



MAGNETIC ANALYSIS CORPORATION

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TRAINING AND INFORMATION PROGRAM EDDY CURRENT

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INTRODUCTION

Since installation of the first electromagnetic inspection equipment in this country in the mid 1930's, Magnetic Analysis Corporation has attempted to provide its customers with training services to assure that operators of the equipment we sell & lease, are properly instructed in the use of the instrument. In addition, our company has on numerous occasions, conducted special short-term courses on eddy current theory and application where the needs of the particular customer justified the time and expense.

In an effort to improve the reliability of non-destructive techniques, the American Society for Non-destructive Testing has instituted a program of personnel qualification and certification. This program applies to employers who utilize eddy current test techniques.

As part of our continuing service to our customers, MAC has now revised and upgraded our training program. This program is also offered to companies or individuals who are not now our customers. This leaflet describes the eddy current program and its intended purpose.

TRAINING AND INFORMATION PROGRAM TIP-A

Theory and Application of Eddy Current Inspection Equipment - Five Days (forty (40) hours)

1. To provide background and understanding of fundamental principles of eddy current inspection.
2. To familiarize students with general types of eddy current test systems, their relative advantages and shortcomings.
3. To illustrate and explain the application of eddy current test systems to meet modern inspection requirements and normal industrial or government specifications.

Course of Study

The course outline (see pages 6,7 and 8) has been drawn to conform to the requirements of the ASNT, recommended practice SNT-TC-1A for both Level I and Level II.

In addition, the course includes suitable material on the practical application of eddy current systems to actual inspection problems.

A combination of lectures, discussions and laboratory sessions will be utilized to provide instruction. A variety of eddy current equipment will be available together with sample materials. Because of the limited class size, each student will have an opportunity to participate directly in the discussions.

This is a progressive training course; i.e., consideration as Level I is based on satisfactory completion of the Level I training course; consideration as Level II is based on satisfactory completion of both Level I and Level II training courses.

Topics in the training outline may be deleted or expanded to meet the employer's specific applications or for limited certification and may be accompanied by a corresponding change in training hours.

Texts

The necessary text material is provided by MAC.

Tests

Since many students will be undertaking this course of study to prepare for certification as Level I or Level II personnel, questions from ASNT-TC-1A will be included as part of the written examinations.

Diploma

Upon satisfactory completion of the course of study and performance on the examinations, MAC will award the student an Eddy Current TIP-A diploma.

This diploma does not constitute certification as required under the recommended practice of the ASNT; such certification can only be performed by the employer. Rather, the diploma will indicate that in the judgment of MAC, the student has completed sufficient theoretical and laboratory work to qualify for the performance of actual tests or to direct the setup of such tests. In the judgment of MAC, neither completion of this course nor time spent on the job is satisfactory evidence that any applicant is qualified to actually run a test or supervise it. These qualifications can only be obtained by actual inspection experience with a particular equipment on a general class of product.

The diploma awarded by MAC includes on its reverse side an endorsement listing each type of equipment for which qualification has been obtained. In this manner, the diploma provides an overall record of the background, training and specific equipment qualifications for each individual.

Facilities and Faculty

Except as otherwise arranged, all TIP-A courses of study will be offered at Elmsford, New York, at MAC's global headquarters and manufacturing plant. The program and instructors will be under the supervision of a Magnetic Analysis ASNT NDT Level III.

Entry Requirements

Because TIP-A will include theoretical discussion as well as practical application work, students should be high school graduates. A working knowledge of simple algebra and geometry is desirable. Familiarity with metallurgical terminology and processes, plus some experience with test equipment and procedures is also desirable.

The requirement of high school graduation will be waived only if the application for the TIP-A is accompanied by a letter from the student's employer attesting that the student is, in other respects, fully qualified for the program.

Application

An application is included in the back of this leaflet. Applications must be received a minimum of two weeks prior to the start of the TIP-A session. There can be no refund of tuition for cancellation or failure to attend. A substitute attendee may be accepted if sufficient notice is provided.

Living Accommodations

All travel and living expenses must be paid by the student and are not included in tuition. MAC has a corporate rate and will make suitable living accommodations at the Springhill Suites Marriott located in Tarrytown, NY (non-smoking hotel). MAC will assist with transportation to and from the hotel to the plant.

Tuition Fee

\$1,250 per student, includes training materials and lunches.

TIP-A EDDY CURRENT COURSE OUTLINE

DAY 1

I. HISTORY

EARLY ELECTROMAGNETIC NDT APPLICATIONS

II. ASNT

SNT-TC-1A REVIEW

III. ELECTROMAGNETIC THEORY

ELECTRICAL SYMBOLS

MULTIPLYING AND DIVIDING PREFIXES

EDDY CURRENT INTRODUCTION

ELECTRICAL CURRENT

VOLTAGE

AC FREQUENCY

RESISTANCE AND OHMS LAW

MAGNETIC FIELD

BASIC EDDY CURRENT INSTRUMENT

ELECTROMAGNETIC INDUCTION

INDUCTIVE AND RESISTIVE CIRCUITS

IMPEDANCE

FILL FACTOR

LIFT OFF

INTERNATIONAL ANNEALED COPPER STANDARD

DEPTH OF EDDY CURRENT PENETRATION

DAY 2

I. MAGNETIC MATERIALS

HISTORY

MAGNETIC PROPERTIES

MAGNETIC FIELD STRENGTH

B-H CURVES

PERMEABILITY

MAGNETIC DOMAINS

CLASSIFICATION

AC MAGNETIZATION

ELIMINATION OF PERMEABILITY AFFECTS

II. TEST FREQUENCY

SKIN EFFECT

DEPTH OF PENETRATION

III. TEST INSTRUMENT SIGNAL PROCESSING

MAJOR SUBSYSTEMS

MAJOR TEST SYSTEM COMPONENTS

BASIC INSTRUMENT CONTROLS

READOUT DEVICES

IV. COIL AND PROBE FUNDAMENTALS

CONSIDERATIONS FOR CHOOSING

PHYSICAL TYPES OF COILS

ELECTRICAL TYPES OF COILS

COIL IMPEDANCE

FACTORS AFFECTING A COILS IMPEDANCE

DAY 2 (cont'd)

V. FLAW DISCRIMINATION

MATERIAL VARIABLES AFFECTING TESTING
CHARACTERISTICS OF DEFECTS
SIGNAL HANDLING SYSTEMS
NOISE SOURCES
SIGNAL TO NOISE RATIO (S/N)
ELIMINATION OF PERMEABILITY EFFECTS
FILTERS

VI. SIGNAL ANALYSIS

IMPEDANCE ANALYSIS
PHASE ANALYSIS
MODULATION ANALYSIS

VII. CALIBRATION AND STANDARDS

CALIBRATION STANDARDS
TEST STANDARDS

DAY 3

I. CHOOSING TYPES OF COILS AND PROBES

II. COIL FUNDAMENTALS

COIL WINDINGS
TRANSFORMER ACTION
COIL ARRANGEMENTS
MODULATION/FLAW FREQUENCY
BALANCE CONTROLS

III. COIL MANUFACTURING

IV. PROBES

ARRANGEMENTS
APPLICATIONS
S/N RATIO
LIFT OFF

V. TEST PARAMETER OPTIMIZATION

S/N RATIO
END SUPPRESSION
COIL CENTERING
FILL FACTOR
PHASE ADJUSTMENT

VI. DEMAGNETIZING

MAGNETIZED PART PROBLEMS
EARTH'S MAGNETIC FIELD
RESIDUAL MAGNETISM/REMANENCE
TECHNIQUES
AC FIELD PROCESS FACTORS
DEMAGNETIZING EQUIPMENT

DAY 4

I. ROTARY PROBE FLAW INSPECTION

EQUIPMENT FUNDAMENTALS
PRODUCTS TESTED
INSPECTION CAPABILITY
ROTARY MECHANISM COMPONENTS
ROTARY PROBES
ROTARY PROBE SIGNAL TRANSMISSION
TESTING SPEED LIMITATIONS
HELICAL PITCH OF INSPECTION (HPI)
OPTIMIZING S/N RATIO
CALIBRATION STANDARDS
LINEAR SWEEP DISPLAY
HEADPLATE TYPES
REVIEW OF SYSTEM CAPABILITIES

II. SORTING EQUIPMENT

APPLICATIONS
COMPARATOR TYPES
TESTING PRINCIPLES
TEST PARAMETERS
COMPARATOR COILS
TEST SETUP
SORTING AND READOUTS
AUTOSORT SYSTEMS
REFERENCE STANDARDS
COMPARATOR REVIEW

III. IMPEDANCE PLANE DIAGRAMS

CONDUCTIVITY CHANGE
CONDUCTIVITY CURVE
LIFT-OFF CURVE
FREQUENCY CHANGE
OPTIMAL FREQUENCY SELECTION
MATERIAL THICKNESS AFFECT

DAY 5

I. PRACTICAL EQUIPMENT SETUP

INDIVIDUAL HANDS ON TRAINING

**TIP-A EDDY CURRENT APPLICATION
TRAINING AND INFORMATION PROGRAM**

Date:			
Name of Applicant:			
Address of Applicant:			
Present Employer:			
Name & Address:			
Telephone number:		Ext.:	
Email address:			
Education:			
Work Experience in NDT Field:			
Work Experience with Following Equipment:			
TIP-A TUITION RATE: \$1,250			
Golf Shirt size: () med () large () XL () XXL () XXXL			
I will arrive on:		at approximately:	
I will depart on:		at approximately:	