment, I also met with personnel at the Lawrence Livermore National Laboratory. The Lawrence Lab. was the primary design laboratory for nuclear weapons from the 60's onward. This facility includes a conventional explosive testing site which is as well equipped as any in the free world. The personnel at the test site reviewed the requirements of the test, and made the site and its facilities available to us. We will be charged actual costs, but no overhead burden. The purpose of the test is to determine that the stresses produced in the equipment by the explosion are within safety standards, and it also allows us to compare the results with our calculations.

PROTOTYPE PLANT IN VIRGINIA

The completed and tested equipment is to be installed in a new prototype plant in Roanoke, Virginia. It was originally planned that the equipment would be installed in a building made available at ARS in Beltsville. The refurbishing of this facility and installation of the equipment was estimated at \$18,000.00. Further, the facility was too small to install the equipment as it would exist in an operating plant. A new corporation was formed by Eric Staton in Virginia, and a building is being erected specifically for the Hydrodyne equipment. The Hydrodyne equipment will be loaned to Tender Wave Inc., the new corporation. In return, the plant will be available to Hydrodyne for testing of the equipment, possible additions or changes to the equipment, and testing of meat samples which are a part of the continuing CRADA between ARS in the person of Dr. Morse Solomon and Hydrodyne. Further, the plant and equipment will be available to show to prospective users of the Hydrodyne Process. Lisa Barnett was notified of this change in plans from those described in the original proposal.

NEW DEVELOPMENTS

At a meeting of the International Congress of Meat Science and Technology in San Antonio, Texas in August of last year, Dr. Morse Solomon presented a paper describing the Hydrodyne Process. In discussion following the presentation it was mentioned that exposure of meat to very high pressures (10,000 psi +) killed bacteria on the meat. Since the E-Coli bacteria event in the Pacific Northwest, a continued effort has been in place to provide a solution to this problem. The Hydrodyne Process subjects meat to pressures of several thousand psi for fractions of a millisecond. It was obvious that tests should be done to examine whether the Hydrodyne Process also kills bacteria. The tests were done at ARS, and the answer is yes. The percentge of bacteria that is killed is still to be determined. Killing bacteria during the tenderizing process will increase the shelf life of the meat. This could be as significant as tenderizing. Pork also was tested to determine the degree of tenderness produced by the Hydrodyne Process. The results were quite satisfactory. In addition, the amount of "purge", a fluid that exudes from meat on the shelf, was 15%less with the meats exposed to the Hydrodyne Process.

TESTS & POTENTIAL USERS

It was intended originally that testing would continue after the equipment was installed in Virginia. However, subsequent to Dr. Solomion's presentation in Texas, several rather urgent requests from potential users of the equipment were made. The inquiries came from the American Sheep Institute to determine the effect of Hydrodyne on Callipyge sheep. The tests were done, and Hydrodyne appeared to be the most effective system overall. Excel, the third biggest meat producer in the U.S., invited us to present the data to the management in Kansas. The results were quite positive. Other inquiries have come from Australia, Costa Rica, and Scotland. Several of these wanted the prototype equipment. It has been decided that it is in the best interests of Hydrodyne to postpone any commitments until the equipment is installed in the prototype plant and evaluated. Other testing includes meat that is being prepared for a Taste Test Panel under the Supervision of Dr. Solomon.

BASIC INVESTIGATION

Dr. Solomon will start the research to determine the change in meat fibers that produces the effect of "tenderness". He will compare that change produced by conventional tenderizing processes and the Hydrodyne Process.

CRADA

Hydrodyne Inc. extended its Cooperative Research and Development Agreement with ARS for two years commencing October 1995 using funds outside the DOE grant.

Sincerely

John B. Long
Project Manager

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