

Data Warehousing Project Fall Term 2018

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SECTION 1 REQUIREMENTS

Business Description

Modeled after a my current company SWD Inc. for a project in my current role that is only conceptual at the time I write this. SWD Inc is a family owned company that has three divisions or services, namely metal finishing, dip spin coatings, and automated sorting. The companies main customer is Automotive OEM's, however they are a tier 2 or higher. The actual tier is unknown as their customers are either the products manufacture or distributor and the end customer is only known in certain circumstances. The products range from screws, washers, bolts and nuts to large stampings, and bolts for bridges.

The three services offered are often combined on the customers purchase order in various combinations. Thus the product routing can be very complex and is controlled via the ERP system (Visual Shop). Where throughput varies part to part, and the processing time is drastically different from Sorting to Dip Spin to Metal Finishing that the process inherently has bottlenecks. Common process flow scheduling systems like Kanban and FIFO are optimized for front end bottlenecks or continuous flow, and will not work for SWD. Their bottlenecks are at the end of the process and they need a pull system or Theory of Constraints Schedule (DBR Schedule) but in reverse, starting at the last process and scheduling backwards.

While there are many aspects to get the final goal of having all the production data, along with the ERP data to build a AI model that could apply the business logic to help schedule the various production lines to help increase on time delivery and customer satisfaction; there is one piece of the puzzle that will need to be addressed first. The Phos 2 line is the main pre-treatment for all Dip Spin work. The software controlling the line (Name) outputs a CSV file daily. The data is not stored in a database. This project would build a database to store the daily production output but would also develop a data warehouse that will contain the facts necessary to aid in the future AI project. Similar data warehouses will follow for all other production lines and the ERP system along with testing databases, and future IIoT data streams and need to be under the overall Enterprise DW Architecture. The Phos 2 DW project will be the first step toward that end goal.

Business Problems

1. The production data has been reviewed from the lens of the ERP system but not from production data. The ERP system only knows the data and time stamps for each process in and out, where the line has additional granular level to each step in the recipe in the line. This additional info may hold unknown insights.
 2. The operators of the line are incentivized to process weight through the line. There are many claims that this drives undesired behavior but management has no data to prove this and is reluctant to make any changes.
-

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3. On Time Delivery of the company as a whole has been lower than the targeted outcome. This may be due to the issues described in number 2 above, however it could also be due to the need to always have the line producing (non TOC theory), and the operators running work where the Dip Spin process is next but not schedule to run generating WIP that doesn't flow through the process until days later.

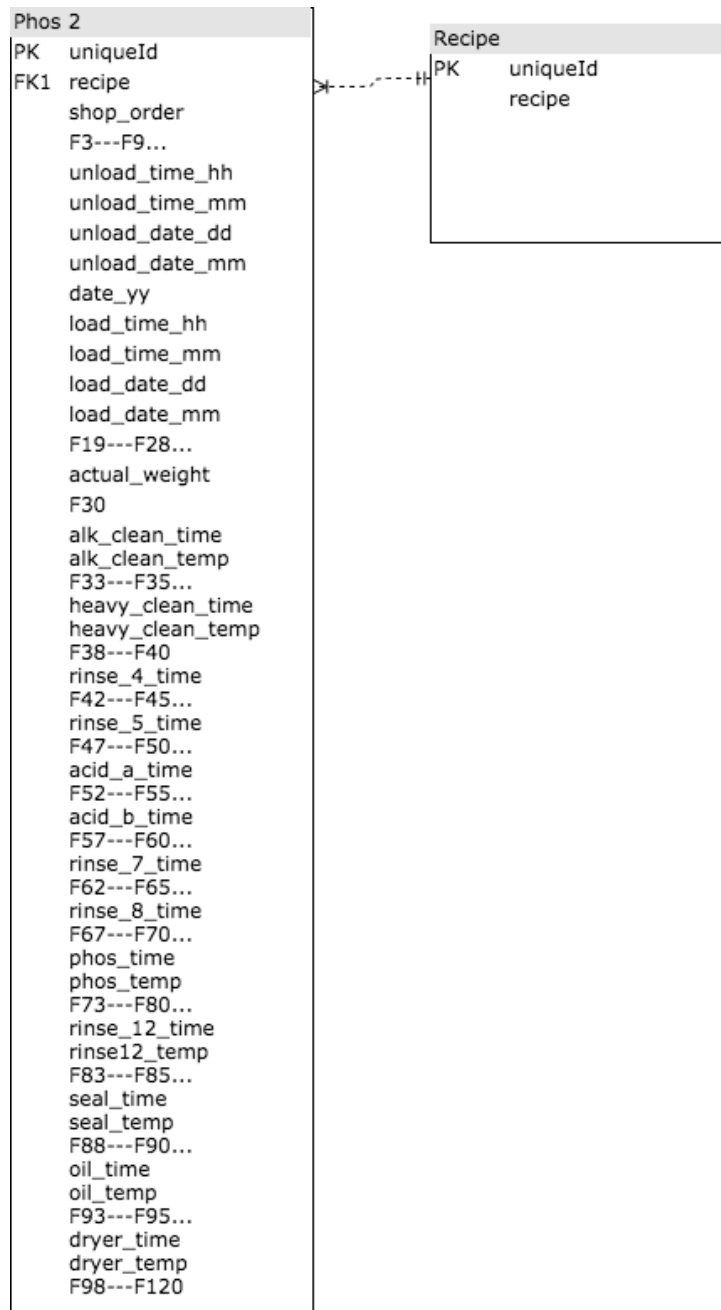
Business Requirements

1. Store all data from Phos 2 output CSV files into a normalized database
2. Production reports per shift can be reported on a daily, weekly, monthly, and yearly (year over year) in a report
 1. Pounds per shift, per each timeframe
 2. Total orders count
 3. Recipe performance
3. Fact and Attribute tables will make the data easier to connect to ERP data for additional analysis and reporting
 1. Determine the pounds per barrel produced
 2. Determine the pounds per minute
 3. Determine the time in each step of the recipe and flag outliers
 4. Determine line uptime and downtime
4. DW tables will be able to be connected to other equipment DW in the future for predictive scheduling

Database Requirements

- Store the daily operational output of Phos 2 in a database
 - DW store data in order to meet the business requirements above
-

SECTION 2 DATA MODELS



Logical Data Model

The logical data format is controlled by the output of the manufacturing line and how the data is structured coming out of that machine. There is potentially additional data that is currently not being outputted by the machine. These missing values are going into a F## column. This allows for further changes if those fields are ever populated and it reduces the ETL scripts necessary to update the table on a daily basis.

SECTION 3 PHYSICAL DATABASE

Un-normalized Tables

Data is in a single CSV file. Recipe_ID is removed from the data and replaced by its FK. The recipes table is populated based off known values from the production equipment. This places the data in 3rd normal form. The shop order could also be separated out, yet it is also a natural key.

SQL Code - Tables

```
USE MDS523_ChazClark
Go
```

```
CREATE TABLE RECIPE
(RECIPE_ID    INT NOT NULL IDENTITY(1,1) PRIMARY KEY,
RECIPE        VARCHAR(255) NOT NULL);
```

```
CREATE TABLE PHOS2
(PHOS2_ID    INT NOT NULL IDENTITY (1,1) PRIMARY KEY,
RECIPE_ID    INT    NOT NULL FOREIGN KEY REFERENCES RECIPE (RECIPE_ID),
SHOP_ORDER  INT    NOT NULL,
F3           INT,
F4           INT,
F5           INT,
F6           INT,
F7           INT,
F8           INT,
F9           INT,
UNLOAD_TIME_HH  INT,
UNLOAD_TIME_MM  INT,
UNLOAD_DATE_MM  INT,
UNLOAD_DATE_DD  INT,
DATE_YY         INT,
LOAD_TIME_HH    INT,
LOAD_TIME_MM    INT,
LOAD_DATE_MM    INT,
LOAD_DATE_DD    INT,
```

F19	INT,	
F20	INT,	
F21	INT,	
F22	INT,	
F23	INT,	
F24	INT,	
F25	INT,	
F26	INT,	
F27	INT,	
F28	INT,	
ACTUAL_WEIGHT	INT,	
F30	INT,	
ALK_CLEAN_TIME	INT,	
ALK_CLEAN_TEMP	INT,	
F33	INT,	
F34	INT,	
F35	INT,	
HEAVY_CLEAN_TIME	INT,	
HEAVY_CLEAN_TEMP	INT,	
F38	INT,	
F39	INT,	
F40	INT,	
RINSE_4_TIME	INT,	
F42	INT,	
F43	INT,	
F44	INT,	
F45	INT,	
RINSE_5_TIME	INT,	
F47	INT,	
F48	INT,	
F49	INT,	
F50	INT,	
ACID_A_TIME	INT,	
F52	INT,	
F53	INT,	
F54	INT,	
F55	INT,	

ACID_B_TIME	INT,	
F57	INT,	
F58	INT,	
F59	INT,	
F60	INT,	
RINSE_7_TIME	INT,	
F62	INT,	
F63	INT,	
F64	INT,	
F65	INT,	
RINSE_8_TIME	INT,	
F67	INT,	
F68	INT,	
F69	INT,	
F70	INT,	
PHOS_TIME	INT,	
PHOS_TEMP	INT,	
F73	INT,	
F74	INT,	
F75	INT,	
RINSE_11_TIME	INT,	
F77	INT,	
F78	INT,	
F79	INT,	
F80	INT,	
RINSE_12_TIME	INT,	
RINSE_12_TEMP	INT,	INT,
F83	INT,	
F84	INT,	
F85	INT,	
SEAL_TIME	INT,	
SEAL_TEMP	INT,	
F88	INT,	
F89	INT,	
F90	INT,	
OIL_TIME	INT,	
OIL_TEMP	INT,	

F93	INT,
F94	INT,
F95	INT,
DRYER_TIME	INT,
DRYER_TEMP	INT,
F98	INT,
F99	INT,
F100	INT,
F101	INT,
F102	INT,
F103	INT,
F104	INT,
F105	INT,
F106	INT,
F107	INT,
F108	INT,
F109	INT,
F110	INT,
F111	INT,
F112	INT,
F113	INT,
F114	INT,
F115	INT,
F116	INT,
F117	INT,
F118	INT,
F119	INT,
F120	INT);

SQL Code - Load Tables

```
INSERT INTO RECIPE (RECIPE)
VALUES ('ZINC PHOS SKIP ACID');
```

```
INSERT INTO PHOS2
(RECIPE_ID,SHOP_ORDER,F3,F4,F5,F6,F7,F8,F9,UNLOAD_TIME_HH,UNLOAD_TIME_MM,UNLOAD_DATE_MM,
UNLOAD_DATE_DD,DATE_YY,LOAD_TIME_HH,LOAD_TIME_MM,LOAD_DATE_MM,LOAD_DATE_DD,F19,F20,F2
1,F22,F23,F24,F25,F26,F27,F28,ACTUAL_WEIGHT,F30,ALK_CLEAN_TIME,ALK_CLEAN_TEMP,F33,F34,F35,HE
```

AVY_CLEAN_TIME,HEAVY_CLEAN_TEMP,F38,F39,F40,RINSE_4_TIME,F42,F43,F44,F45,RINSE_5_TIME,F47,F48
,F49,F50,ACID_A_TIME,F52,F53,F54,F55,ACID_B_TIME,F57,F58,F59,F60,RINSE_7_TIME,F62,F63,F64,F65,RINS
E_8_TIME,F67,F68,F69,F70,PHOS_TIME,PHOS_TEMP,F73,F74,F75,RINSE_11_TIME,F77,F78,F79,F80,RINSE_1
2_TIME,RINSE_12_TEMP,F83,F84,F85,SEAL_TIME,SEAL_TEMP,F88,F89,F90,OIL_TIME,OIL_TEMP,F93,F94,F95,
DRYER_TIME,DRYER_TEMP,F98,F99,F100,F101,F102,F103,F104,F105,F106,F107,F108,F109,F110,F111,F112,
F113,F114,F115,F116,F117,F118,F119,F120)
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[illegible]

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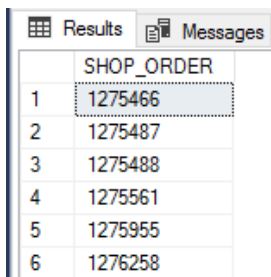
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SECTION 4 DATABASE QUERIES

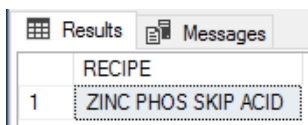
Simple Queries

```
USE MDS523_ChazClark
GO
SELECT DISTINCT SHOP_ORDER
FROM PHOS2
GROUP BY SHOP_ORDER;
```



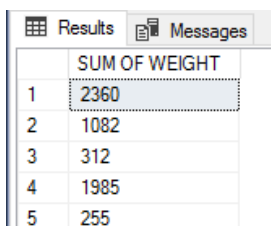
	SHOP_ORDER
1	1275466
2	1275487
3	1275488
4	1275561
5	1275955
6	1276258

```
USE MDS523_ChazClark
GO
SELECT RECIPE
FROM RECIPE;
```



	RECIPE
1	ZINC PHOS SKIP ACID

```
USE MDS523_ChazClark
GO
SELECT SUM(ACTUAL_WEIGHT)AS 'SUM OF WEIGHT'
FROM PHOS2
GROUP BY SHOP_ORDER;
```



	SUM OF WEIGHT
1	2360
2	1082
3	312
4	1985
5	255

```
USE MDS523_ChazClark
GO
SELECT PHOS_TEMP, PHOS_TIME
FROM PHOS2
WHERE PHOS_TEMP > 170;
```

Results			Messages	
	PHOS_TEMP	PHOS_TIME		
1	172	599		
2	173	768		
3	172	781		
4	171	1377		
5	173	1465		

```
SELECT SHOP_ORDER,
MAX(ACID_A_TIME) AS MAXACIDATIME,
MAX(ACID_B_TIME) AS MAXACIDBTIME
FROM PHOS2
GROUP BY SHOP_ORDER;
```

Results				Messages	
	SHOP_ORDER	MAXACIDATIME	MAXACIDBTIME		
1	1275466	0	430		
2	1275487	0	607		
3	1275488	0	751		
4	1275561	0	475		
5	1275955	0	240		

Complex Queries

Where the database is a basic structure and the business results will come from complex queries from the data warehouse. I have moved this section into section 5 after the creation of the DW.

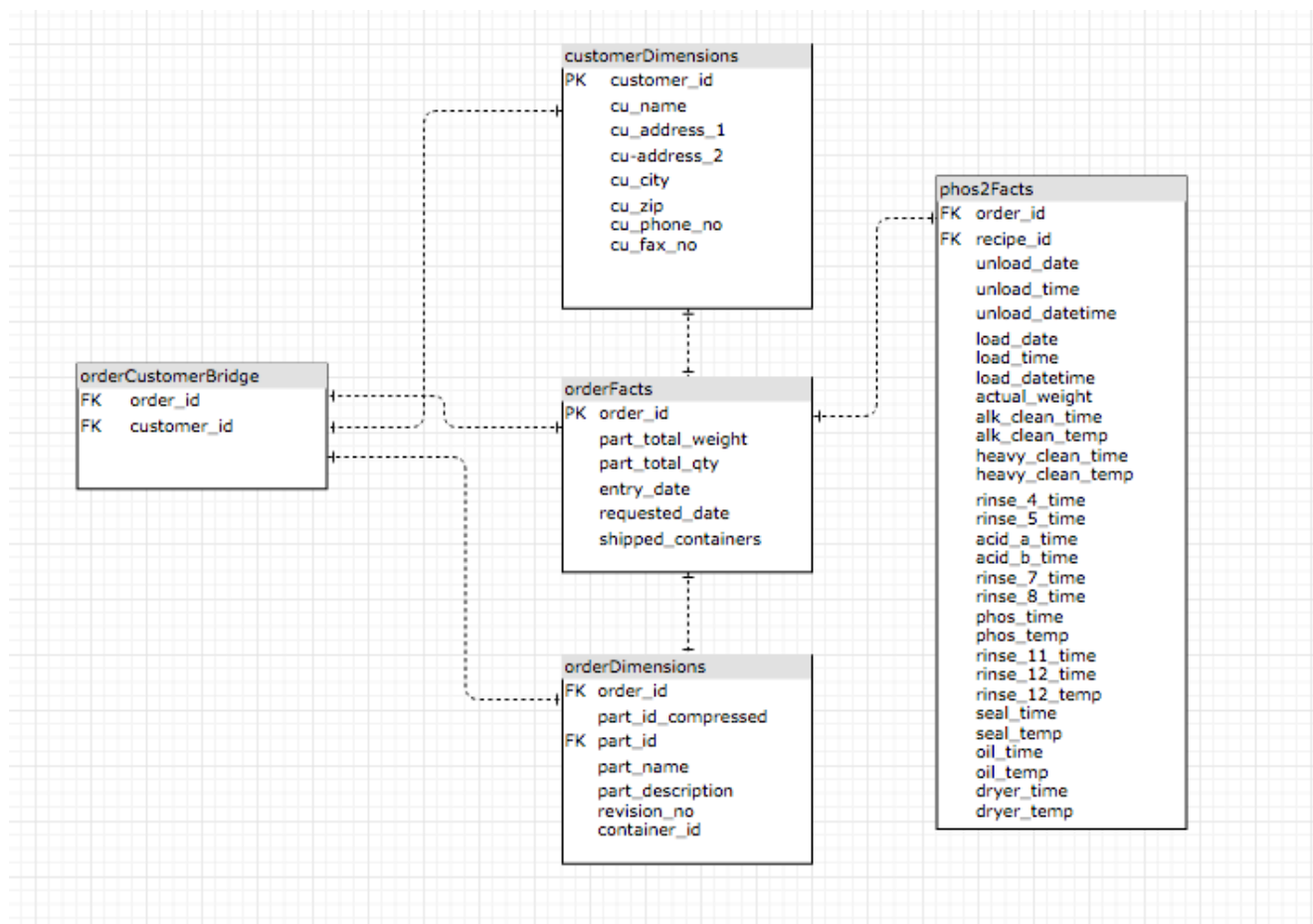
SECTION 5 DATA WAREHOUSE DESIGN AND CODING

Data Warehouse Design

The business needs to be able to track the barrels through the line, and see how much time it is taking at each tank for processing. This information is verified during an audit to confirm that the machine is properly timing the product in each bath.

The order, customer, and billing dimension were created from existing tables in the ERP that relate to the Phos 2 line fact table through the shop order. The date dimension table was created in excel.

The production fact table was created with the database build above. The data in that table is granular to the time a barrel is processed in a specific tank. This has been aggregated to match one record per order of all the dimension tables.

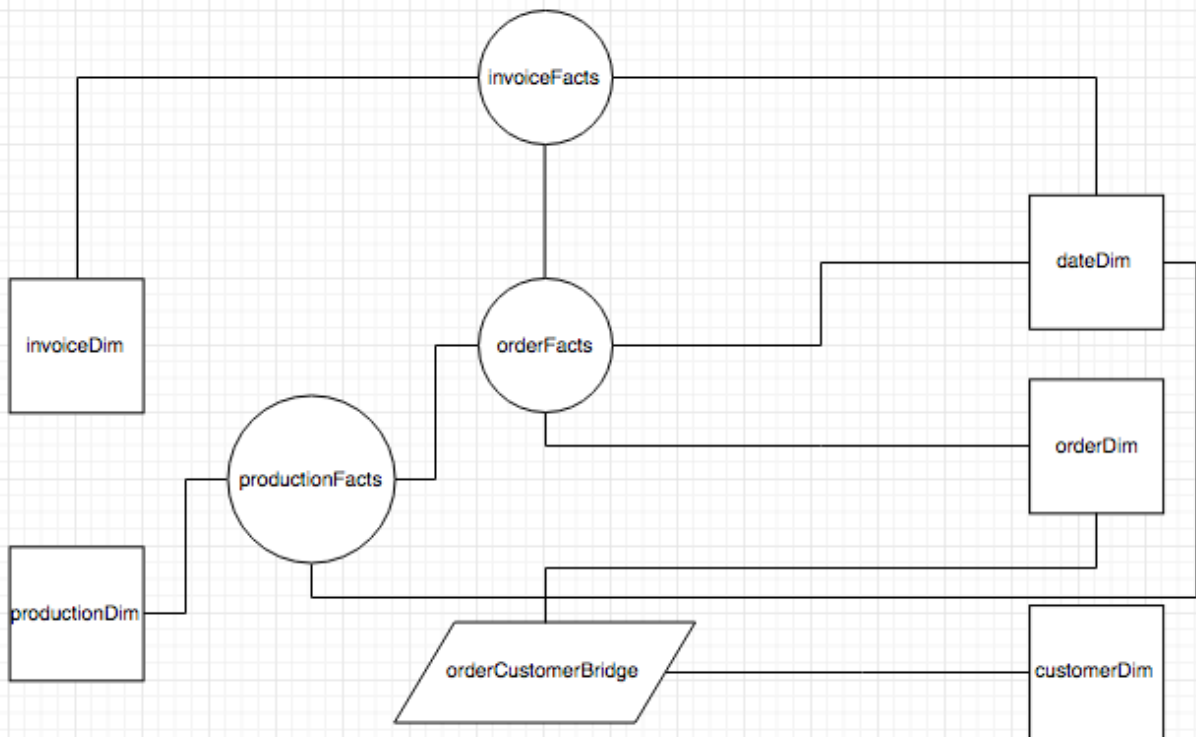


Data Marts

I have included an overall EDW diagram below. Its a compilation of at least three different data marts that could be set up individually and possibly have ties to one another. For the purpose of this paper the OrderFacts will not connect to Invoice Facts or Production Facts. These will be future projects.

Data Marts

This is a potential structure for all the data marts. Only the Order and Customer Data Marts will be developed for this project.



Data Warehouse Creation - Code

Customer Dimension Create SQL:

```
USE MDS523_ChazClark  
GO
```

```
CREATE TABLE CUSTOMERDIMENSION (CUSTOMER_ID INT NOT NULL PRIMARY KEY,  
    CU_NAME          VARCHAR(255) NOT NULL,  
    CU_ADDRESS_1     VARCHAR(255) NOT NULL,  
    CU_ADDRESS_2     VARCHAR(255),  
    CU_CITY          VARCHAR(255),  
    CU_ZIP           VARCHAR(255),  
    CU_PHONE_NO      VARCHAR(12),  
    CU_FAX_NO        VARCHAR(12));
```

This is the SQL that would extract the data from the ERP to seed the Customer Dimension table. However to keep this and other tables for this project void of confidential information the tables will be seeded with randomly generated data thanks to Mackaroo.

Customer Dimension Extract SQL:

```
SELECT DISTINCT dbo_CUSTOMER.customer_id, dbo_CUSTOMER.cu_name,  
    dbo_CUSTOMER.cu_address_1, dbo_CUSTOMER.cu_address_2, dbo_CUSTOMER.cu_city,  
    dbo_CUSTOMER.cu_zip, dbo_CUSTOMER.cu_phone_no, dbo_CUSTOMER.cu_fax_no  
    INTO CUSTOMERDIMENSION  
FROM (DEC42018PD LEFT JOIN Query2 AS Query2_1 ON DEC42018PD.Field2 =  
    Query2_1.MaxOforder_id) LEFT JOIN dbo_CUSTOMER ON Query2_1.customer_id =  
    dbo_CUSTOMER.customer_id  
WHERE (((dbo_CUSTOMER.cu_active)="Y"));
```

This is also a potential option to seed the database but it requires a higher level of permissions to do so:

```
USE MDS523_ChazClark  
GO
```

```
BULK INSERT MDS523_CHAZCLARK.CUSTOMERDIMENSION  
    FROM 'H:\DESKTOP\customerDimension.csv'  
    WITH (FIRSTROW = 2, FIELDTERMINATOR=',', ROWTERMINATOR = '\N')
```

Customer Dimension Load SQL:

USE MDS523_ChazClark
GO

```
INSERT INTO CUSTOMERDIMENSION (CUSTOMER_ID,  
CU_NAME,CU_ADDRESS_1,CU_ADDRESS_2,CU_CITY,CU_ZIP,CU_PHONE_NO,CU_FAX_NO)  
VALUES (00081,'Manihot dichotoma Ule','59 Kenwood Road','39 Canary Pass','Leticia',NULL,  
634-309-7135,602-839-9711),  
(00097,'Hibiscus moscheutos L.','60344 Corben Pass','966 Eastwood Road','Nioro',NULL,  
272-218-6820,587-584-2060),  
(00162,'Psychotria pubescens Sw.','95230 Arizona Parkway','77389 Magdeline Parkway','Cachan','94234  
CEDEX',730-765-2933,163-796-7981),  
(00201,'Limnanthes vinculans Ornduff','2977 Glacier Hill Street','2 Texas Place','Wanjia',NULL,  
914-173-8113,729-450-4779),  
(00230,'Justicia lanceolata (Chapm.) Small','73 Kingsford Place','1 Holmberg Park','Karnobat','8438',  
524-277-9543,533-903-3994),  
(00250,'Heliotropium procumbens Mill. var. procumbens','16 Tennyson Plaza','88 Menomonie  
Junction','Lille','59715 CEDEX 9',476-256-9130,798-614-3701),  
(00280,'Xanthoria papillifera (Vain.) Poelt','7268 Almo Lane','40 Eastlawn Junction','Plumbangan',NULL,  
475-639-1770,475-252-6491),  
(00284,'Selaginella subcaulescens Baker','00407 Dixon Way','7553 Schiller Alley','Agboville',NULL,  
337-453-1963,849-706-8473),  
(00290,'Phyllostegia floribunda Benth.','0497 Manitowish Pass','5708 Graedel Crossing','Hutou',NULL,  
204-836-6285,740-826-6388),  
(00307,'Lonicera subspicata Hook. & Arn. var. johnstonii D.D. Keck','47663 Bultman Parkway','8 Orin  
Court','Ritchie','8701',883-921-9008,105-709-4942),  
(00340,'Cyclanthera gracillima Cogn.','8972 Golf Course Plaza','088 Stone Corner Lane','Kyrenia',NULL,  
841-484-4994,154-958-4299),  
(00403,'Schinopsis Engl.','8874 Vermont Center','839 7th Circle','Jingyang',NULL,147-660-9617,252-423-0526),  
(00572,'Acmella decumbens (Sm.) R.K. Jansen','856 Sunbrook Center','710 Oak Valley  
Crossing','Mardakyany',NULL,653-829-0977,298-151-9905),  
(00597,'Quercus jómunzii Tucker','4 Lakeland Street','229 Roxbury Hill','Mjðlbý',595 94',  
847-515-9286,811-557-2837),  
(00605,'Astragalus bicristatus A. Gray','12 Forest Run Alley','95999 Hudson Plaza','Babakan',NULL,  
948-257-3542,611-962-8239),
```

(00770,'Orthothecium diminutivum (Grout) H.A. Crum, Steere & L.E. Anderson','9628 Bobwhite Terrace','9974 La Follette Parkway','Bobigny','93909 CEDEX 9','684-656-3972,277-773-6411),

(00970,'Ligustrum vulgare L.','912 International Parkway','7 Kensington Crossing','Yacheng',NULL,297-416-9165,116-145-3153),

(01035,'Trifolium trichocalyx A. Heller','8100 Thierer Center','6 Algoma Drive','Qingqu',NULL,911-993-3512,970-839-4872),

(01080,'Bactris guineensis (L.) H.E. Moore','9719 Lillian Plaza','27046 Red Cloud Parkway','Eirado','4990-540',164-180-1553,135-177-6068),

(01100,'Aethusa cynapium L.','52 Merrick Parkway','35 Swallow Way','J/μhvi',NULL,201-122-2838,717-109-0148),

(01156,'Prenanthes carrei Singhurst, O'Kennon & W.C. Holmes','9 Sutherland Way','9233 Anderson Drive','Bradag',NULL,824-828-5918,582-408-1592),

(01265,'Echinacea paradoxa (J.B.S. Norton) Britton','7 Meadow Ridge Place','47 Memorial Junction','Dahe',NULL,787-308-6420,759-999-4446),

(01391,'Podophyllum peltatum L.','308 Dawn Trail','5 Bonner Parkway','Banjarkemuning',NULL,938-797-3841,648-320-8877),

(101835,'Galium sparsiflorum W. Wight','70824 Southridge Lane','73605 Ridgeview Point','Balogo','6542',722-502-5700,456-292-5562),

(102019,'Tabebuia heterophylla (DC.) Britton','8395 Southridge Way','516 Lawn Court','Psebay','352585',717-376-9099,117-374-7547),

(102090,'Metasequoia glyptostroboides Hu & W.C. Cheng','5 Kim Junction','43410 Dakota Road','Kumalarang','7005',631-691-8130,659-243-4288),

(102896,'Polygonum bistorta L. var. plumosum (Small) B. Boivin','97 Manley Center','3618 Continental Terrace','Ongabelen',NULL,914-252-5480,925-471-7195),

(1030,'Parmotrema dilatatum (Vain.) Hale','1606 Butterfield Center','007 Luster Trail','Quisqueya','11109',371-995-0108,482-754-9728),

(1109,'Lewisia stebbinsii Gankin & Hildreth','125 Bay Center','1280 Roth Place','Quinta da Courela','2840-547',268-606-1621,332-965-2276),

(1326,'Dioscorea floridana Bartlett','8 Ruskin Drive','726 North Junction','Fengmen',NULL,590-153-0005,944-943-7980),

(172,'Prunus spinosa L.','88 Forest Run Alley','78929 Carey Park','Florenxia','195047',507-582-4153,350-437-4768),

(1726,'Lewisia columbiana (Howell ex A. Gray) B.L. Rob. var. wallowensis C.L. Hitchc.','72 Chive Terrace','664 Paget Plaza','Gasi',NULL,833-582-4630,139-804-7603),

(188,'Agoseris aurantiaca (Hook.) Greene','15232 Brickson Park Street','7554 Almo Street','Shaochang',NULL,208-410-3979,694-113-3343),

(264,'Amaranthus pumilus Raf.','719 Lien Court','2 Harper Plaza','Noramarg',NULL,
908-412-2458,732-765-8631),
(335,'Pinus discolor D.K. Bailey & Hawksw.','6608 Cardinal Parkway','46832 Moulton
Crossing','Redondos','2865-493',841-511-2839,446-984-6225),
(402,'Passiflora multiflora L.','70 Brentwood Park','892 Manitowish Street','Atlanta','30343',
404-848-0833,646-478-1449),
(440,'Mycoblastus marginatus Degel.','99 Weeping Birch Street','675 Straubel Center','Kayes',NULL,
790-199-7324,969-763-8446),
(783,'Taxiphyllum cuspidifolium (Cardot) Z. Iwats.','056 Meadow Valley Trail','291 Meadow Vale Street','Cergy-
Pontoise','95032 CEDEX',233-260-3878,774-610-6784),
(790,'Cephaelis Sw.','3 Eggendart Terrace','3 Kipling Drive','Campo Grande','59680-000',
866-231-3602,996-258-0674);

Order Facts Create SQL:

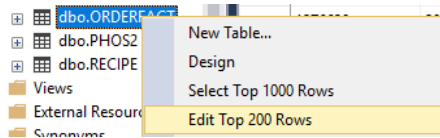
```
USE MDS523_ChazClark
GO
```

```
CREATE TABLE ORDERFACT (ORDER_ID INT NOT NULL PRIMARY KEY,
    PART_TOTAL_WEIGHT      INT      NOT NULL,
    PART_TOTAL_QTY         INT      NOT NULL,
    ENTRY_DATE             DATETIME,
    REQUESTED_DATE         DATETIME,
    SHIPPED_CONTAINERS     INT);
```

Order Facts Extraction SQL:

```
SELECT dbo_ORDER_HEADER.order_id, dbo_ORDER_PART.part_total_weight,
dbo_ORDER_PART.part_total_qty, dbo_ORDER_HEADER.entry_date, dbo_ORDER_HEADER.requested_date,
Sum(dbo_ORDER_SHIP.shipped_containers) AS SumOfshipped_containers INTO ORDERDIMENSION
FROM DEC42018PD LEFT JOIN (((dbo_ORDER_HEADER LEFT JOIN dbo_ORDER_PART ON
dbo_ORDER_HEADER.order_id = dbo_ORDER_PART.order_id) LEFT JOIN dbo_ORDER_SHIP ON
dbo_ORDER_HEADER.order_id = dbo_ORDER_SHIP.order_id) LEFT JOIN dbo_ORDER_CONTAINER ON
dbo_ORDER_HEADER.order_id = dbo_ORDER_CONTAINER.order_id) ON DEC42018PD.Field2 =
dbo_ORDER_HEADER.order_id
GROUP BY dbo_ORDER_HEADER.order_id, dbo_ORDER_PART.part_total_weight,
dbo_ORDER_PART.part_total_qty, dbo_ORDER_HEADER.entry_date, dbo_ORDER_HEADER.requested_date
HAVING (((dbo_ORDER_HEADER.order_id) Is Not Null));
```

Order Facts Load SQL:



By clicking on the table that was created and editing the top 200 rows, I was then able to copy from excel and paste right into the table.

ORDER_ID	PART_TOTAL_...	PART_TOTAL_...	ENTRY_DATE	REQUESTED_D...	SHIPPED_CON...
1275466	436	19900	2018-11-16 13:3...	2018-11-27 00:0...	48
1275487	704	15300	2018-11-16 13:5...	2018-12-07 00:0...	8
1275488	155	5000	2018-11-16 13:5...	2018-11-27 00:0...	1
1275561	1088	48000	2018-11-16 15:0...	2018-11-23 00:0...	228
1275955	54	25000	2018-11-19 15:5...	2018-11-30 00:0...	2

Order Dimension Create SQL:

USE MDS523_ChazClark

GO

```
CREATE TABLE ORDERDIMENSION (ORDER_ID INT NOT NULL FOREIGN KEY REFERENCES
ORDERFACT(ORDER_ID),
    PART_ID_COMPRESSED    VARCHAR(255) NOT NULL,
    PART_ID                VARCHAR(255) NOT NULL,
    PART_NAME              VARCHAR(255),
    PART_DESCRIPTION       VARCHAR(255),
    REVISION_NO            INT,
    CONTAINLER_ID          VARCHAR(255));
```

Order Dimension Extraction SQL:

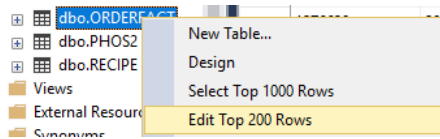
```
SELECT dbo_ORDER_HEADER.order_id, dbo_ORDER_PART.part_id_compressed, dbo_ORDER_PART.part_id,
dbo_ORDER_PART.part_name, dbo_ORDER_PART.part_description, dbo_ORDER_PART.revision_no,
Max(dbo_ORDER_CONTAINER.container_id) AS MaxOfcontainer_id INTO ORDERDIMENSION
FROM DEC42018PD LEFT JOIN ((dbo_ORDER_HEADER LEFT JOIN dbo_ORDER_PART ON
dbo_ORDER_HEADER.order_id = dbo_ORDER_PART.order_id) LEFT JOIN dbo_ORDER_CONTAINER ON
```

```

dbo_ORDER_HEADER.order_id = dbo_ORDER_CONTAINER.order_id) ON DEC42018PD.Field2 =
dbo_ORDER_HEADER.order_id
GROUP BY dbo_ORDER_HEADER.order_id, dbo_ORDER_PART.part_id_compressed,
dbo_ORDER_PART.part_id, dbo_ORDER_PART.part_name, dbo_ORDER_PART.part_description,
dbo_ORDER_PART.revision_no
HAVING (((dbo_ORDER_HEADER.order_id) Is Not Null));

```

Order Dimension Load SQL:



By clicking on the table that was created and editing the top 200 rows, I was then able to copy from excel and paste right into the table.

ORDER_ID	PART_ID_COM...	PART_ID	PART_NAME	PART_DESCRIP...	REVISION_NO	CONTAINER_ID
1275466	5072471351413...	507247 (135141...	GM3179-B ***...	SPRING ...	1	Box
1275487	X12078 ...	X12078 ...	GMW3359 BLA...	GAURD DEFLEC...	1	Box
1275488	X1295402 ...	X12954-02 ...	SILVER PER WSS...	SPRING BRACK...	1	Box
1275561	B300241A20 ...	B300241A-20	1	Box
1275955	BST57287 ...	BST-572.87 ...	MAGNI 575 ****...	8.8 6 LOBE FL H...	1	Box

Order Customer Bridge Create SQL:

```

USE MDS523_ChazClark
GO
CREATE TABLE ORDERCUSTOMERBRIDGE
    (ORDER_ID INT NOT NULL FOREIGN KEY REFERENCES ORDERFACT(ORDER_ID),
    CUSTOMER_ID INT NOT NULL FOREIGN KEY REFERENCES
CUSTOMERDIMENSION(CUSTOMER_ID));

```

Order Customer Bridge Extraction SQL:

```

SELECT DISTINCT dbo_ORDER_HEADER.order_id, dbo_ORDER_HEADER.customer_id INTO
ORDERDIMENSION
FROM DEC42018PD LEFT JOIN dbo_ORDER_HEADER ON DEC42018PD.Field2 =
dbo_ORDER_HEADER.order_id
WHERE (((dbo_ORDER_HEADER.order_id) Is Not Null));

```

Order Customer Bridge Load SQL:

USE MDS523_ChazClark

GO

INSERT INTO ORDERCUSTOMERBRIDGE

VALUES(1275466,102019),(1275487,1030),(1275488,1030),(1275561,1726),(1275955,102090),
(1276258,00250),(1276348,440),(1276478,01265),(1276572,00290),(1276575,01035),(1276599,00307),
(1276639,00770),(1276741,188),(1276803,00280),(1276838,00307),(1276900,01156),(1276979,1326),
(1276986,01080),(1277062,102896),(1277247,1726),(1277456,01035),(1277489,00097),(1277490,00097),
(1277518,1326),(1277548,00081),(1277561,1326),(1277590,01265),(1277594,101835),(1277614,00307),
(1277634,1326),(1277653,188),(1277655,188),(1277657,188),(1277690,172),(1277721,00605),(1277734,188),
(1277821,101835),(1277823,101835),(1277860,01100),(1277882,00201),(1277885,00201),(1277888,00201),
(1278001,00605),(1278063,1326),(1278094,00284),(1278099,00403),(1278113,00572),(1278117,790),
(1278126,01391),(1278153,783),(1278166,790),(1278225,00597),(1278234,402),(1278240,335),(1278248,1109),
(1278250,1109),(1278251,1109),(1278255,1109),(1278258,1109),(1278259,1109),(1278260,1109),
(1278261,1109),(1278262,1109),(1278265,1109),(1278267,1109),(1278268,1109),(1278284,1109),
(1278286,1109),(1278289,1109),(1278290,1109),(1278315,00970),(1278326,00340),(1278327,00340),
(1278374,01080),(1278394,00605),(1278395,00605),(1278396,00605),(1278415,00605),(1278416,00605),
(1278459,01100),(1278483,00605),(1278485,00605),(1278487,00605),(1278488,00605),(1278490,00605),
(1278493,00605),(1278494,00605),(1278495,00605),(1278496,00605),(1278497,00605),(1278498,00605),
(1278508,00307),(1278514,00605),(1278524,00307),(1278581,00097),(1278659,00162),(1278667,264),
(1278700,00230);

Date Dimension Create SQL:

USE MDS523_ChazClark

GO

CREATE TABLE DATEDIMENSION (DATE_KEY INT NOT NULL PRIMARY KEY,
DATE_FIELD DATE NOT NULL,
YEAR_FIELD INT NOT NULL,
MONTH_FIELD INT NOT NULL,
DAY_FIELD INT NOT NULL,
WEEKDAYNO INT NOT NULL,
WEEKDAY_FIELD CHAR(3) NOT NULL,
WEEKNO INT NOT NULL,
MONTHNAMESHORT CHAR(3) NOT NULL,

```

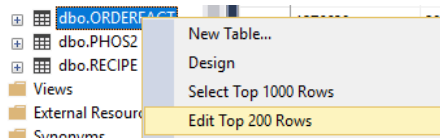
QUARTER_FIELD      CHAR(2)      NOT NULL,
YEAR_MONTH  CHAR(8) NOT NULL,
YEAR_QUARTER      CHAR(8)      NOT NULL,
ISWEEKEND    BIT);

```

Date Dimension Extraction SQL:

This was built in excel, therefore no SQL was used to extract it.

Date Dimension Load SQL:



By clicking on the table that was created and editing the top 200 rows, I was then able to copy from excel and paste right into the table.

Results		Messages					
	DATE_KEY	DATE_FIELD	YEAR_FIELD	MONTH_FIELD	DAY_FIELD	WEEKDAYNO	WEEKDAY_FIELD
1	20150101	2015-01-01	2015	1	1	5	Thu
2	20150102	2015-01-02	2015	1	2	6	Fri
3	20150103	2015-01-03	2015	1	3	7	Sat
4	20150104	2015-01-04	2015	1	4	1	Sun
5	20150105	2015-01-05	2015	1	5	2	Mon

WEEKNO	MONTHNAMESHORT	QUARTER_FIELD	YEAR_MONTH	YEAR_QUARTER	ISWEEKEND
1	Jan	Q1	2015 Jan	2015 Q1	NULL
1	Jan	Q1	2015 Jan	2015 Q1	NULL
1	Jan	Q1	2015 Jan	2015 Q1	NULL
2	Jan	Q1	2015 Jan	2015 Q1	NULL
2	Jan	Q1	2015 Jan	2015 Q1	NULL

Phos2 Fact Create SQL:

USE MDS523_ChazClark

GO

```
CREATE TABLE PHOS2FACT (ORDER_ID      INT      NOT NULL FOREIGN KEY REFERENCES
ORDERFACT(ORDER_ID),
      RECIPE_ID      INT      NOT NULL      FOREIGN KEY REFERENCES RECIPE(RECIPE_ID),
      UNLOAD_DATE DATE      NOT NULL,
      UNLOAD_TIME  TIME      NOT NULL,
      UNLOAD_DATETIME DATETIME      NOT NULL,
      LOAD_DATE    DATE      NOT NULL,
      LOAD_TIME    TIME      NOT NULL,
      LOAD_DATETIME DATETIME      NOT NULL,
      ACTUAL_WEIGHT INT      NOT NULL,
      ALK_CLEAN_TIME INT      NOT NULL,
      ALK_CLEAN_TEMP INT      NOT NULL,
      HEAVY_CLEAN_TIME INT      NOT NULL,
      HEAVY_CLEAN_TEMP INT      NOT NULL,
      RINSE_4_TIME INT      NOT NULL,
      RINSE_5_TIME INT      NOT NULL,
      ACID_A_TIME  INT      NOT NULL,
      ACID_B_TIME  INT      NOT NULL,
      RINSE_7_TIME INT      NOT NULL,
      RINSE_8_TIME INT      NOT NULL,
      PHOS_TIME    INT      NOT NULL,
      PHOSE_TEMP   INT      NOT NULL,
      RINSE_11_TIME INT      NOT NULL,
      RINSE_12_TIME INT      NOT NULL,
      RINSE_12_TEMP INT      NOT NULL,
      SEAL_TIME    INT      NOT NULL,
      SEAL_TEMP    INT      NOT NULL,
      OIL_TIME     INT      NOT NULL,
      OIL_TEMP     INT      NOT NULL,
      DRYER_TIME   INT      NOT NULL,
      DRYER_TEMP   INT      NOT NULL,
      LOAD_UNLOAD_TIME_DIFF INT      NOT NULL,
      TOTAL_PROC_TIME INT      NOT NULL);
```

Phos 2 Fact Load SQL:

USE MDS523_ChazClark

GO

```
SELECT PHOS2.SHOP_ORDER AS ORDER_ID, PHOS2.RECIPE_ID,
       DATEFROMPARTS([DATE_YY],[LOAD_DATE_MM],[LOAD_DATE_DD]) AS LOAD_DATE,
       TIMEFROMPARTS([LOAD_TIME_HH],[LOAD_TIME_MM],0,0,0) AS LOAD_TIME,
       DATETIME2FROMPARTS([DATE_YY],[LOAD_DATE_MM],[LOAD_DATE_DD],[LOAD_TIME_HH],
[LOAD_TIME_MM],0,0,0) AS LOAD_DATETIME,
       DATEFROMPARTS([DATE_YY],[UNLOAD_DATE_MM],[UNLOAD_DATE_DD]) AS UNLOAD_DATE,
       TIMEFROMPARTS([UNLOAD_TIME_HH],[UNLOAD_TIME_MM],0,0,0) AS UNLOAD_TIME,
       DATETIME2FROMPARTS([DATE_YY],[UNLOAD_DATE_MM],[UNLOAD_DATE_DD],[UNLOAD_TIME_HH],
[UNLOAD_TIME_MM],0,0,0) AS UNLOAD_DATETIME,
       PHOS2.ACTUAL_WEIGHT,
       PHOS2.ALK_CLEAN_TIME, PHOS2.ALK_CLEAN_TEMP, PHOS2.HEAVY_CLEAN_TIME,
       PHOS2.HEAVY_CLEAN_TEMP, PHOS2.RINSE_4_TIME, PHOS2.RINSE_5_TIME,
       PHOS2.ACID_A_TIME, PHOS2.ACID_B_TIME, PHOS2.RINSE_7_TIME,
       PHOS2.RINSE_8_TIME, PHOS2.PHOS_TIME, PHOS2.PHOS_TEMP,
       PHOS2.RINSE_11_TIME, PHOS2.RINSE_12_TIME, PHOS2.RINSE_12_TEMP,
       PHOS2.SEAL_TIME, PHOS2.SEAL_TEMP, PHOS2.OIL_TIME, PHOS2.OIL_TEMP,
       PHOS2.DRYER_TIME, PHOS2.DRYER_TEMP,
       DateDiff(minute,DATETIME2FROMPARTS([DATE_YY],[LOAD_DATE_MM],[LOAD_DATE_DD],
[LOAD_TIME_HH],[LOAD_TIME_MM],0,0,0),DATETIME2FROMPARTS([DATE_YY],[UNLOAD_DATE_MM],
[UNLOAD_DATE_DD],[UNLOAD_TIME_HH],[UNLOAD_TIME_MM],0,0,0)) AS LOAD_UNLOAD_TIME_DIFF_MIN,
       ROUND((([ALK_CLEAN_TIME]+[HEAVY_CLEAN_TIME]+[RINSE_4_TIME]+[RINSE_5_TIME]+[ACID_A_TIME]
+[ACID_B_TIME]+[RINSE_7_TIME]+[RINSE_8_TIME]+[PHOS_TIME]+[RINSE_11_TIME]+[RINSE_12_TIME]+
[SEAL_TIME]+[OIL_TIME]+[DRYER_TIME])/60,0) AS TOTAL_PROC_TIME_MIN
FROM PHOS2;
```

Results Messages									
	ORDER_ID	RECIPE_ID	LOAD_DATE	LOAD_TIME	LOAD_DATETIME	UNLOAD_DATE	UNLOAD_TIME	UNLOAD_DATETIME	
1	1278094	3	2018-04-12	04:56:00.0000000	2018-04-12 04:56:00.000	2018-04-12	06:13:00.0000000	2018-04-12 06:13:00.000	
2	1278094	3	2018-04-12	05:03:00.0000000	2018-04-12 05:03:00.000	2018-04-12	06:22:00.0000000	2018-04-12 06:22:00.000	
3	1278094	3	2018-04-12	05:12:00.0000000	2018-04-12 05:12:00.000	2018-04-12	06:29:00.0000000	2018-04-12 06:29:00.000	
4	1278094	3	2018-04-12	05:18:00.0000000	2018-04-12 05:18:00.000	2018-04-12	06:37:00.0000000	2018-04-12 06:37:00.000	
5	1276258	2	2018-04-12	05:44:00.0000000	2018-04-12 05:44:00.000	2018-04-12	06:43:00.0000000	2018-04-12 06:43:00.000	
	ACTUAL_WEIGHT	ALK_CLEAN_TIME	ALK_CLEAN_TEMP	HEAVY_CLEAN_TIME	HEAVY_CLEAN_TEMP	RINSE_4_TIME	RINSE_5_TIME	ACID_A_TIME	
1	2104	808	159	338	169	146	100	0	
2	2107	681	159	315	169	164	100	0	
3	2107	637	158	330	169	303	99	0	
4	2134	652	159	471	169	331	100	0	
5	1477	619	159	349	169	285	99	0	
	ACID_B_TIME	RINSE_7_TIME	RINSE_8_TIME	PHOS_TIME	PHOSE_TEMP	RINSE_11_TIME	RINSE_12_TIME	RINSE_12_TEMP	
1	278	20	49	981	157	20	90	0	
2	417	20	49	806	157	20	90	0	
3	446	20	49	709	156	20	90	0	
4	240	20	51	863	157	20	90	0	
5	420	20	49	651	157	20	90	0	

Data Warehouse - Tables, Columns and Keys

Customer Dimension

dbo.CUSTOMERDIMENSION
Columns
CUSTOMER_ID (PK, int, not null)
CU_NAME (varchar(255), not null)
CU_ADDRESS_1 (varchar(255), not null)
CU_ADDRESS_2 (varchar(255), null)
CU_CITY (varchar(255), null)
CU_ZIP (varchar(255), null)
CU_PHONE_NO (varchar(12), null)
CU_FAX_NO (varchar(12), null)
Keys
PK_CUSTOMER_1CE12D371A9674FB

Date Dimension

dbo.DATEDIMENSION
Columns
DATE_KEY (PK, int, not null)
DATE_FIELD (date, not null)
YEAR_FIELD (int, not null)
MONTH_FIELD (int, not null)
DAY_FIELD (int, not null)
WEEKDAYNO (int, not null)
WEEKDAY_FIELD (char(3), not null)
WEEKNO (int, not null)
MONTHNAMESHORT (char(3), not null)
QUARTER_FIELD (char(2), not null)
YEAR_MONTH (char(8), not null)
YEAR_QUARTER (char(8), not null)
ISWEEKEND (bit, null)
Keys
PK_DATEDIME_A3F84DDD5C447BA7

Order Customer Bridge

dbo.ORDERCUSTOMERBRIDGE
Columns
ORDER_ID (FK, int, not null)
CUSTOMER_ID (FK, int, not null)
Keys
FK_ORDERCUST_CUSTO_4CA06362
FK_ORDERCUST_ORDER_4BAC3F29

Order Fact

[-]	[-]	[-]	dbo.ORDERFACT
		[-]	Columns
			PK ORDER_ID (PK, int, not null)
			PART_TOTAL_WEIGHT (int, not null)
			PART_TOTAL_QTY (int, not null)
			ENTRY_DATE (datetime, null)
			REQUESTED_DATE (datetime, null)
			SHIPPED_CONTAINERS (int, null)
		[-]	Keys
			PK_ORDERFAC__460A946424A75A37

Phos2

[-]	[-]	[-]	dbo.PHOS2
		[-]	Columns
			PK PHOS2_ID (PK, int, not null)
			FK RECIPE_ID (FK, int, not null)
			SHOP_ORDER (int, not null)
			F3 (int, null)
			F4 (int, null)
			F5 (int, null)
		[-]	Keys
			PK_PHOS2_C6883AD175170545
			FK_PHOS2_RECIPE_ID__398D8EEE

Recipe

[-]	[-]	[-]	dbo.RECIPE
		[-]	Columns
			PK RECIPE_ID (PK, int, not null)
			RECIPE (varchar(255), not null)
		[-]	Keys
			PK_RECIPE__84399C1858158F48

Phos2 Facts

dbo.PHOS2FACT
Columns
ORDER_ID (FK, int, not null)
RECIPE_ID (FK, int, not null)
LOAD_DATE (date, not null)
LOAD_TIME (time(7), not null)
LOAD_DATETIME (datetime, not null)
UNLOAD_DATE (date, not null)
UNLOAD_TIME (time(7), not null)
UNLOAD_DATETIME (datetime, not null)
ACTUAL_WEIGHT (int, not null)
ALK_CLEAN_TIME (int, not null)
ALK_CLEAN_TEMP (int, not null)
HEAVY_CLEAN_TIME (int, not null)
HEAVY_CLEAN_TEMP (int, not null)
RINSE_4_TIME (int, not null)
RINSE_5_TIME (int, not null)
ACID_A_TIME (int, not null)
ACID_B_TIME (int, not null)
RINSE_7_TIME (int, not null)
RINSE_8_TIME (int, not null)
PHOS_TIME (int, not null)
PHOSE_TEMP (int, not null)
RINSE_11_TIME (int, not null)
RINSE_12_TIME (int, not null)
RINSE_12_TEMP (int, not null)
SEAL_TIME (int, not null)
SEAL_TEMP (int, not null)
OIL_TIME (int, not null)
OIL_TEMP (int, not null)
DRYER_TIME (int, not null)
DRYER_TEMP (int, not null)
LOAD_UNLOAD_TIME_DIFF (int, not null)
TOTAL_PROC_TIME (int, not null)
Keys
FK_PHOS2FACT_ORDER_619B8048
FK_PHOS2FACT_RECIP_628FA481

DATA WAREHOUSE QUERIES - CODE

Data Warehouse - Simple Queries

Here are a few more simple queries of the Data Warehouse:

```
USE MDS523_ChazClark
```

```
GO
```

```
SELECT COUNT(CUSTOMER_ID)
```

```
FROM CUSTOMERDIMENSION;
```

Results		Messages	
(No column name)			
1	39		

```
USE MDS523_ChazClark
```

```
GO
```

```
SELECT COUNT( ORDERCUSTOMERBRIDGE.ORDER_ID ), CUSTOMERDIMENSION.CU_NAME
```

```
FROM CUSTOMERDIMENSION JOIN ORDERCUSTOMERBRIDGE
```

```
ON CUSTOMERDIMENSION.CUSTOMER_ID = ORDERCUSTOMERBRIDGE.CUSTOMER_ID
```

```
GROUP BY CUSTOMERDIMENSION.CU_NAME;
```

Results		Messages	
(No column name)		CU_NAME	
1	1	Acmeila decumbens (Sm.) R.K. Jansen	
2	2	Aethusa cynapium L.	
3	5	Agoseris aurantiaca (Hook.) Greene	
4	1	Amaranthus pumilus Raf.	
5	19	Astragalus bicristatus A. Gray	

```
USE MDS523_ChazClark
GO
SELECT COUNT( CONTAINLER_ID ), CONTAINLER_ID
FROM ORDERDIMENSION
GROUP BY CONTAINLER_ID
```

Results Messages		
	(No column name)	CONTAINLER_ID
1	1	Baskets
2	30	Box
3	10	Can
4	14	Gaylord
5	2	Pan
6	41	Tub

```
USE MDS523_ChazClark
GO
SELECT TOP (5) MAX( PART_TOTAL_WEIGHT ) AS MAXWEIGHT, ORDER_ID
FROM ORDERFACT
GROUP BY ORDER_ID
```

Results Messages		
	MAXWEIGHT	ORDER_ID
1	436	1275466
2	704	1275487
3	155	1275488
4	1088	1275561
5	54	1275955

```
USE MDS523_ChazClark
GO
SELECT TOP (5) MIN( ACID_B_TIME ) AS MINACIDBTIME, SHOP_ORDER
FROM PHOS2
GROUP BY SHOP_ORDER
```

Results Messages		
	MINACIDBTIME	SHOP_ORDER
1	291	1275466
2	509	1275487
3	751	1275488
4	0	1275561
5	240	1275955

Data Warehouse - Complex Queries

Here are a few complex queries that would apply to business cases relating to the data:

What are the Max, Min, Average time for each recipe?

```
USE MDS523_ChazClark
GO
SELECT RECIPE.RECIPE,
MAX( PHOS2FACT.LOAD_UNLOAD_TIME_DIFF ) AS MAX_TIME_DIFF,
MIN( PHOS2FACT.LOAD_UNLOAD_TIME_DIFF ) AS MIN_TIME_DIFF,
AVG( PHOS2FACT.LOAD_UNLOAD_TIME_DIFF ) AS AVG_TIME_DIFF
FROM PHOS2FACT JOIN RECIPE ON PHOS2FACT.RECIPE_ID = RECIPE.RECIPE_ID
GROUP BY RECIPE.RECIPE;
```

Results		Messages		
	RECIPE	MAX_TIME_DIFF	MIN_TIME_DIFF	AVG_TIME_DIFF
1	BIG PART	112	65	77
2	CAL MOD ACID B	117	117	117
3	HIGH SPEED (PHOS)	145	73	106
4	ZINC PHOS ACID B	135	64	86
5	ZINC PHOS GENTLE HANDLING	77	59	68

What are the Max, Min, Average, and Total pounds per barrel per day?

```
USE MDS523_ChazClark
GO
SELECT PHOS2FACT.LOAD_DATE,
MAX( PHOS2FACT.ACTUAL_WEIGHT ) AS MAX_WEIGHT,
MIN( PHOS2FACT.ACTUAL_WEIGHT ) AS MIN_WEIGHT,
AVG( PHOS2FACT.ACTUAL_WEIGHT ) AS AVG_WEIGHT,
SUM( PHOS2FACT.ACTUAL_WEIGHT ) AS TOTAL_WEIGHT
FROM PHOS2FACT JOIN DATEDIMENSION
ON PHOS2FACT.LOAD_DATE = DATEDIMENSION.DATE_FIELD
GROUP BY PHOS2FACT.LOAD_DATE;
```

Results		Messages			
	LOAD_DATE	MAX_WEIGHT	MIN_WEIGHT	AVG_WEIGHT	TOTAL_WEIGHT
1	2018-04-12	2614	134	1068	105772

*NOTE: additional fields form Date Dimension Table could be used once more data is in the Phos2 Fact Table

What is the pounds per minute rate being produced by each recipe each day?

USE MDS523_ChazClark

GO

```
SELECT PHOS2FACT.LOAD_DATE, RECIPE.RECIPE,  
SUM( PHOS2FACT.ACTUAL_WEIGHT ) / SUM( PHOS2FACT.LOAD_UNLOAD_TIME_DIFF ) AS LBS_PER_MIN,  
SUM( ACTUAL_WEIGHT ) AS TOTAL_LBS,  
COUNT( ORDER_ID ) AS COUNT_ORDERS  
FROM PHOS2FACT JOIN DATEDIMENSION  
ON PHOS2FACT.LOAD_DATE = DATEDIMENSION.DATE_FIELD JOIN RECIPE  
ON PHOS2FACT.RECIPE_ID = RECIPE.RECIPE_ID  
GROUP BY PHOS2FACT.LOAD_DATE,RECIPE.RECIPE;
```

	LOAD_DATE	RECIPE	LBS_PER_MIN	TOTAL_LBS	COUNT_ORDERS
1	2018-04-12	ZINC PHOS GENTLE HANDLING	14	1963	2
2	2018-04-12	ZINC PHOS ACID B	13	81801	70
3	2018-04-12	HIGH SPEED (PHOS)	6	15108	22
4	2018-04-12	BIG PART	21	6529	4
5	2018-04-12	CAL MOD ACID B	3	371	1

*NOTE - same note applies here for the query above

What are the Standard Deviation for Phos Temperature for each recipe?

USE MDS523_ChazClark

GO

```
SELECT RECIPE.RECIPE,  
MAX( PHOS2FACT.PHOSE_TEMP ) AS MAX_TEMP_DIFF,MIN( PHOS2FACT.PHOSE_TEMP ) AS MIN_TEMP_DIFF,  
AVG( PHOS2FACT.PHOSE_TEMP ) AS AVG_TEMP_DIFF, STDEV( PHOS2FACT.PHOSE_TEMP ) AS  
STD_TEMP_DIFF FROM PHOS2FACT JOIN RECIPE ON PHOS2FACT.RECIPE_ID = RECIPE.RECIPE_ID  
GROUP BY RECIPE.RECIPE;
```



	RECIPE	MAX_TEMP_DIFF	MIN_TEMP_DIFF	AVG_TEMP_DIFF	STD_TEMP_DIFF
1	BIG PART	157	155	156	0.816496580927726
2	CAL MOD ACID B	173	173	173	NULL
3	HIGH SPEED (PHOS)	173	153	158	5.87551231992982
4	ZINC PHOS ACID B	158	149	156	1.54095235536062
5	ZINC PHOS GENTLE HANDLING	157	157	157	0

Is there a particular customers part that take a long time to run?

USE MDS523_ChazClark

GO

```
SELECT ORDERCUSTOMERBRIDGE.CUSTOMER_ID,ORDERDIMENSION.PART_ID,  
PHOS2FACT.LOAD_UNLOAD_TIME_DIFF - (SELECT MAX(LOAD_UNLOAD_TIME_DIFF) FROM PHOS2FACT) AS  
DELTA_FROM_MAX_TIME_DIFF  
FROM ((PHOS2FACT INNER JOIN ORDERDIMENSION ON PHOS2FACT.ORDER_ID =  
ORDERDIMENSION.ORDER_ID)  
INNER JOIN ORDERCUSTOMERBRIDGE ON PHOS2FACT.ORDER_ID =  
ORDERCUSTOMERBRIDGE.ORDER_ID)  
ORDER BY DELTA_FROM_MAX_TIME_DIFF DESC;
```

 Results  Messages			
	CUSTOMER_ID	PART_ID	DELTA_FROM_MAX_TIME_DIFF
1	605	3177407	0
2	605	BUL3172400 3/16 x 2-1/4 PFH TAPCON BLUE	-2
3	605	BUL3188400	-9
4	102090	BST-572.87	-10
5	605	BUL3192400	-17
6	1030	X12954-02	-17
7	162	SUB-84170802	-18
8	162	SUB-84170802	-18
9	97	P2790026	-18
10	97	P2790026	-19
