International Journal of General Engineering and Technology (IJGET)
ISSN (P): 2278–9928; ISSN (E): 2278–9936
Vol. 9, Issue 1, Jan – Jun 2020; 31–54

International Academy of Science, Engineering and Technology
Connecting Researchers; Nurturing Innovations

FORMULATING MACHINE LEARNING MODELS FOR YIELD OPTIMIZATION IN SEMICONDUCTOR PRODUCTION

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ABSTRACT

In the dynamic realm of semiconductor manufacturing, yield optimization remains a pivotal challenge, directly influencing cost efficiency and product reliability. This study explores the integration of machine learning (ML) models to enhance yield optimization processes within semiconductor production environments. By harnessing historical data and real-time processing variables, we develop predictive models that identify key factors contributing to yield deviation and propose potential improvements.

The methodology focuses on applying various machine learning algorithms, including regression analysis, decision trees, and neural networks, to analyze patterns and anomalies in the manufacturing data. These models are trained on datasets comprising parameters such as temperature, pressure, chemical composition, and equipment behavior during the wafer fabrication process. The objective is to predict defects and process inefficiencies before they result in yield degradation.

Our findings reveal that machine learning models can significantly reduce the occurrence of defects by providing insights into optimal process conditions and detecting early signs of equipment malfunctions. The implementation of these predictive models has demonstrated a potential increase in yield by optimizing the critical parameters involved in the production cycles.

The study underscores the necessity of a collaborative framework where data scientists and process engineers work together to continuously refine the predictive models. This integration not only enhances the accuracy of yield forecasts but also fosters a proactive approach to semiconductor manufacturing, thereby leading to substantial improvements in both yield and operational efficiency.

KEYWORDS: *Machine Learning, Yield Optimization, Semiconductor Production, Predictive Analytics, Manufacturing Efficiency*

Article History

Received: *05 Feb 2020* | ***Revised:*** *06 Feb 2020* | ***Accepted:*** *10 Feb 2020*