# ERD SYSTEM

Procees failure Risk Ananlysis for The ERD System
quality assurance, process control and manufacturing process, the following issue was identified:

**Internet secure transmissions and Quality Assurance Control Inspections not being performed properly**

A Corrective Action for this Failure/Risk was identified as being “Properly Model Correct Quality Test”.

**“Properly Model Correct Process Improvement Test”.**

**ERD along with partnering companies quality assurance and process control organization** decided to create a model to help verify and identify any security violations and stability of the kiosk machine stand.
In order to complete this action the company decides to employ the ***Weibull statistical model*** in order to in order to identify the most suitable model.

**STEP 1**

Data is collected from quality and process control test, during a random check of systems, approximately (20) ERD Kiosk machi

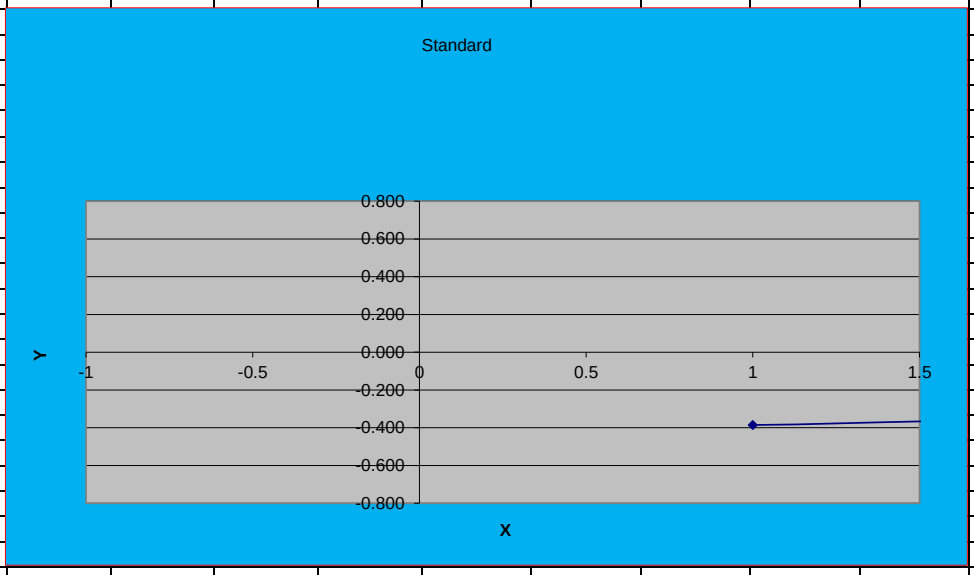
| i | t(i) | i | t(i) |
|---|---|---|---|
| 1 | 0.8 | 16 | 1.66 |
| 2 | 0.82 | 17 | 1.69 |
| 3 | 0.6 | 18 | 1.85 |
| 4 | 0.56 | 19 | 1.9 |
| 5 | 0.85 | 20 | 2.12 |
| 6 | 1.12 | | |
| 7 | 1.35 | | |
| 8 | 1.29 | | |
| 9 | 1.29 | | |
| 10 | 1.32 | | |
| 11 | 1.33 | | |
| 12 | 1.32 | | |
| 13 | 1.36 | | |
| 14 | 1.39 | | |
| 15 | 1.41 | | |

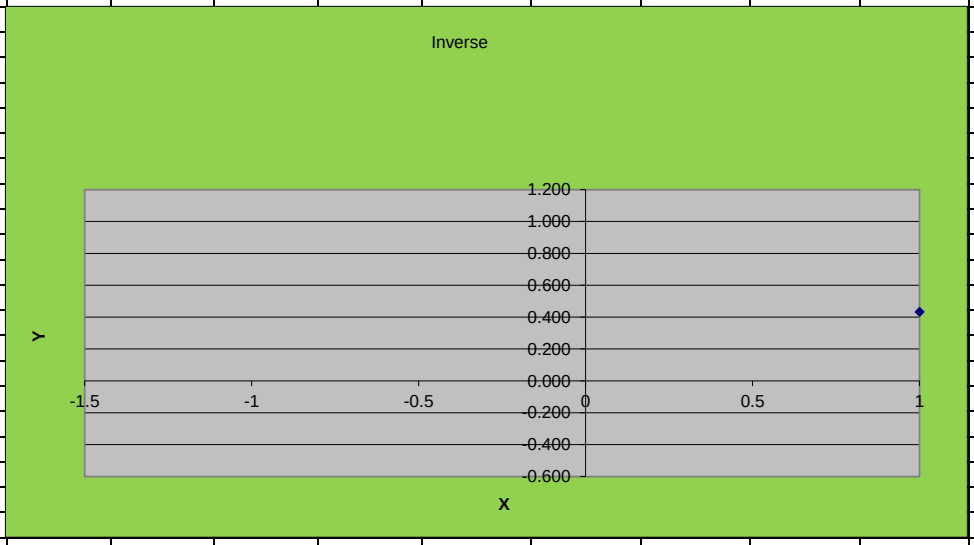
**STEP 2**

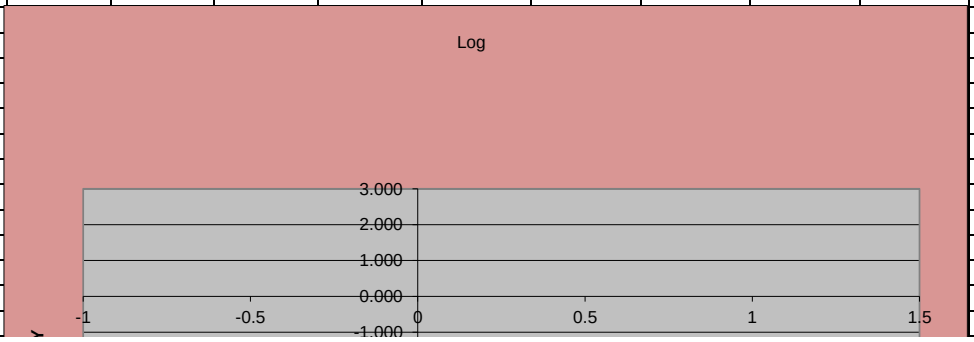
Based upon the data collected the x and y variables for a Standard , Log and Inverse model are calculated in the chart below

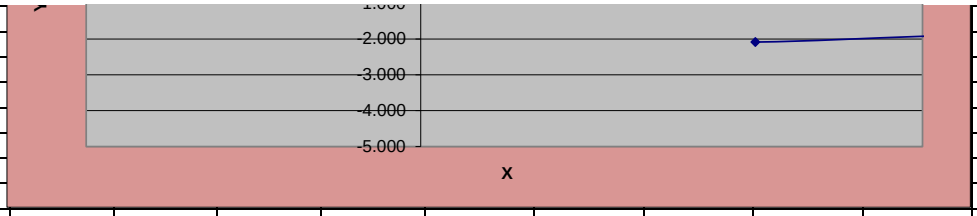
| | Standard | | | Log | | | Inverse | | |
|---|---|---|---|---|---|---|---|---|---|
| i | z(i) | $x_i$ | $y_i$ | z(i) | $x_i$ | $y_i$ | z(i) | $x_i$ | $y_i$ |
| 1 | 0.800 | -0.223 | -0.385 | -0.223 | -0.223 | -2.086 | 1.250 | 0.223 | 0.433 |
| 2 | 0.820 | -0.198 | -0.370 | -0.198 | -0.198 | -1.966 | 1.220 | 0.198 | 0.398 |
| 3 | 0.600 | -0.511 | -0.539 | -0.511 | -0.511 | -3.487 | 1.667 | 0.511 | 0.911 |
| 4 | 0.560 | -0.580 | -0.570 | -0.580 | -0.580 | -3.822 | 1.786 | 0.580 | 1.047 |
| 5 | 0.850 | -0.163 | -0.347 | -0.163 | -0.163 | -1.791 | 1.176 | 0.163 | 0.349 |
| 6 | 1.120 | 0.113 | -0.139 | 0.113 | 0.113 | -0.448 | 0.893 | -0.113 | 0.024 |
| 7 | 1.350 | 0.300 | 0.037 | 0.300 | 0.300 | 0.461 | 0.741 | -0.300 | -0.151 |
| 8 | 1.290 | 0.255 | -0.009 | 0.255 | 0.255 | 0.240 | 0.775 | -0.255 | -0.111 |
| 9 | 1.290 | 0.255 | -0.009 | 0.255 | 0.255 | 0.240 | 0.775 | -0.255 | -0.111 |
| 10 | 1.320 | 0.278 | 0.014 | 0.278 | 0.278 | 0.351 | 0.758 | -0.278 | -0.132 |
| 11 | 1.330 | 0.285 | 0.022 | 0.285 | 0.285 | 0.388 | 0.752 | -0.285 | -0.138 |
| 12 | 1.320 | 0.278 | 0.014 | 0.278 | 0.278 | 0.351 | 0.758 | -0.278 | -0.132 |
| 13 | 1.360 | 0.307 | 0.045 | 0.307 | 0.307 | 0.497 | 0.735 | -0.307 | -0.157 |
| 14 | 1.390 | 0.329 | 0.068 | 0.329 | 0.329 | 0.603 | 0.719 | -0.329 | -0.175 |
| 15 | 1.410 | 0.344 | 0.083 | 0.344 | 0.344 | 0.672 | 0.709 | -0.344 | -0.187 |
| 16 | 1.660 | 0.507 | 0.275 | 0.507 | 0.507 | 1.467 | 0.602 | -0.507 | -0.309 |
| 17 | 1.690 | 0.525 | 0.299 | 0.525 | 0.525 | 1.554 | 0.592 | -0.525 | -0.322 |
| 18 | 1.850 | 0.615 | 0.421 | 0.615 | 0.615 | 1.994 | 0.541 | -0.615 | -0.380 |
| 19 | 1.900 | 0.642 | 0.460 | 0.642 | 0.642 | 2.124 | 0.526 | -0.642 | -0.397 |
| 20 | 2.120 | 0.751 | 0.629 | 0.751 | 0.751 | 2.658 | 0.472 | -0.751 | -0.459 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | average | 1.302 | | | 0.205 | | | 0.872 | | | |
| | | | | | | | | | | | |
| | **STEP 3** | | | | | | | | | | |
| | | | | | | | | | | | |
| | The x and y data is then graphed for the **Standard**, **Inverse** and **Log** data points | | | | | | | | | | |






**STEP 4**

Studying the graphs plotted above we see the only straight line results were those obtained for the Log Weibull distribution.
This is the best suited model to choose. We will calculate the parameters as showm below

We use the following formulas to relate parameters **(α)** and **(β)** to the **slope** and the **y intersection**

**β = slope** $\quad$ **$y_0$= -ln(α) x β**

We next use the LINEST function to determine the values of the **slope** and the **y intersection**

We obtain the following results

We next calculate the values for (α) and (β).

| | | | | | |
|---|---|---|---|---|---|
| **Slope** | #VALUE! | | **α** | **β** |
| **$y_0$** | -1 | | **#VALUE!** | **#VALUE!** |

We obtain the following formula

**F(t)= 1-exp[exp((t-a)/b)]** $\quad$ **where** $\quad$ **a=ln(α)**

**b=1/β**