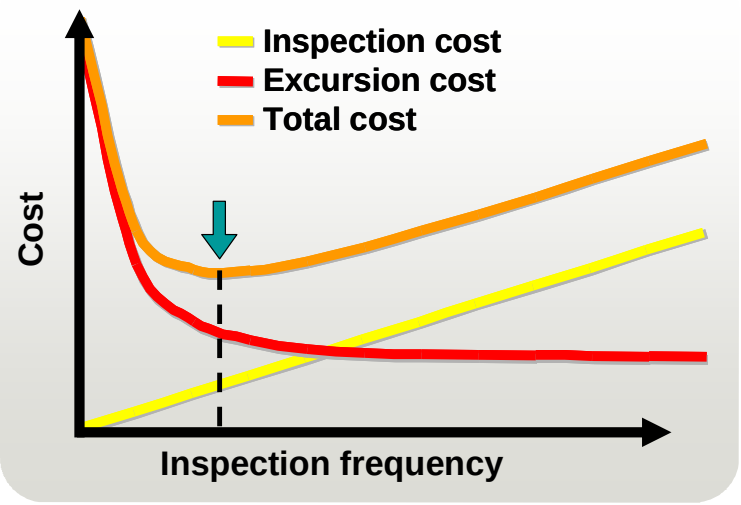
Planning based on total cost

To find the optimal inspection capacity it is necessary to balance inspection and excursion costs.

Our Inspection Planning software is used to calculate the revenue lost to excursions (out-of-control events).

IP1.0 Inspection Planner 1.0 contains state of the art probability models. See our IP1.0 product sheet for more info.

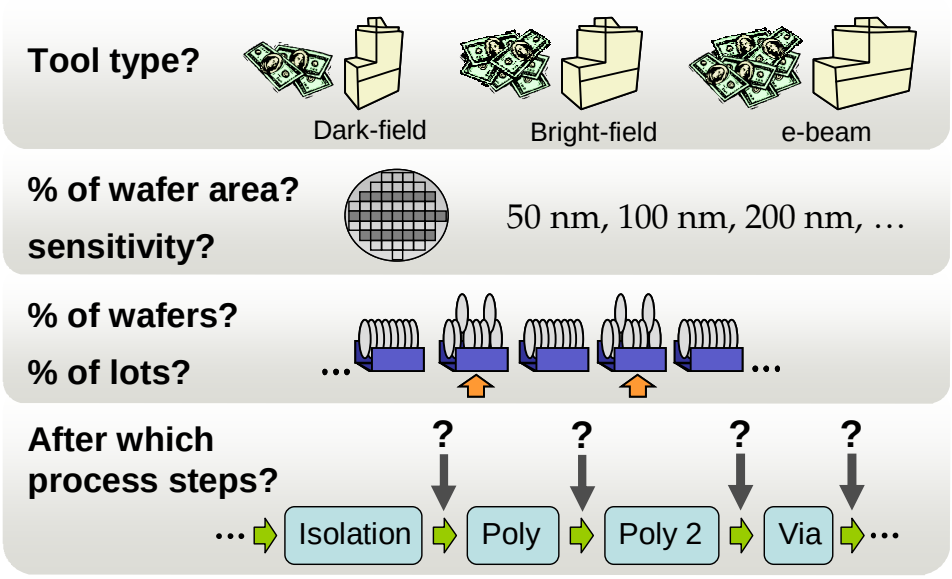


Decision variables affecting excursion costs

The overall excursion cost is a function of numerous decision variables.

Identifying economic settings for these variables requires understanding of the defect mechanisms inspection is trying to control.

Inspection data from the process provides that information.



Examples of decision variables in inspection planning.

Analysis based on fab defectivity data

Parameters derived from defect data are used to model how defect excursions reduce yield. The parameters include: excursion frequencies, excursion yield impacts, excursion signal to noise ratios, lot-to-lot and wafer-to-wafer variances. The sampling plan and Inspection tool capability parameters are then used to model how excursions can be detected. These include (for each sensitivity setting): throughput, capture rate per defect type, MTBF/MTTR, and sampling (percent of lots, wafers, wafer area, & defects to review). Using these parameters, and more, the Inspection Planner software is used to calculate and minimize total cost.

Outline of an Inspection Planning Project

- **Project planning**
- **Data collection**
- **Data analysis**
- **Inspection planning & optimization**
- **Delivery of results**

Project planning

Project scope can range anywhere from an aggregate analysis of one step to a detailed analysis of a whole fab. Aggregate analysis of a single step could include, for example, two defect types (killer and non-killer defects) and majority of parameter inputs from benchmark data. In contrast, a detailed full fab analysis could include data collection from all inspection steps and modeling of 5+ defect types per step (including their propagation to downstream steps). Resulting project duration can range from 2 to 20 days depending on number of experiments and fab involvement. Sensor Analytics will provide a fixed bid on the project plan.

Data collection

Considerable amount of inspection data is needed to estimate parameters associated with excursions. However, effective analysis can be done with benchmark and/or previous process data. Other data needed for analysis includes: product types and their design rules, production volume, selling prices, average yields, inspection/process tool counts & types, inspection/process tool throughputs, MTBF/MTTR statistics, defect capture rates, and material handling times.

Data analysis

Custom analysis methods in the Inspection Planner software are used to estimate in and out of control defect counts, excursion frequencies, wafer-to-wafer and lot-to-lot variance. In absence of fab yield estimates, yield models are used to estimate in and out of control yields.

Inspection planning and optimization

Calculation of excursion and total cost is done with the Inspection Planner software. Inspection Planner contains an advanced analytic formulation based on probability theory. The formulation allows rapid calculation of high dimensional problems (multiple steps, excursion types, and tools). This allows extensive sensitivity and optimization analysis to be performed.

Delivery of results

Recommended values for decision variables are delivered along with tables and charts containing inspection and excursion costs for all experiments. Results include the impact inspection has on processing capacity, queue times, and fab cycle-time. Additional deliveries depend on project objectives, examples include return on investment comparison for competing tools, and full fab capacity plans.

