



# Introduction

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**▼ John Abbott is a new EPRI Project Manager and Nozzle Inner Radius Expert**



# RPV Nozzle Update / John Abbott

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## ▼ Generic Procedure for Nozzle Inside Corner Region

- The Generic Procedure for conventional Manual Nozzle Inner Radius (PDI-UT-11) has been qualified along with seven Personnel Qualifications. Procedure has been used successfully on site during 2005 Spring Outages.

## ▼ Modeling Software Tool – forward plotting

- Intended to plot flaws recorded by the candidate during a nozzle inside radius examination.
- This tool may be used by the candidates during qualification and subsequent field examinations.
- Tool has been successfully used during personnel qualification.



# ***EPRI 3D Nozzle Modeling Toolkit V1.0R1***

## **EPRI 3D Nozzle Modeling Toolkit V1.0R1**

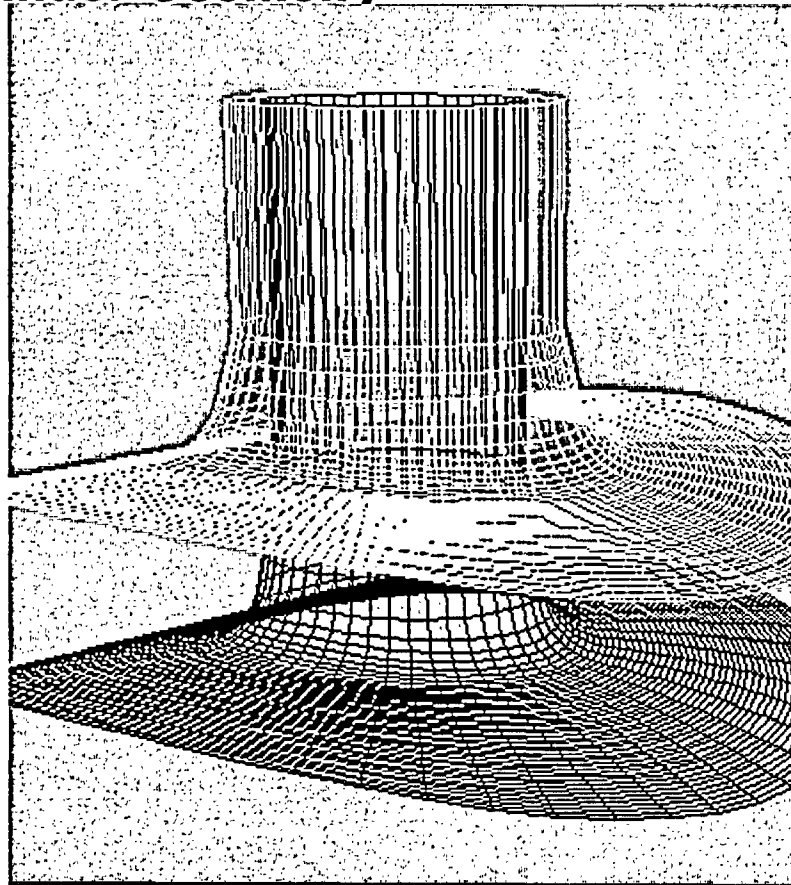
### **▼ Software Description**

- The *EPRI 3D Nozzle Modeling Toolkit* is a software program that serves as a three-dimensional graphical aid in visualizing ultrasonic procedures to examine the nozzle inner radius and nozzle-to-shell regions
- The principal function of the software is to aid inspectors in plotting indications that are detected
- The user is able to graphically display the nozzle geometry, transducers, and possible flaws
- The software is not intended for procedure design and is only applicable to “Cylinder-Cylinder”, “Cylinder-Sphere”, and “Cylinder-Sphere Offaxis/Sidehill” nozzle geometries

# ***EPRI 3D Nozzle Modeling Toolkit V1.0R1***

## **EPRI 3D Nozzle Modeling Toolkit V1.0R1**

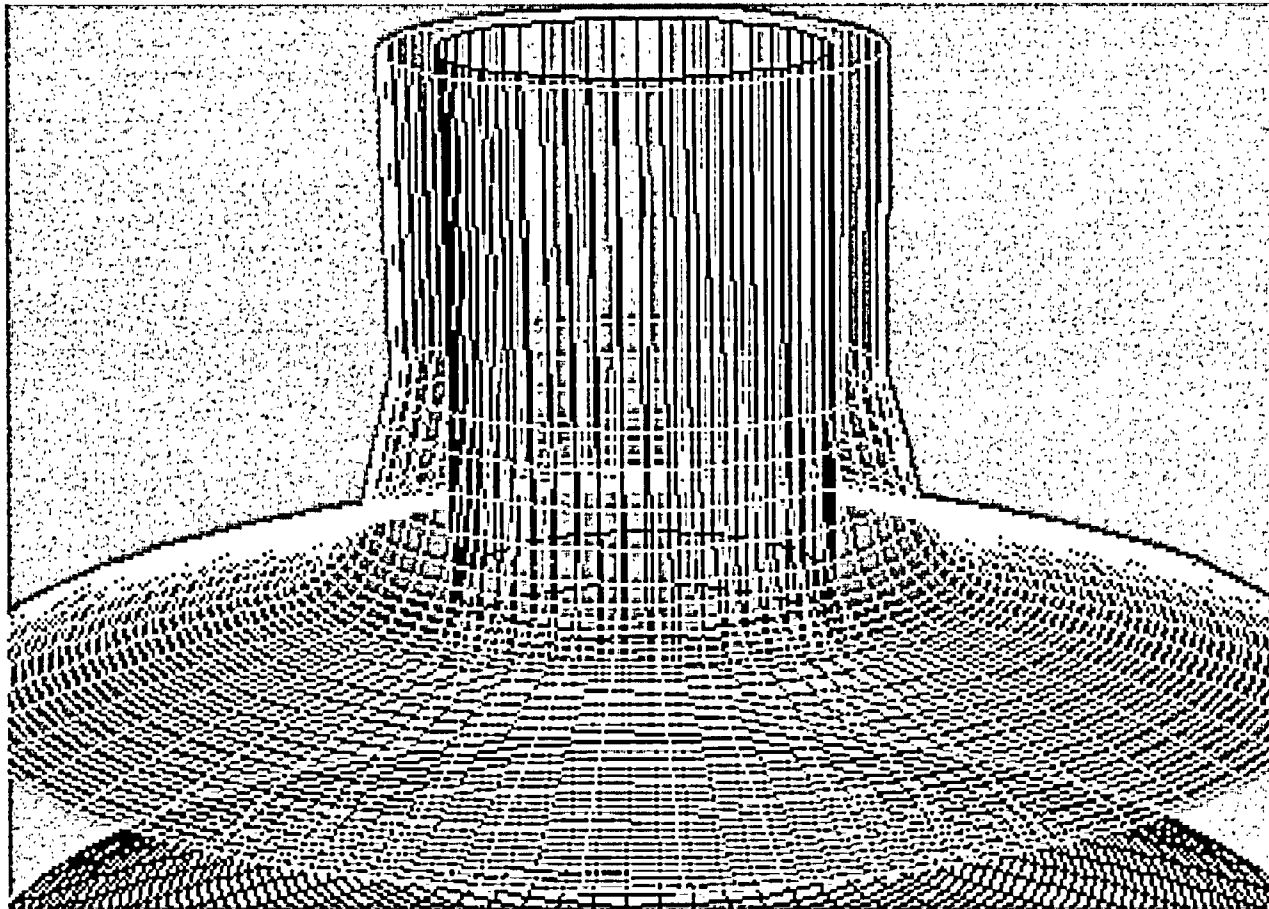
### **▼ Cylinder-Cylinder Geometry**



# ***EPRI 3D Nozzle Modeling Toolkit V1.0R1***

## **EPRI 3D Nozzle Modeling Toolkit V1.0R1**

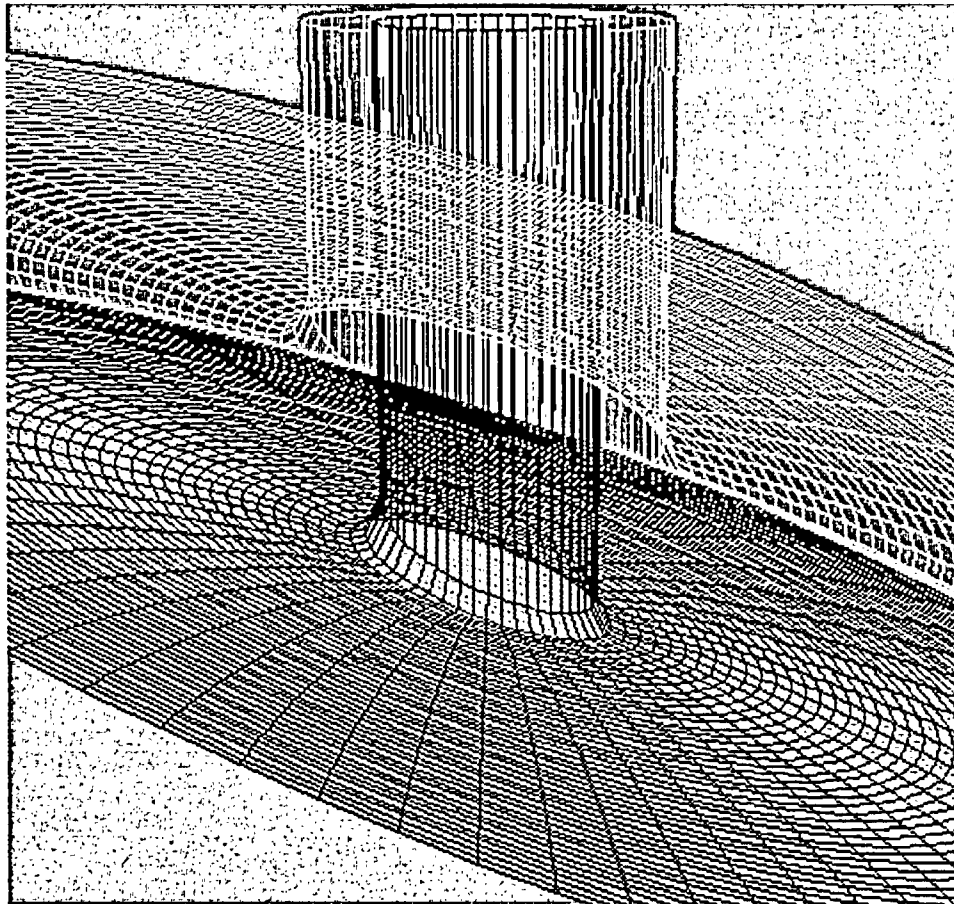
### **▼ Cylinder-Sphere Geometry**



# ***EPRI 3D Nozzle Modeling Toolkit V1.0R1***

## **EPRI 3D Nozzle Modeling Toolkit V1.0R1**

### **▼ Cylinder-Sphere Offaxis/Sidehill Geometry**





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# ***EPRI 3D Nozzle Modeling Toolkit V1.0R1***

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## **EPRI 3D Nozzle Modeling Toolkit V1.0R1**

### **▼ Benefits and Value**

- A method of visualizing and resolving indications for a complex geometry
- Helps eliminate operator errors in probe placement and orientation
- Reports the likelihood that an indication should be detected (misorientation angle)
- Easily documents indications using tabulated results and a three-dimensional view

# EPRI 3D Nozzle Modeling Toolkit V1.0R1

## EPRI 3D Nozzle Modeling Toolkit V1.0R1

**Input Geometry**
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Geometry Type

Cyl-Sph (On-Axis)

Cyl-Cyl

Cyl-Sph (Off-Axis/Sidehill)

Nozzle Name:

Rmax (in):  Zmax (in):

Inner Taper Angle (deg):  Outer Taper Angle (deg):

Rbore (in):  Rnozzle (in):

Zbore (in):  Znozzle (in):

Rbi (in):  Rbo (in):

Rvi (in):  Rvo (in):

Inside Cord XP (in):  Inside Cord XN (in):

Xoff (in):  Rref (On Vessel) (in):

Exam Start R (NSW) (in):  Exam End R (NSW) (in):

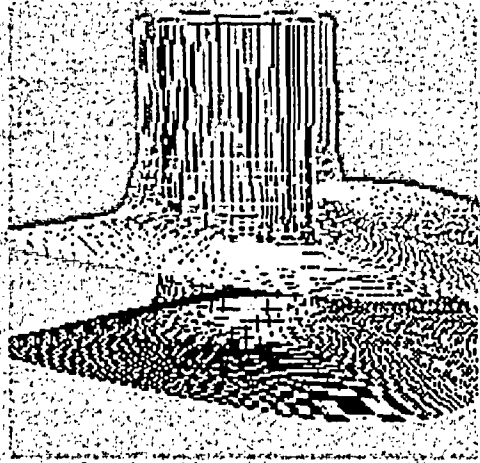
Exam Height (NSW) (in):   Class 1 (NIR)  Class 2 (NIR)

OK

Cancel

Load...

Save...







# EPRI 3D Nozzle Modeling Toolkit V1.0R1

## EPRI 3D Nozzle Modeling Toolkit V1.0R1

The screenshot displays the EPRI 3D Nozzle Modeling Toolkit V1.0R1 software interface, which is divided into several functional panels:

- Forward Modeling:** This panel allows for the configuration of the probe. It includes fields for:
  - Flaw Type:  NIR,  NSW
  - Probe Name: Default Probe
  - Probe Angle (deg): 31.225063
  - Probe Skew (deg): 132.83703
  - Probe R (in): 27
  - Probe Theta (deg): 65
  - Probe Z (in): 132.24428
  - User Metal Path (in): 11
- Transducer Parameters:** This panel defines the physical characteristics of the nozzle:
  - Wedge Base Length (in): 2
  - Wedge Front Height (in): 1
  - Wedge Back Height (in): 0.25
  - Wedge Top Length (in): 0.75
  - Wedge Width (in): 2
- NIR Flaw Forward Results:** This panel displays the calculated parameters for the nozzle:
  - Flaw R (in), Theta (deg), Z (in), S (in), Loc: 20.68, 52.19, 124.95, 7.71, Inner Blend
  - Probe R (in), Theta (deg), Z (in), Loc: 27.00, 65.00, 132.24, Outer Blend
  - Probe Angle (deg), Skew (deg), Metal Path (in): 31.23, 132.84, 11.00
  - Beam/Skew Angle at Flaw (deg), Misorientation Angle (deg): 38.19/128.48, 38.48
  - Conf Probe R (in), Theta (deg), Z (in), Loc: 27.13, 41.98, 133.38, Outer Blend
  - Conf Probe Angle (deg), Skew (deg), Metal Path (in): 32.58, -135.79, 11.43
  - Beam/Conf Skew Angle at Flaw (deg), Conf Misorientation Angle (deg): 38.19/-128.48, 38.48
- Scale and Rotate:** This panel provides controls for the 3D model's orientation:
  - Scale X, Y, Z: Up (3), Down
  - Trans Nozzle X: 0
  - Trans Nozzle Y: 0
  - Trans Nozzle Z: -70
  - Rot Abt Nozzle X: 0
  - Rot Abt Nozzle Y: 0
  - Rot Abt Nozzle Z: 0

The right side of the interface features a 3D wireframe model of the nozzle, showing its conical shape and internal structure. The model is rendered in a perspective view, highlighting its complex geometry.

# RPV Nozzle Update

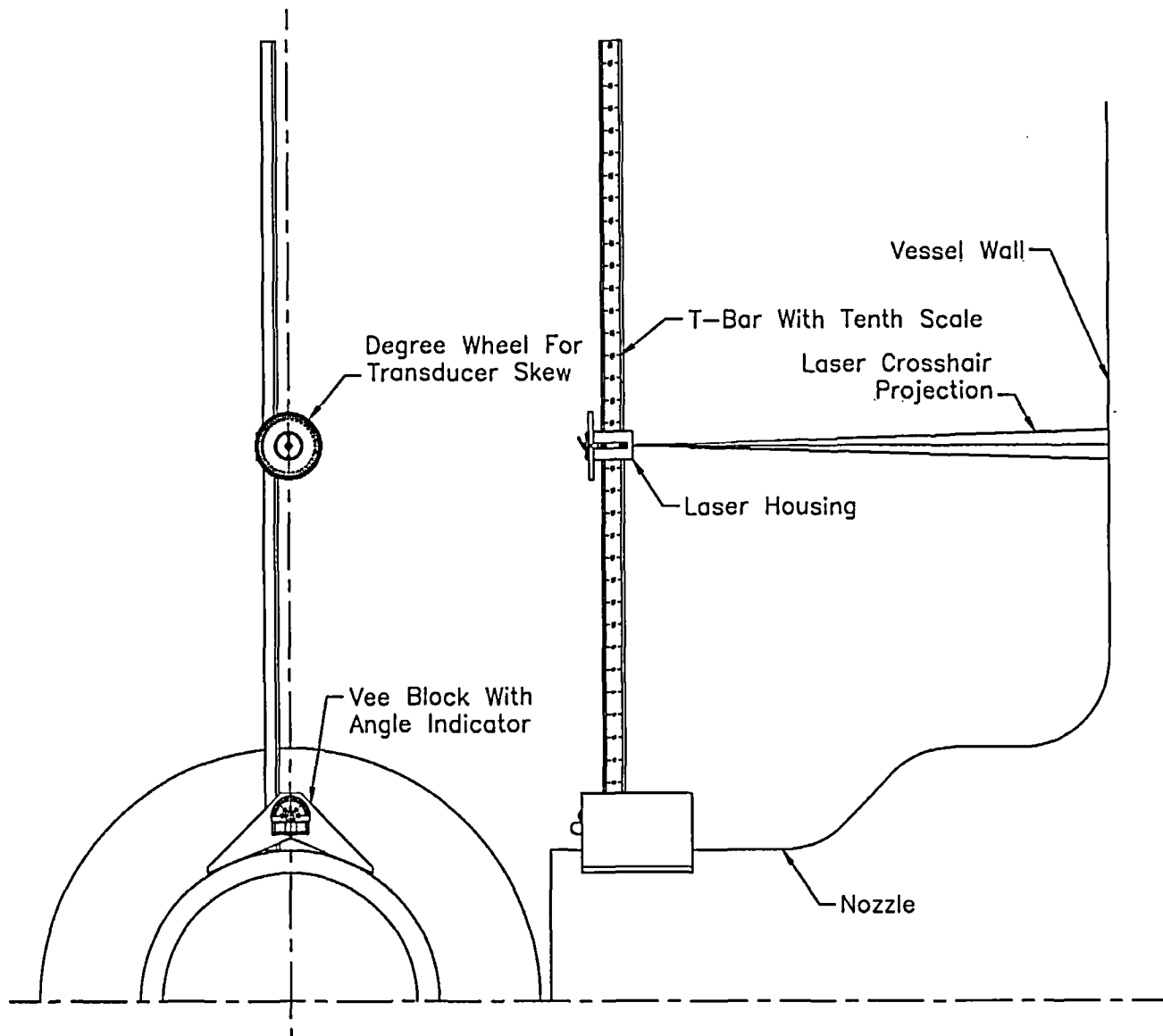
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- ▼ **EPRI Developed and Patented a tool to accurately measure Transducer Location and Skew for detecting flaws in the Nozzle Inner Radius.**

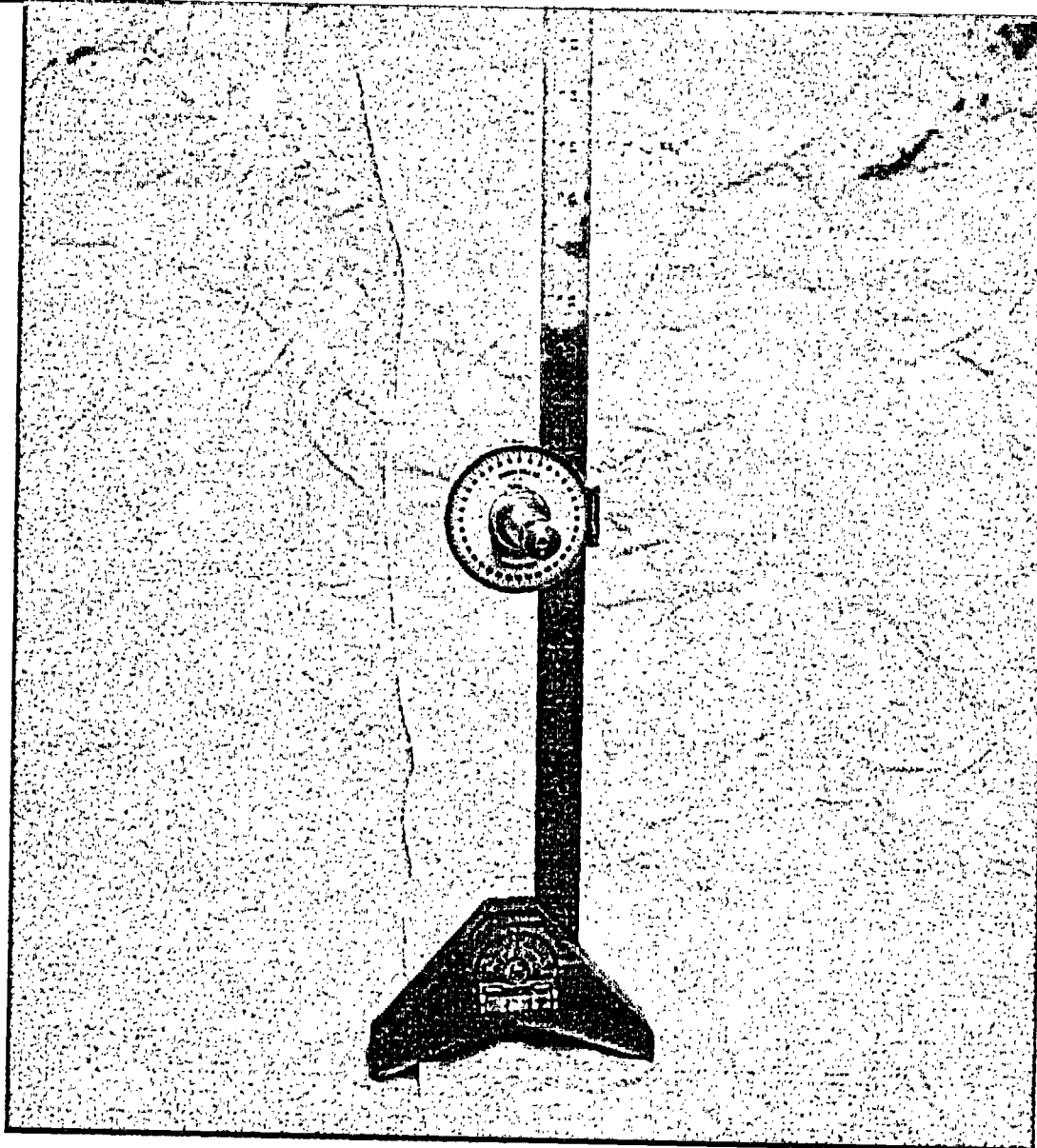
**Three input values are needed to locate a flaw:**

- 1) Nozzle Azimuth.**
- 2) Dimension from the Nozzle center line.**
- 3) Transducer skew in relation to the Nozzle.**

# Dimensioning and Measurement Inspection Tool



# Dimensioning and Measurement Inspection Tool



# *Dimensioning and Measurement Inspection Tool*

