

Rite Track eTracking

By

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Submitted to
the Faculty of the Computer Science Technology Program
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the Degree of Bachelor of Science
in Computer Science Technology

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Date

Tom Wulf, Faculty Advisor

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James F. Sullivan, Department Head

Date

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Abstract

Rite Track eTracking is a complete online system to view, add, and manage all serial numbers, warranty information, and field service reports. Currently all information is stored on Excel worksheets without the ability to easily share information. eTracking allows serial numbers to be added during production, warranty information is added when the product ships, and any field service reports are entered online and emailed to the billing department. All information is accessible through the existing Rite Track Intranet to allow a single username/password to gain access to all information. All existing information was imported, and all new information is added on a daily basis. The site was developed using ASP on Windows 2003 Server with Microsoft SQL Server 2000 used for the database. The site has been designed to allow any user to view the information, select users the ability to add information and change only items they have added, and an Administration section for managers to modify any item.

Rite Track eTracking

1. Statement of the Problem

Rite Track manufactures automated wafer processing equipment for the semiconductor industry. It typically sells fifty machines a year, each valued at between \$300,000 and \$800,000. Each machine has about forty serial numbers to identify component modules. There is also warranty information and field service history for each machine. With all of this information, no information is stored electronically.

While a machine is being built, the serial numbers are manually generated by the production staff and written down on the paperwork that is generated for each assembly. These numbers are stored in a binder for each machine at the factory. Since the numbers are not stored electronically, serial numbers are not able to be referenced to the machine. If one needs to determine what serial number goes with a specific machine, for warranty information for example, someone needs to look through the binders to find that serial number.

Once a machine has shipped and been installed, the Director of Field Service updates an Excel spreadsheet with the warranty information. The warranty is established at the install date, since it may take up to a month to get a machine installed. Since the Director of Field Service is at the main office in Cincinnati, the document is routinely e-mailed to the field service staff. This is inefficient and requires the field service technicians to either have printed copies or carry their laptops around.

After a machine ships, any work that is completed on it, including the installation, is documented with a Field Service Report (FSR). FRS's are filled out by the field service technician at the customer's site and signed by the customer and the technician.

The FRS's are stored by each field service technician and, if the work is billable, a copy is faxed to the billing department. This presents several problems because only the field service technician that performs the work has the documentation. If additional work is performed on the machine by a different field service technician, he/she is not able to determine what previous work has been performed. In addition, the technical support department at the Cincinnati location does not have access to the field service history while trying to diagnose problems over the phone.

2. Description of the Solution

This is a web-based database solution designed to solve the all three problem areas (Serial Numbers, Warranty Information, and Field Service Reports). Rite Track eTracking was developed using ASP pages with a Microsoft SQL 2000 database.

This technology allows 24-hour access to submit and review information. This is especially critical for Rite Track because they have offices in nine states and eleven countries. Rite Track also has a 4MB fiber optic connection to provide guaranteed Internet access to the web servers. The eTracking project will contain three major areas:

- 1) **Serial Numbers.** While the production staff is building assemblies, they use pre-printed serial numbers and stick them to the assembly. Then they record the information on the build instruction documentation. When the assemblies are complete the serial numbers and descriptions are entered into a database. In order to reduce time and data entry error the serial numbers will have barcodes. A default set of descriptions are available with barcodes to reduce data entry time as well.

- 2) **Warranty Information.** Once a machine has been installed, the Director of Field Service fills out a form to enter the warranty information into the database. It contains the ship date, install date, type of warranty (e.g. parts and labor, parts only), and the warranty expiration. A report can be generated to show when warranties will expire to allow Rite Track's sales or service teams to sell extended warranties.
- 3) **Field Service Reports.** All FSR's are manually completed and signed by the customer. When the field service technician returns to their hotel room or office, he/she enters the information online. Once the information is entered, he/she reviews and submits the report. The report automatically e-mails to the billing department, Director of Field Service, the field service technician, the technical support group, and the customer. For customers, a link is included that allows the customer to fill out a survey based on their experience with our field service group.
 - All information is entered and retrieved using a Web site. This allows a single point of access for all data. Once the information is entered into the database, everything is viewed on web pages and printed out. The application runs on Rite Track's current Web server and accesses Rite Track's current database server.

2.1 User Profile

Rite Track eTracking has four primary groups of users accessing the information. Each group has certain access levels and they have different levels of computer experience. The levels are:

Final Test – These users primary only use the system to enter serial numbers. These employees have basic computer skills: ability to navigate through web pages and enter data.

Field Service Technician – Field Service Technicians are responsible for more computer skills. In addition to simple data input, they also must be aware of entering in valid information and recognizing error message provided by JavaScript form validation.

Technical Support Agent – These users are already skilled at problem solving and our skilled with using the computer. They will be responsible for going to the web site and looking up historical information. They will have no data input responsibilities.

Field Service Manager – These users need to be more skilled in troubleshooting and problem resolution since they have the ability to login to view or change all information. Basic computer skills are required since all information is done through a simple web interface.

3. Deliverables

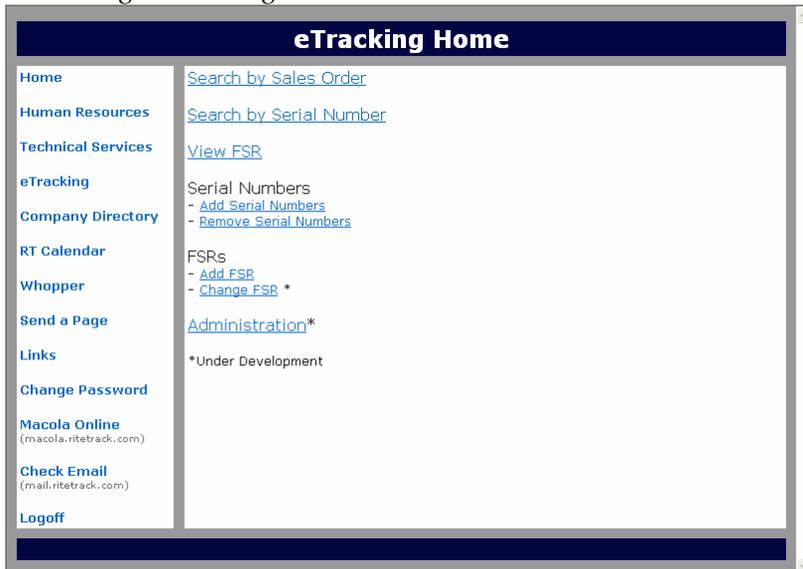
- Electronically store and retrieve all serial numbers
- Electronically store and retrieve warranty information
- Electronically store and retrieve Field Service Reports
- Enable users to store information easily
- Enable users to retrieve information easily and from anywhere with computer access
- Complete the project keeping cost to a minimum
- Use as many existing resources as possible

4. Project Design

I used the following areas within the Computer Science Technology program to complete this project: Web Development, Databases, and Multimedia. The primary focus was the web development to interface with the database. To develop the web site I used my skills in ASP, HTML, and JavaScript. I used my skills in Database to design and integrate with a Microsoft SQL Server. Multimedia was used to provide a user-friendly interface.

4.1 Interface Design

eTracking Home Page



Once the users gain access to the Rite Track Intranet, they can click the **eTracking** link on the left to be directed to the screen above. From this screen they can select the features they want to use.

Search by Sales Order

eTracking - Sales Order Search

Home
Human Resources
Technical Services
eTracking
Company Directory
RT Calendar
Whopper
Send a Page
Links
Change Password
Macola Online
(macola.ritetrack.com)
Check Email
(mail.ritetrack.com)
Logoff

Sales Order:
9163

Sales Order	9163	Expires	11/21/2003
Customer	SILICON SENSING	SC_Quote	1/1/1900
Terms	1 YEAR	SC_Term	
Conditions	P/L & TRAVEL	Notes	

FSRs: [3498](#)

Serial Numbers:
 101102023 - T-2B CTD FTC
 38358 - T-1A TRACK BOARD
 46284 - T-1A CPU BOARD
 63414 - T-1A IDXR INTF BRD
 69954 - T-1B CPU BOARD
 72173 - T-1B TRACK BOARD
 76700 - T-2A CPU BOARD
 76767 - T-2B CPU BOARD
 76947 - T-2B TRACK BOARD
 76971 - T-2A TRACK BOARD
 78473 - T-2A IDXR INTF BRD
 78498 - T-2B IDXR INTF BRD
 78558 - T-1B IDXR INTF BRD
 79506 - T-1A EFC
 PR1900845 - PUMP 2 MILLIPORE CNTR
 PR191139 - PUMP 1 MILLIPORE CNTR
 RT-22-011116-01 - T-1B INDEXER
 RT-22-011116-07 - T-1A INDEXER

On this screen they can enter the Sales Order and view all the warranty information, FSRs, and serial numbers.

Search by Serial Number

eTracking - Serial Number Search

Home
Human Resources
Technical Services
eTracking
Company Directory
RT Calendar
Whopper
Send a Page
Links
Change Password
Macola Online
(macola.ritetrack.com)
Check Email
(mail.ritetrack.com)
Logoff

Serial Number:
RT-22-011116-08

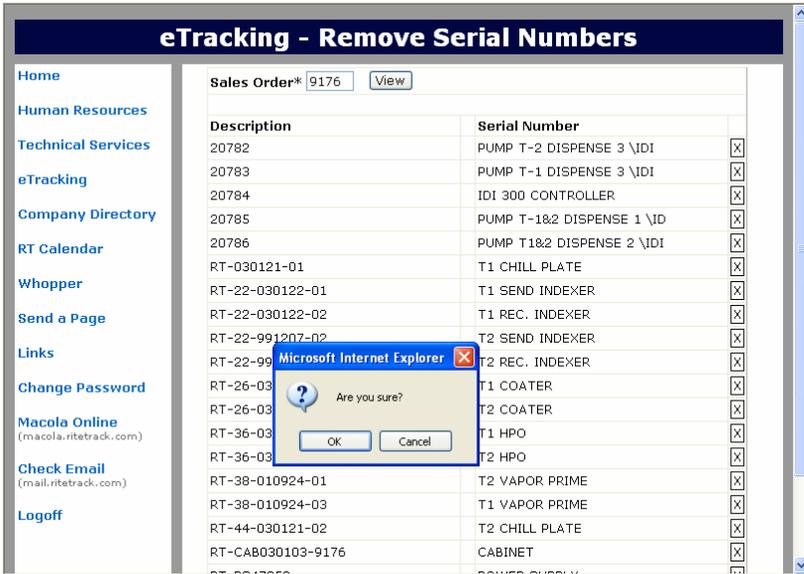
Sales Order	9163	Expires	11/21/2003
Customer	SILICON SENSING	SC_Quote	1/1/1900
Terms	1 YEAR	SC_Term	
Conditions	P/L & TRAVEL	Notes	

FSRs: [3498](#)

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 78498 - T-2B IDXR INTF BRD
 78558 - T-1B IDXR INTF BRD
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 PR191139 - PUMP 1 MILLIPORE CNTR
 RT-22-011116-01 - T-1B INDEXER
 RT-22-011116-07 - T-1A INDEXER

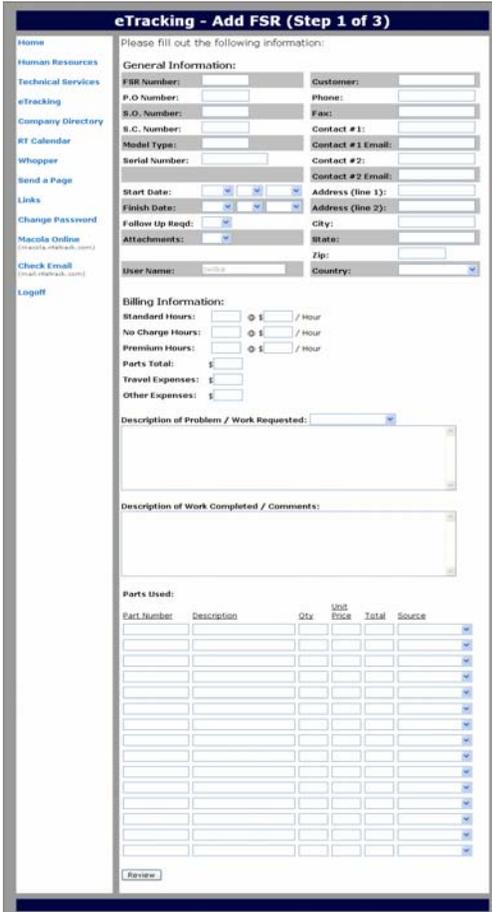
If only the serial number is known, it can be referenced back to the system it was sold with and all relevant information.

Remove Serial Numbers



Once the final test staff logs in, they have the ability to remove serial numbers only if warranty information has not been added. This allows them to fix problems before the machine ships. After that only Field Service Managers can make those changes.

Add FSR



This Page allows the Field Service Technicians to fill out all the information on a FSR. Once all information is entered, they review it, and then submit it if satisfied.

If they are not satisfied, using session variables, they can click *back* and still have all fields filled out as they had previously.

4.2 Database Design

FSR_TBL – Contains all information about an FSR

	Column Name	Data Type	Length	Allow Nulls
▶	FSR_NUMBER	int	4	
	PO_NUMBER	varchar	25	✓
	SO_NUMBER	varchar	25	✓
	SC_NUMBER	varchar	25	✓
	MODEL_TYPE	varchar	25	
	SERIAL_NUMBER	varchar	50	
	CUSTOMER	varchar	50	
	PHONE	varchar	25	
	FAX	varchar	25	
	CONTACT1_NAME	varchar	25	
	CONTACT1_EMAIL	varchar	50	
	CONTACT2_NAME	varchar	25	✓
	CONTACT2_EMAIL	varchar	50	✓
	ADDRESS1	varchar	50	
	ADDRESS2	varchar	50	✓
	CITY	varchar	25	
	STATE	varchar	25	✓
	ZIP	varchar	10	✓
	COUNTRY_ID	int	4	
	START_DATE	smalldatetime	4	
	FINISH_DATE	smalldatetime	4	
	FOLLOW_UP_REQ	varchar	5	
	ATTACHMENTS	varchar	5	
	USER_NAME	varchar	15	
	STANDARD_HOURS	smallint	2	✓
	STANDARD_RATE	money	8	✓
	NO_CHARGE_HOURS	smallint	2	✓
	NO_CHARGE_RATE	money	8	✓
	PREMIUM_HOURS	smallint	2	✓
	PREMIUM_RATE	money	8	✓
	PARTS_TOTAL	money	8	
	TRAVEL_EXPENSES	money	8	
	OTHER_EXPENSES	money	8	✓
	TYPE_OF_WORK	varchar	25	
	DESC_OF_PROBLEM	varchar	2000	
	DESC_OF_WORK	varchar	2000	
	EVALUATION	smallint	2	
	NOTES	varchar	2000	✓
	DATE_SUBMITTED	datetime	8	✓

FSR_PARTS_TBL – When entering an FSR, the parts used are stored in another table since the number of parts is dynamic

	Column Name	Data Type	Length	Allow Nulls
▶	PART_NUMBER_ID	int	4	
	FSR_NUMBER	int	4	
	PART_NUMBER	varchar	25	
	DESCRIPTION	varchar	50	
	QUANTITY	int	4	
	UNIT_PRICE	money	8	
	WAREHOUSE_ID	int	4	✓

FSR_USER_TBL – Contains the username and passwords for data entry areas

	Column Name	Data Type	Length	Allow Nulls
▶	USER_NAME	varchar	15	
	PASSWORD	varchar	15	
	ADMIN	smallint	2	
	FIRST_NAME	varchar	25	
	LAST_NAME	varchar	25	
	EMAIL	varchar	50	✓

FSR_WAREHOUSES_TBL – Contains the available warehouse when submitting an FSR

	Column Name	Data Type	Length	Allow Nulls
?	WAREHOUSE_ID	varchar	5	
	WAREHOUSE_NAME	varchar	25	

FSR_COUNTRIES_TBL – Contains the available countries when submitting an FSR

	Column Name	Data Type	Length	Allow Nulls
?	COUNTRY_ID	int	4	
	COUNTRY_NAME	varchar	25	

SERIAL_NUMBERS_TBL – Contains all the serial numbers

	Column Name	Data Type	Length	Allow Nulls
?	SERIAL_NUMBER_ID	int	4	
	SO_NUMBER	varchar	25	
	SERIAL_NUMBER	varchar	100	
	DESCRIPTION	varchar	1000	✓

WARRANTY_TBL – Contains all warranty information

	Column Name	Data Type	Length	Allow Nulls
?	SO_NUMBER	varchar	50	
	CUSTOMER	varchar	50	✓
	TERMS	varchar	50	✓
	CONDITIONS	varchar	100	✓
	EXPIRES	datetime	8	✓
	SC_QUOTE	datetime	8	✓
	SC_TERM	varchar	50	✓
	NOTES	varchar	1000	✓

4.3 Time Line

Spring 03	Summer and Fall 03	Winter 04
<ul style="list-style-type: none"> - Research (4 weeks) - Write Proposal (1 week) - Present Proposal 	<ul style="list-style-type: none"> - Develop Database (6 weeks) - Develop Web Interface (4 weeks) - Test Prototype (4 weeks) - Present Prototype 	<ul style="list-style-type: none"> - Add Advanced Error Checking (2 Weeks) - Complete Project (3 Weeks) - Present Completed Project

4.4 Budget

Hardware	Purpose	Cost
Compaq ML 350 Server	SQL and IIS 5 will run on this server	\$7,800
Dell Dimension 4550	I will use this workstation to develop the web site	\$1,000

Software	Purpose	Cost
Microsoft SQL Server 2000	Database Server	\$1,400
Office XP w/ FrontPage	Web design and layout development	\$550
Adobe Photoshop 7.0	Graphic design	\$600

Total	\$11,350
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5. Testing Procedures

This site was functional for several months and that has allowed some of our 40+ field service engineers to test this site. Initially I created the ability to add information several months ago, and then I have completed the project to add the abilities to change/remove necessary items. Overall there were few problems; the only main problem was I had users entering single quotes into fields and it would cause my INSERT SQL Statement to fail. I then created a FixQuotes function that replaces single quotes with double quotes for the INSERT statement and everything was resolved. The other problem was when <ENTER> was used, it was not displayed properly in HTML. To fix this problem I wrote another function that replaced Chr(13) with a
.

The site has been completed and running for about a month with currently about 10 FSRs submitted weekly with no complaints.

6. Conclusion and Recommendations

This project was created to fulfill a need to reduce and eliminate a lot of the paperwork and combine similar information into one system available worldwide. Using Windows 2003, Microsoft SQL 2000, and ASP I have created a site that does all of this for Rite Track. With 40+ users now worldwide, this site has become an essential tool for Rite Track. The project has met and exceeded all off the Design Freeze deliverables, and the project has been thoroughly tested to ensure its stability.

For students that would attempt a project of this magnitude in the future, I would recommend that they try to consider everything before hand. This not only means the site functionality, but also security features. This site requires usernames/passwords and

verifies users are logged in on every page. With company critical information, security has to be a key concern with all of this information available over the Internet. Another item is to make sure to check for single quotes in your SQL statements. You can accept any other character than that one. One last recommendation, remember when developing a web application that your users have a wide range of skills, always aim toward the side that users are five year olds, this includes clear instructions, JavaScript validation, and even setting a tab order.