SYTEC INC.
Systems Technology
2525 South Oneida Street
Appleton, Wisconsin 54915
(414) 734-2500

Applicant Mar-24 III
Check No. 1006 $120.00
Amount (3D) 3P
Type of Fee
Date Check Rec'd 4/1/85
Received By

March 20, 1985

RECEIVED
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U.S.N.R.C.
LIC. FEE MGMT. BRANCH

Ms. B. J. Holt
U. S. Nuclear Regulatory Commission
Materials Licensing Section
Region III
700 Roosevelt Road
Glen Ellyn, IL 60137

Dear Ms. Holt:

SYTEC, Inc., would like to add one new customer site to our current NRC License Ammendment Control #78509.

The new site is:

Gilbert Paper Division
Mead Corporation
P.O. Box 260
Menasha, WI 54952

The gauging devices that will be serviced at this site are manufactured by LFE Corporation. SYTEC received radiation safety training and routine source housing maintenance training from Mr. William Prendergast of LFE the week of January 9, 1985. Mr. Prendergast's training program has been approved by the NRC. Four SYTEC Technical Representatives received certification by Mr. Prendergast to perform the above on LFE equipment:

Greg Horton
Ray Clark
Larry Hentges
Richard Stith

Copies of their certificates are included with this ammendment. I also received certification, but will not perform any maintenance on the equipment.

The sources that will be serviced at Gilbert Paper Company are:

Source Model #	Source Type	Serial Number
SCL-77A	Kr-85	5818
SCL-77A	Kr-85	8511

Enclosed are the necessary additions to the SYTEC Radiation Safety manual.

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REGION III

MAR 25 1985

CONTROL NO. 78509

Also in this ammendment, SYTEC would like to add a new source at a current site. The site is Container Corporation of America in Philadelphia, PA. The new source is a Fe-55, manufactured by Columbia Scientific Industries and has an activity of 2 mci.. SYTEC wishes only to perform source wipe tests and shutter inspection.. No maintenance will be performed by SYTEC on this device.

Source Model #	Source Type	Serial Number
740	Fe-55	1502LG

Mr. Dean Taylor, who was approved by the NRC on February 24, 1984, will service this device.

Also enclosed in this letter is a check for the required fee for ammendment.

If you have any questions, feel free to call me. Thank you.

Sincerely,

Allison Blackmer

Allison Blackmer
Radiological Officer

6.6 LFE Gauging Devices

Function

The function of the Beta Gauge Detector Unit is to collect and convert to a useable electrical signal those beta or gamma rays that reach it from a radioisotope source. The radioisotope source is located on one side of the material to be measured and the Detector Assembly which converts the radioactive energy to an electrical signal, on the other.

Physical Configuration

The Detector Unit is an aluminum casting housing the following basic functional components as shown in Fig. 6.6.

A. Detector window
B. Gap temperature thermistor
C. Detector collimator
D. Ionization chamber
E. Pre-amplifier

Principal of Operation

If two electrodes are suspended a short distance apart in air and an electric potential is placed across them, no current will flow, since the air between the electrodes is an insulator acting to break the circuit. The two electrodes and the air between them form what is known as an ionization chamber.

If high speed electrons, that is beta particles, are allowed to enter this air, they will "collide" with the atoms of air, yieling some of their energy of motion to the atoms in such a way as to divide some of the normally uncharged atoms into two equally opposite charged sections called ions. The ions, being charged, are attracted to and collected on the electrode with an opposite charge, and the migration of ions across the gas constitutes an electrical current between the electrodes. If the material to be measured is placed between the radioisotope source and the detector, some of the beta particles will be absorbed by the material and the corresponding change in the electrical signal generated in the ionization chamber will be proportional to the change in thickness of the material being measured.

Detector Window

The function of the detector window is primarily to keep internal parts of the head dry and clean. It is made of either aluminum or mylar, as thin as practical, so that it stops a minimum of radiation. A corrosion resistant metal ring holds the window taut over a rubber "O" ring seal. This window is replaced by removing the metal ring should it become damaged with use.

Detector Collimator

The detector collimator is mounted between the detector window and the ionization chamber. It consists of material arranged in a specific geometric pattern that is placed in the path of the electrons entering the chamber. Its function is to selectively absorb or deflect the electrons in a manner to make the number which reach the chamber as constant as possible even if the detector unit moves with respect to the source unit, or the measured material moves in the gap between source and detector.

Ionization Chamber

The ionization chamber consists of a cylindrical shell with a thin window to allow electrons in with minimum interference. In the center of this sheel, and carefully insulated from it, is the anode which collects the negative ions. The shell has a negative voltage applied to it and becomes the cathode. Internally, the chamber is carefully cleaned and filled with a gas (usually Argon or Xenon) to increase the number of atoms available for collision with electrons, and hermetically sealed.

Source Housing Assembly Models SCL-, SC-, SO-, SN-

Function

The source housing assembly provides: (1) a radioactive source, (2) a fail-safe shutter to close the source when not in use, (3) a means of directing the Beta particles toward the detector.

Physical Configuration

In transmission gauging systems, the source housing assembly is positioned oposite the detector unit with the process web passing between them. Source housings, Fig. 6.7, vary with the application Source housing assemblies, in general, will be comprised of a source housing cover plate assembly and a cast iron or aluminum source housing body.

The source housing cover plate assembly consists of a carbon steel cadmium plated cover plate which mounts:

A. The outer source window, window clamp ring, and "O" ring.
B. The source collimator.
C. The source holder bracket.
D. The source holder.
E. The fail-safe shutter mechanism.

The source housing provides:

A. For attaching and enclosing the source housing cover plate assembly.
B. Assistance in keeping the radiation level low
C. Access for electrical/pneumatic power for operating the source shutter mechanism
D. The thermistor assembly.

Principle of Operation

The source housing provides a directed beam of Beta particles to the measured media. Some of these particles will travel through the measured medium to ionize the gas in the Detector Unit. The quantity of particles reaching the Detector Unit is directly proportional to the weight per unit area of product through which they pass.

The emission of Beta particles by the radioisotope takes place in all directions within the source housing. However, due to the construction of the source housing, the only path by which they can escape is through the source capsule window and the outer source housing window. As the Beta particles leave the source housing they are "focused" by the collimator between the source capsule window and the outer source housing window. The pattern of radiation leaving the source housing is determined by the geometrical configuration of the collimator. Also, the scattering of the Beta particles is greatly reduced, which helps maintain a low radiation profile.

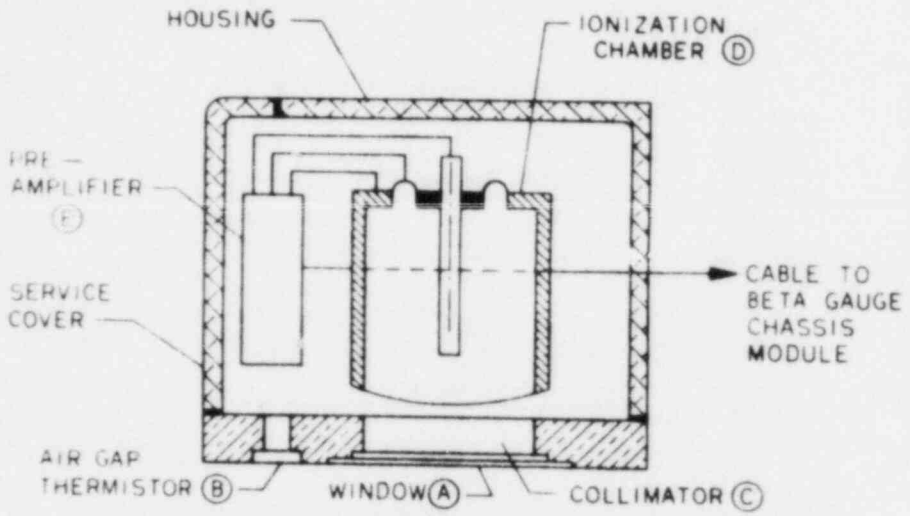

FIG. NO. 1

Figure 6.6

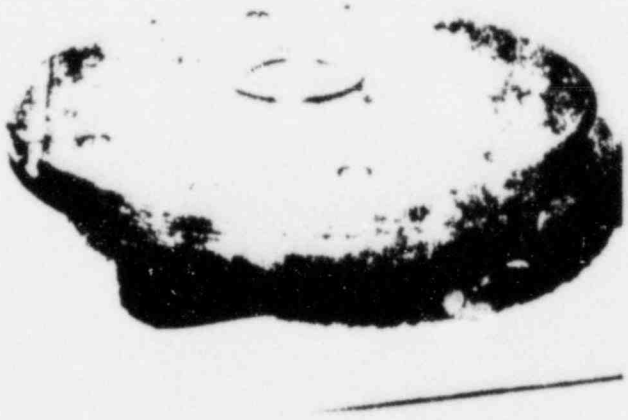

Figure 6.7

LFE CORPORATION

CERTIFICATE

LFE CORPORATION

THIS IS TO CERTIFY THAT LARRY R. HENTGES

SUCCESSFULLY COMPLETED A 16 HOUR COURSE IN RADIATION TECHNOLOGY. SUBJECTS INCLUDED WERE:

STRUCTURE OF THE ATOM
THE ELEMENTS
PRINCIPLES OF RADIOACTIVITY
PRODUCTION OF X-RAYS
CHARACTERISTICS OF RADIOISOTOPES
INTERACTION WITH MATTER
RADIOACTIVE DECAY
UNITS OF RADIOACTIVITY
DESIGN OF RADIOACTIVE SOURCES
DETECTION OF RADIATION
DETECTION STATISTICS
COUNTING EFFICIENCY
PRINCIPLES OF RADIATION GAUGING
GEIGER TUBE SURVEY METER
UNITS OF RADIATION EXPOSURE
ION CHAMBER SURVEY METER
LICENSING
NRC AND AGREEMENT STATES
SOURCE CHECKING
PROTECTION AGAINST RADIATION
BIOLOGICAL EFFECTS OF RADIATION
RADIATION SAFETY OFFICER
TRANSPORTATION OF RADIOACTIVE MATERIAL
CALIBRATION OF SURVEY METERS
EMERGENCY PROCEDURES
REPORTING INCIDENTS

PRESENTED AT:

Sytec, Inc.
Appleton, Wisconsin

January 8 and 9, 1985

William R. Prendergast

William R. Prendergast
Radiation Safety Officer
LFE Corporation

LFE CORPORATION

CERTIFICATE

LFE CORPORATION

THIS IS TO CERTIFY THAT GREGORY L. HORTON

SUCCESSFULLY COMPLETED A 16 HOUR COURSE IN RADIATION TECHNOLOGY. SUBJECTS INCLUDED WERE:

STRUCTURE OF THE ATOM
THE ELEMENTS
PRINCIPLES OF RADIOACTIVITY
PRODUCTION OF X-RAYS
CHARACTERISTICS OF RADIOISOTOPES
INTERACTION WITH MATTER
RADIOACTIVE DECAY
UNITS OF RADIOACTIVITY
DESIGN OF RADIOACTIVE SOURCES
DETECTION OF RADIATION
DETECTION STATISTICS
COUNTING EFFICIENCY
PRINCIPLES OF RADIATION GAUGING

GEIGER TUBE SURVEY METER
UNITS OF RADIATION EXPOSURE
ION CHAMBER SURVEY METER
LICENSING
NRC AND AGREEMENT STATES
SOURCE CHECKING
PROTECTION AGAINST RADIATION
BIOLOGICAL EFFECTS OF RADIATION
RADIATION SAFETY OFFICER
TRANSPORTATION OF RADIOACTIVE MATERIAL
CALIBRATION OF SURVEY METERS
EMERGENCY PROCEDURES
REPORTING INCIDENTS

PRESENTED AT:

Sytec, Inc.
Appleton, Wisconsin

January 8 and 9, 1985

William R. Prendergast

William R. Prendergast
Radiation Safety Officer
LFE Corporation

CONTROL NO. 85509

LFE CORPORATION

CERTIFICATE

LFE CORPORATION

THIS IS TO CERTIFY THAT Richard C. Stith

SUCCESSFULLY COMPLETED A 16 HOUR COURSE IN RADIATION TECHNOLOGY. SUBJECTS INCLUDED WERE:

STRUCTURE OF THE ATOM
THE ELEMENTS
PRINCIPLES OF RADIOACTIVITY
PRODUCTION OF X-RAYS
CHARACTERISTICS OF RADIOISOTOPES
INTERACTION WITH MATTER
RADIOACTIVE DECAY
UNITS OF RADIOACTIVITY
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CALIBRATION OF SURVEY METERS
EMERGENCY PROCEDURES
REPORTING INCIDENTS

PRESENTED AT:

Sytec, Inc.
Appleton, Wisconsin

January 8 and 9, 1985

William R. Prendergast
Radiation Safety Officer
LFE Corporation

LFE CORPORATION

CERTIFICATE

LFE CORPORATION

THIS IS TO CERTIFY THAT ALLISON K. BLACKMER

SUCCESSFULLY COMPLETED A 16 HOUR COURSE IN RADIATION TECHNOLOGY. SUBJECTS INCLUDED WERE:

STRUCTURE OF THE ATOM
THE ELEMENTS
PRINCIPLES OF RADIOACTIVITY
PRODUCTION OF X-RAYS
CHARACTERISTICS OF RADIOISOTOPES
INTERACTION WITH MATTER
RADIOACTIVE DECAY
UNITS OF RADIOACTIVITY
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TRANSPORTATION OF RADIOACTIVE MATERIAL
CALIBRATION OF SURVEY METERS
EMERGENCY PROCEDURES
REPORTING INCIDENTS

PRESENTED AT:

Sytec, Inc.
Appleton, Wisconsin

January 8 and 9, 1985

William R Prendergast

William R. Prendergast
Radiation Safety Officer
LFE Corporation

CONTROL NO. 7 8 5 0 4

SYTEC INC.
Systems Technology

2525 South Oneida Street
Appleton, Wisconsin 54915
(414) 734-2500

March 15, 1985

Ms. B. J. Holt
U. S. Nuclear Regulatory Commission
Materials Licensing Section
Region III
700 Roosevelt Road
Glen Ellyn, IL 60137

Dear Ms. Holt:

SYTEC, Inc., would like to add one new customer site to our current NRC License Ammendment Control #76623.

The new customer site is: Appleton Waste Water Treatment Plant
City of Appleton
59 Weimer Court
Appleton, WI 54911

The site will be serviced by Greg Horton, who received NRC approval through the original License dated February 24, 1984.

The source device that will be serviced at Appleton Waste Water Treatment Plant, manufactured by Kay-Ray, is a Cs-137 source with an activity of 500 mCi:

Source Type	Source Serial Number	Device Model Number
Cs-137	5032	7050B

Enclosed are the necessary additions to the SYTEC Radiation Safety Manual. I have been in contact with Kay-Ray and they agree that SYTEC'S source wipe procedures, safety procedures and general maintenance procedures are in accordance with their specifications.

If you need further information, feel free to call me.

Sincerely,

Allison Blackmer

Allison Blackmer
Radiological Officer

6.5 Kay-Ray

The Kay-Ray Model 3600E Density System is a rugged, non-contacting industrial instrument designed to continuously monitor the density of a liquid or slurry. The density measurement is performed by projecting a beam of gamma radiation into one side of a pipe section and measuring the amount of radiation which passes through the pipe. As the material flowing in the pipe section becomes dense more and more of the radiataion beam is absorbed and the strength of the radiation field outside of the pipe is decreased. The relationship between product density and radiation absorption forms the basis for density measurement by the 3600E System.

The basic 3600E Density System is comprised of three units:

The source housing, which contains the radioactive material.

The detector, which is used to convert the radiation field into a proportional electric current.

The electronics unit, which is used to amplify and scale the detector output and provide the customer with useable signals for monitoring, recording or controlpurposes.

The 3600E Skystem outputs may be scaled in any density related units such as Specific Gravity Units, Percent Skolids, Baume, etc. In addition to the bvasic system, various options may be ordered such as a signal linearizer, alarm contacts, or an isolated current output.

The source housing contains the radioactive material, usually Cesium -137. The exact model of source housing supplied with the system is dependent upon the amount of radiation material and the beam pattern necessary for the application. In all cases, the actual source material is double encapsulated in stainless steel and surrounded by lead walls in in a welded steel casement. Kay-Ray source housings are designed to insure that all radiation levels meet or exceed government safety requirements. An opening in the source housing defines the shape of the radiation beam. A lead shutter block is provided as an integral component of the source housing. Operated by an external shutter handle, the shutter may be locked in the store or closed position for safety in storage, shipment or installation of the unit. The measure position of the shutter handle removes the shutter block during actual process measurement and a third position, reference, places an absorber block in the beam path for use during standardization procedures. 7062P, 7063P and 7064P source heads are equipped with a two-position shutter providing the "store" and "measure" functions described above. A sliding reference is normally supplied with this type of sorce housing to provide the "reference" function.

The source housing is normally mounted on a pipe saddle and oriented so that the radiation beam passes through the pipe to the detector on the opposite pipe wall.

The detector unit contains an ion chamber type radiation detector which provides a low level current signal ;output proportional to the strength of the radiation field. In addition to being very sensitive, the ion chamber is a highly stable device capable of detecting very small changes in radiation levels. This quality of high resolution is especially important when measuring narrow density spans. In essence, the detector is a sealed chamber filled with a pressurized heavy gas which ionized when struck with the radiation beam. The amount of ionization is directly proportional to the strength of the radiation. A voltage potential, applied to the chamber wall forces the charaged ions toward a collection rod in the center of the chamber from which the current level output of the device is taken. The ion chamber is housed in an explosion proof enclosure, which is temperature controlled to prevent condensation of moisture on the detector seals and connections. Maintaining the detector housing at a constant temperature also eliminates the effects of the slight ion chamber temperature coefficient. The detector is normally mounted on the pipe saddle opposite the source housing.

Source Wipe Procedures for the Kay-Ray Model 7050B

There is no disassembly required to wipe the Kay-Ray Model 7050B source housing.

1. Lock the shutter mechanism in the "store" position.

2. Utilizing the survey meter, perform an initial radiation survey of the area around the source housing.

3. If radiation is not detected, wipe all seams on the source housing as shown in Figure 5.

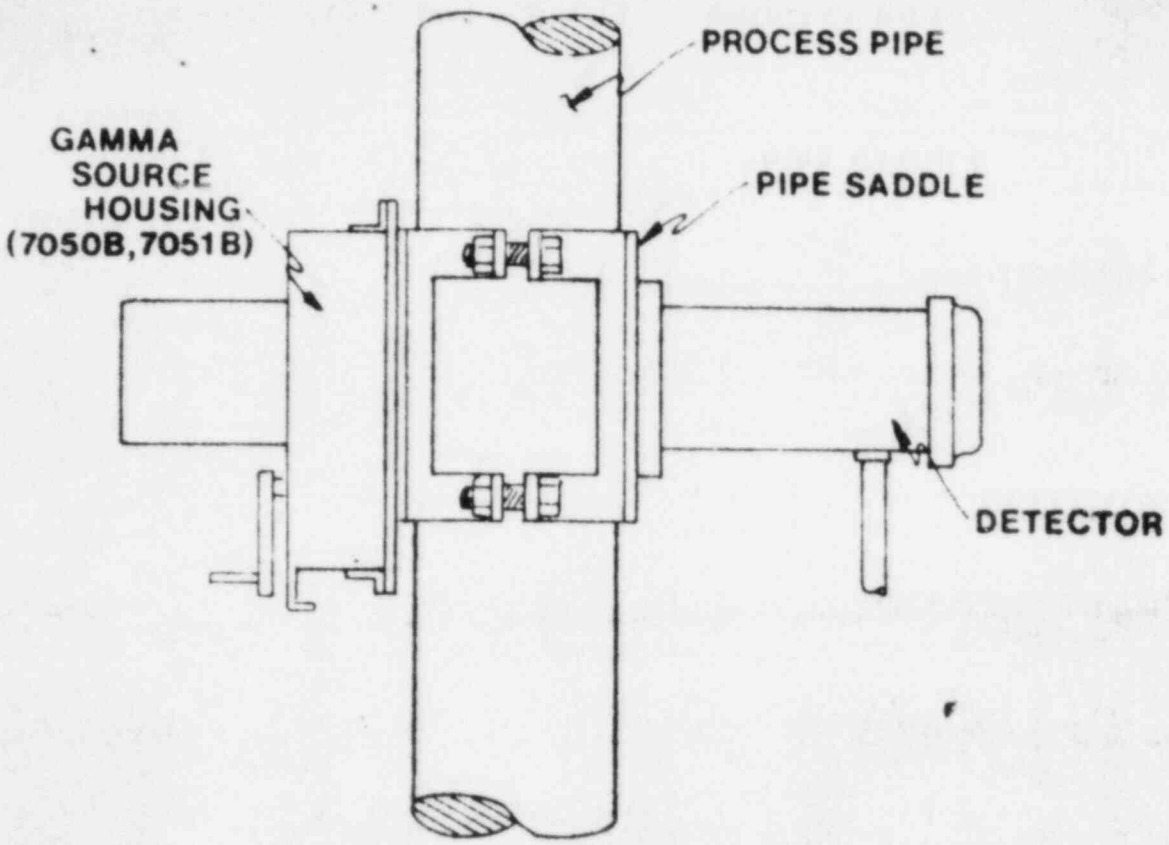
4. Send the wipe test to the laboratory as specified in the Radiation Safety Manual.

5. If radiation is detected, notify the Corporate Radiation Safety Officer and follow the established emergency procedures as outlined in the Radiation Safety Manual.

6. Retain two copies of the results of the source wipe on the customer's site. One in SYTEC'S file and one in the customer's file.

The maximum interval between source wipes that is allowed for this equipment is three years.

CONTROL NO. 78534


PROCESS PIPE
GAMMA
SOURCE
HOUSING
(7050B,7051B)
PIPE SADDLE
DETECTOR

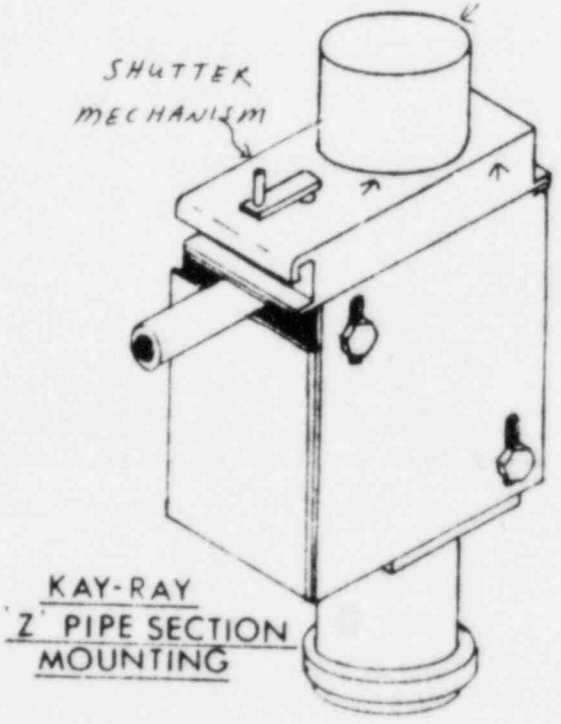

SHUTTER
MECHANISM
KAY-RAY
2" PIPE SECTION
MOUNTING

Figure 6.5