6/22/2014

Custody Metering System for Natural gas 3D Modeling Realization and Development Direction

Technology Corporation
Valmax

Designed by J.I Jeon
VALMAX Technology Corporation

Agenda

- VALMAX TECHNOLOGY CORPORATION Introduction
- Instrumentation Division Introduction
- Custody Metering System Concept
- System Integration & Components
- Project Review
- Q & A

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VALMAX TECHNOLOGY CORPORATION

VALMAX TECHNOLOGY CORPORATION

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COMPANY OVERVIEW

- Established : 6, December, 2002
- Nature of Business : System Integration,
  Engineering Service
  Product Representative

- CEO : **Mr. Il-hwan kim**

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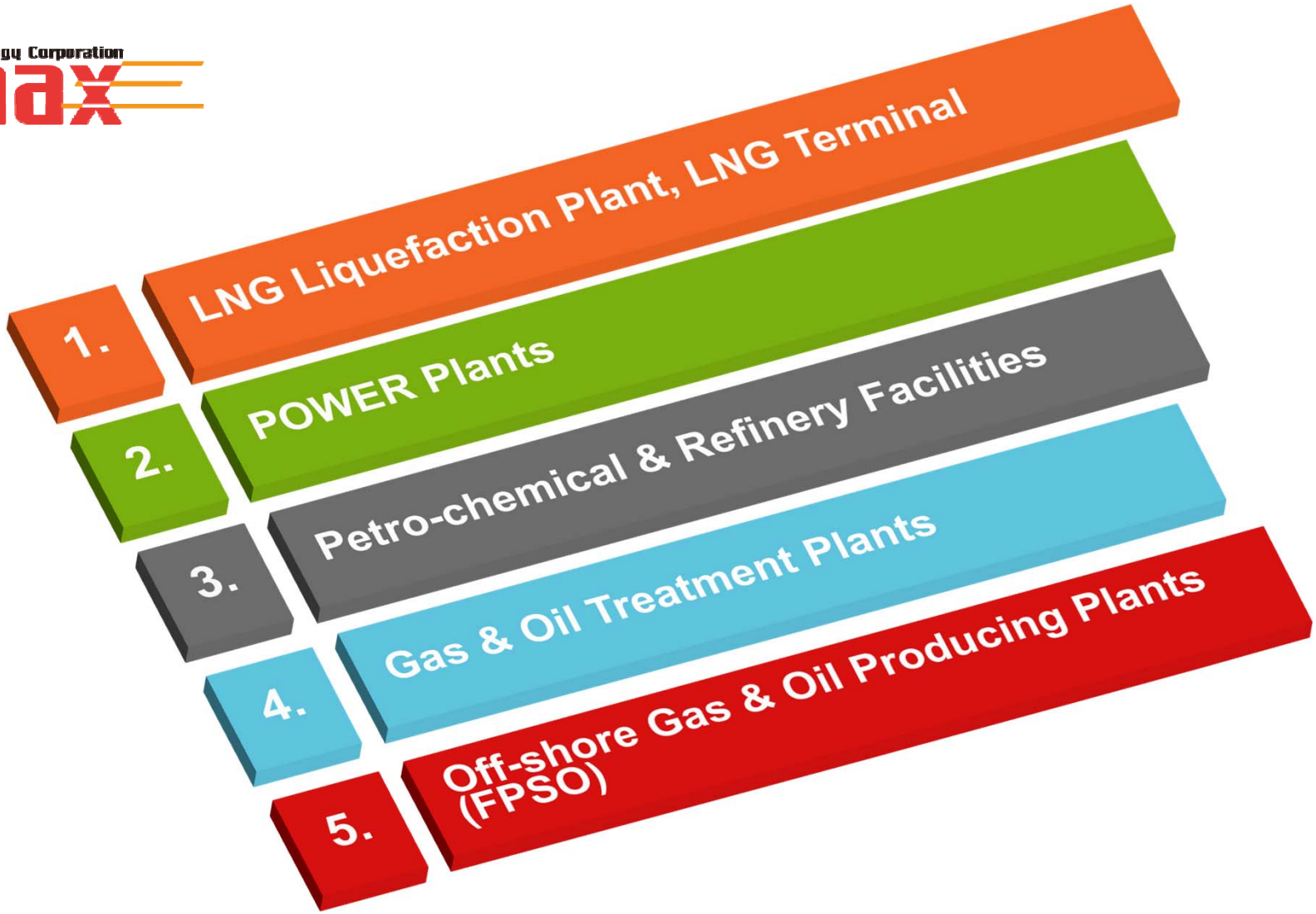
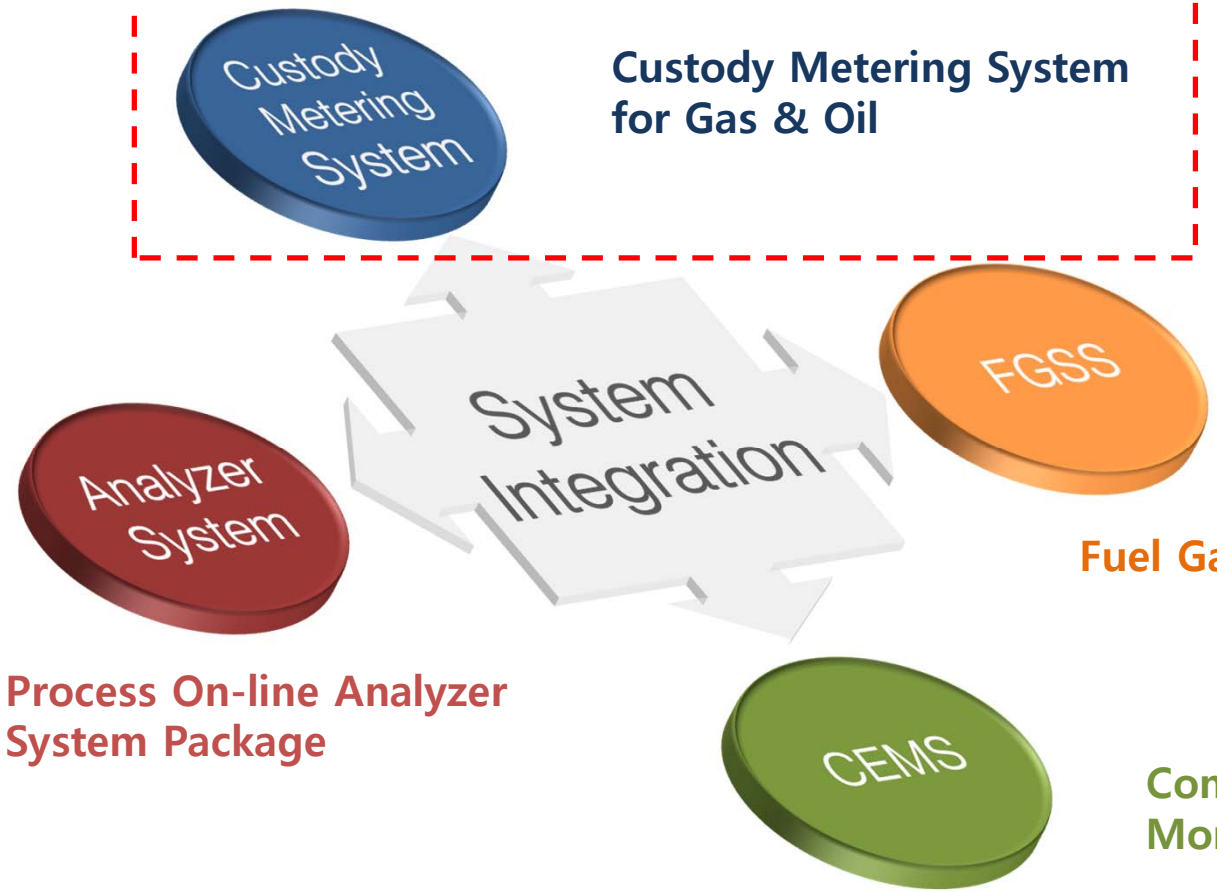


System Integration



Custody Metering System for Gas & Oil

Fuel Gas Supply System

Process On-line Analyzer System Package

Continuous Emissions Monitoring System

Main Clients in KOREA

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DAELIM

HYUNDAI HEAVY INDUSTRIES CO.,LTD.

posco E&C

DOOSAN 두산중공업

HYUNDAI ENGINEERING & CONSTRUCTION CO., LTD

SK engineering & construction

DSME

한국지역난방공사 KOREA DISTRICT HEATING CORP.

SAMSUNG

SAMSUNG C&T Engineering & Construction Group

GS E&C

LOTTE ENGINEERING & CONSTRUCTION

SAMSUNG

SAMSUNG HEAVY INDUSTRIES

Hanwha

SAMSUNG

SAMSUNG ENGINEERING

한국가스공사

한진중공업 HANJIN HEAVY INDUSTRIES & CONSTRUCTION

Main Clients in KOREA

Hyundai Oilbank

대한유화공업주식회사
KOREA PETROCHEMICAL IND. CO., LTD.

SK innovation

SK global chemical

S-OIL

Main Clients in OVERSEAS

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Chandra Asri Petrochemical

emal
الإمارات للألمنيوم
Emirates Aluminium

Toyo Engineering Corporation

PEMEX

الشركة السعودية للكهرباء
Saudi Electricity Company

سابك
sabic

البيروني
albayroni

KNPC

Hajr
شركة هجر لإنتاج الكهرباء
HAJR ELECTRICITY PRODUCTION COMPANY

SLNG
Singapore LNG Corporation

هيئة مياه وكهرباء أبوظبي
Abu Dhabi Water & Electricity Authority

شركة نفط الكويت
Kuwait Oil Company
إحدى شركات مؤسسة البترول الكويتية
A Subsidiary of Kuwait Petroleum Corporation

MITSUBISHI HEAVY INDUSTRIES, LTD.

MES

Minera Panamá

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INSTRUMENTATION DIVISION INTRODUCTION

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Instrumentation Division

- 계측하는 범위가 넓고, 계량은 계측의 일부이며, 이러한 **계측・계량**을 하기 위해 **계측기류를 장비하는 것**을 **계장**이라 한다. 계장에는 계측기와 자동제어장치에 있어서 발신기, 수신기(지시계, 기록계, 증폭기 등), 조절부, 조작부, 공압(空壓)원, 유압(油壓)원 등 일체의 부착장비가 포함된다.

  [네이버 지식백과] 계장 [instrumentation, 計裝] (산업안전대사전, 2004.5.10, 도서출판 골드)

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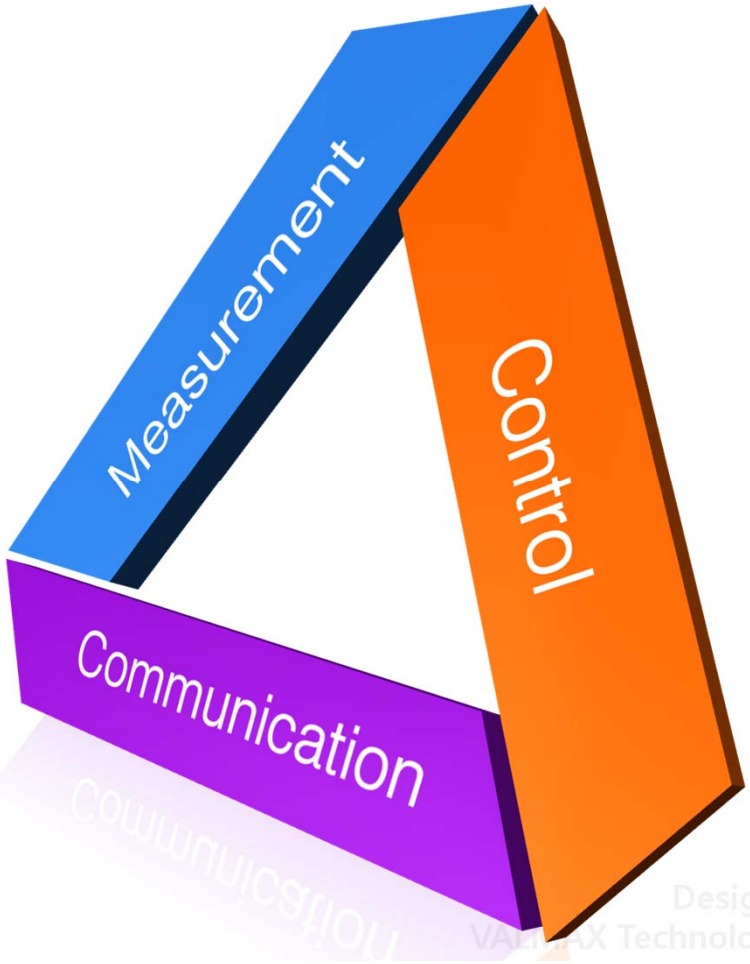
1. Control
System Control

2. Measurement
Condition Measurement

3. Communication
Signal Communication among instruments



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CUSTODY METERING SYSTEM CONCEPT

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For Example

본 페이지는 특정 브랜드의 광고를 위하여 제작한 것이 절대 아닙니다.

Custody Metering System

- 정산용 계량 설비 및 System
- 발전소, 기타 플랜트에서 **비용**과 직결되는 가장 중요한 계장 설비 System
- 2012년 7월 1일부로 부피 거래제 -> **열량 거래제**로 변경, 시행 (국내 천연가스)

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열량

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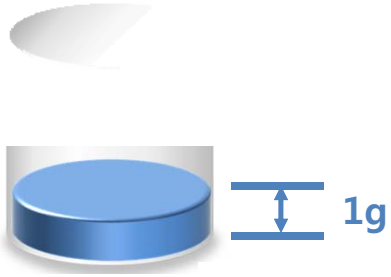
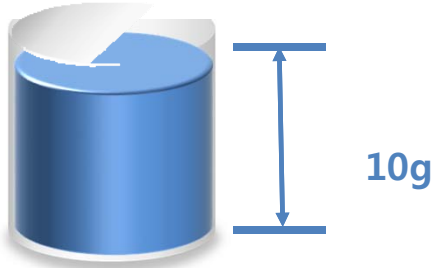
열량? (Calorie Value)

- 물질의 온도를 높이는 데 필요한 열의 분량



온도를 1℃ 올리기 위해서
1cal의 열이 필요하다



온도를 1℃ 올리기 위해서
10cal의 열이 필요하다

Natural Gas와 열량과의 관계

- 열량이 높은 Gas = 좋은 Gas
- 열량 -> 발전소 간 비용 정산의 가장 중요한 거래단위
- 열량 측정 방법 = ISO 6976, AGA 8, GPA 2172
- 열량 계산 TOOL = FRCP, FRCPT, NGP

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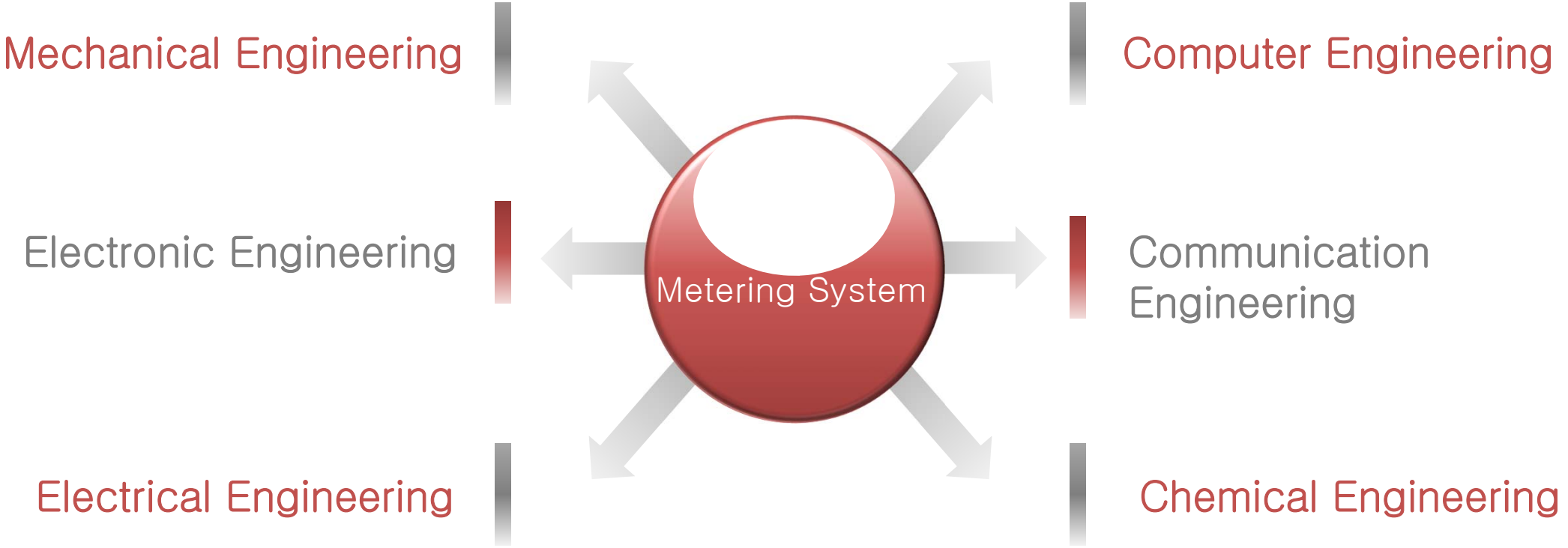

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SYSTEM INTEGRATION & COMPONENTS

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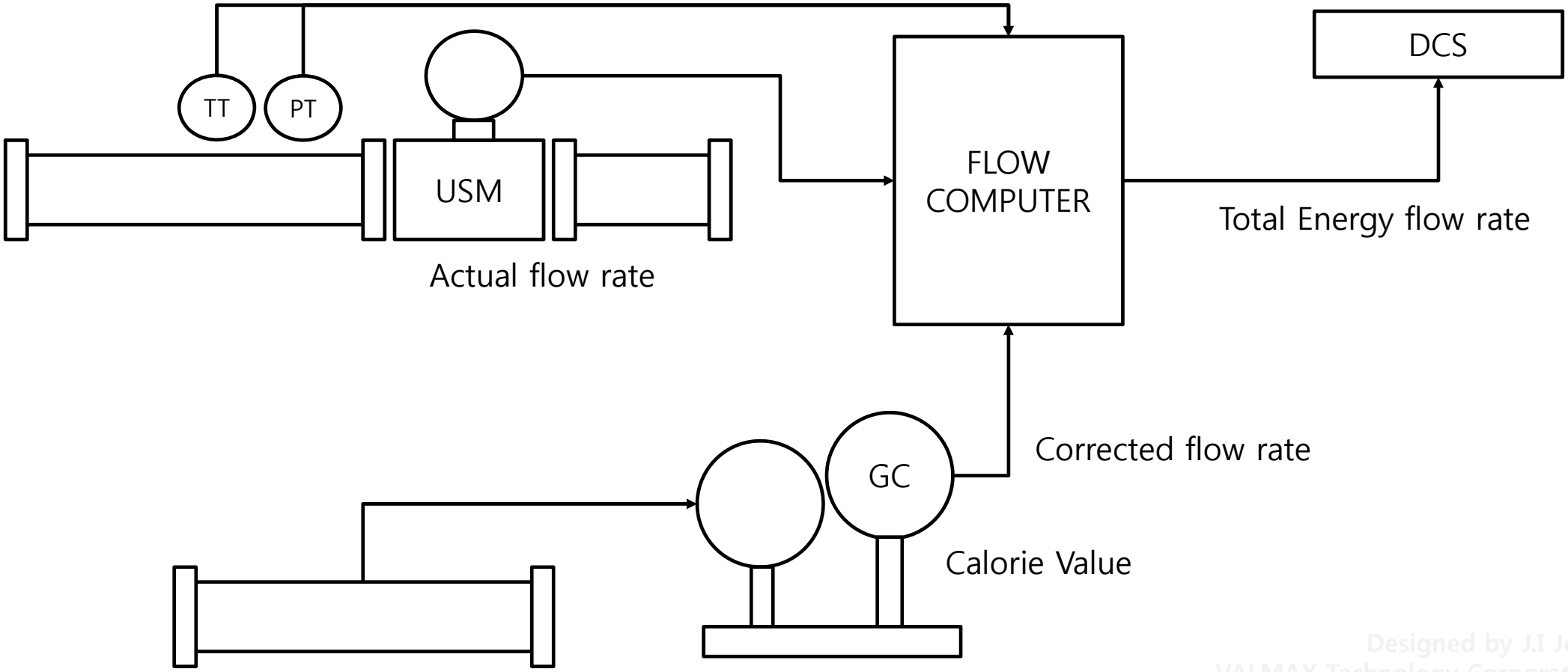
System Integration Diagram



Flow rate Calc.

- 일반적으로 측정되는 유량
  - -. Qr : 유량계에서 흐르는 실제 체적유량 [m3/hr]
  - -. Qb : 계약조건(101.325 kPa, 0 deg.C) 에서의 보상 체적유량 [Nm3/hr]
  - -. Qm : 질량유량 [Ton/hr]
  - -. Qe : 에너지유량 [GJ/hr]

Flow rate Calc.

각 유량의 상관 관계는 아래와 같다. (AGA-7, AGA-9)

- Qb = Qr * (Pf / Pb) * (Tb / Tf) * (Zb * Zf)
  = Qr * (Df / Db)
  = Qm / Db * 1000
- Qm = Qb * (Db / 1000) = Qr * (Df / 1000)
- Qe = Qb * (Ed/ 1000)

- Pf : 현재 유체의 압력 [kPa]
- Pb : 계약 건 유체의 압력 조건 [101.325 kPa]
- Tf : 현재 유체의 온도 [deg.K]
- Tb : 계약 조건 유체의 온도 [0 deg.C = 273.15 deg.K]
- Zf : 현재 유체의 압축계수 [Compressibility Authorize factor]
- Zb : 계약 조건 유체의 압축계수 [Compressibility factor]
- Df : 현재 유체의 밀도 [kg/m3]
- Db : 계약 조건 유체의 밀도 [kg/Nm3]
- Ed : 계약 조건에서의 단위열량 [MJ/Nm3]

Flow rate Calc.

실체적 유량(Qr)을 위와 같이 측정한다.

따라서

1. Qr 로 Qb 를 계산한다.(Zb, Zf 는 AGA8 로 계산)
2. Qb 로 Qm 을 계산 (AGA8 로 계산한 Db 를 사용)
3. Qb 로 Qe 를 계산 (ISO6976 으로 계산된 Eb 를 사용)

앞의 계산에서 밀도의 오차는 유량에 직접적인 영향을 미침을 알 수 있다
밀도 값은 밀도계로 측정이 가능하나, 밀도계의 안정성 문제로 분석계기를 사용, 계산한 밀도를 사용한다.

분석계기를 사용한 밀도의 이론적인 계산 아래의 방법 계산한다.

Df : AGA-8 Detailed or Gross Characterization Method (DCM/GCM)
Db : AGA-8 Detailed or Gross Characterization Method (DCM/GCM)

단위열량은 아래의 방법으로 계산한다.
Eb : ISO6976 or GPA2172 등

NGC 8206 Technical Description

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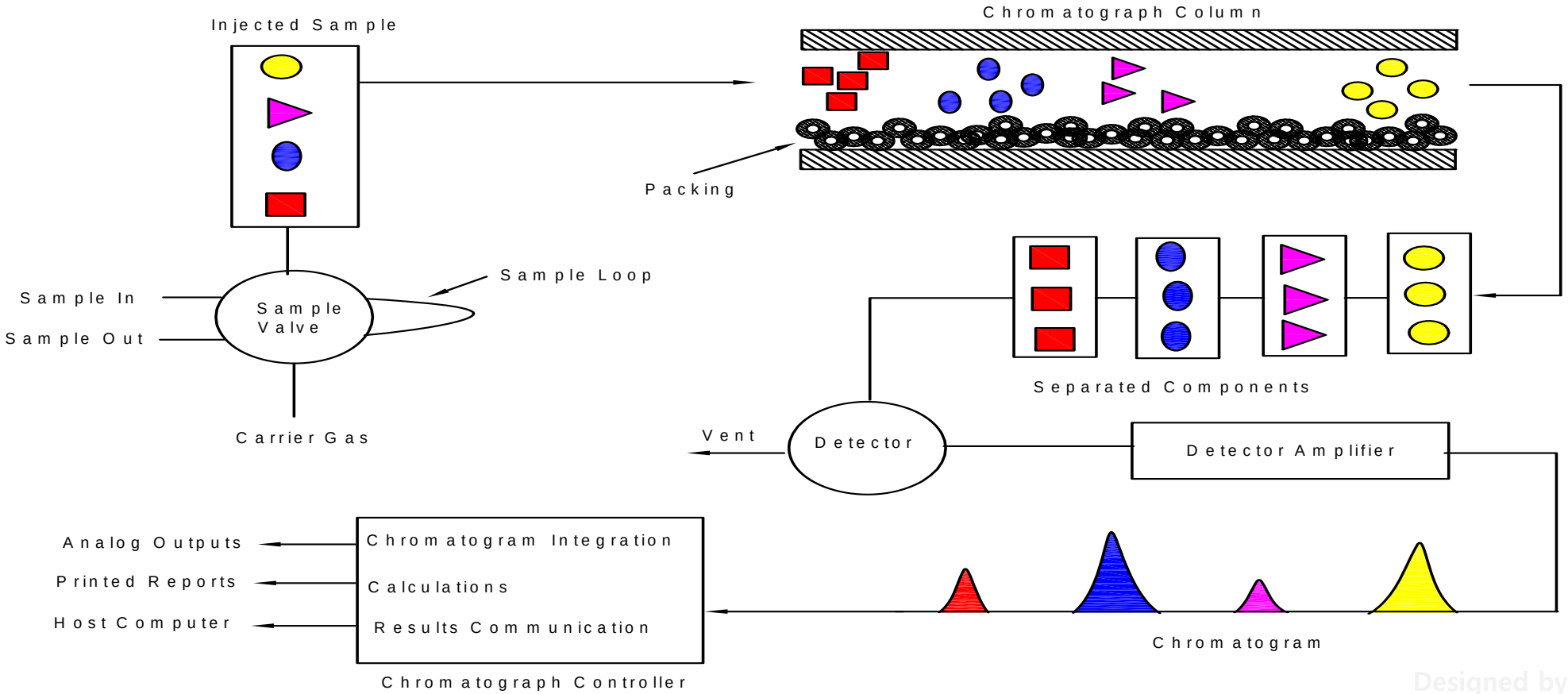
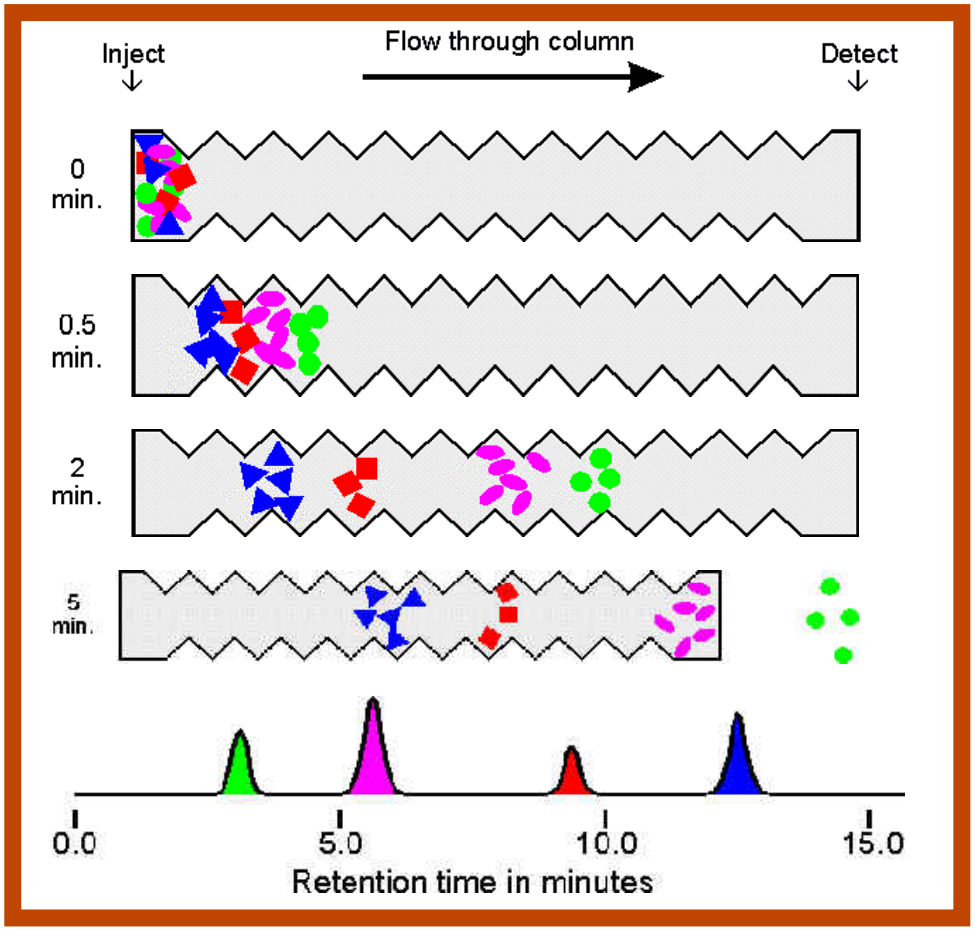
NGC 8206 Technical Description



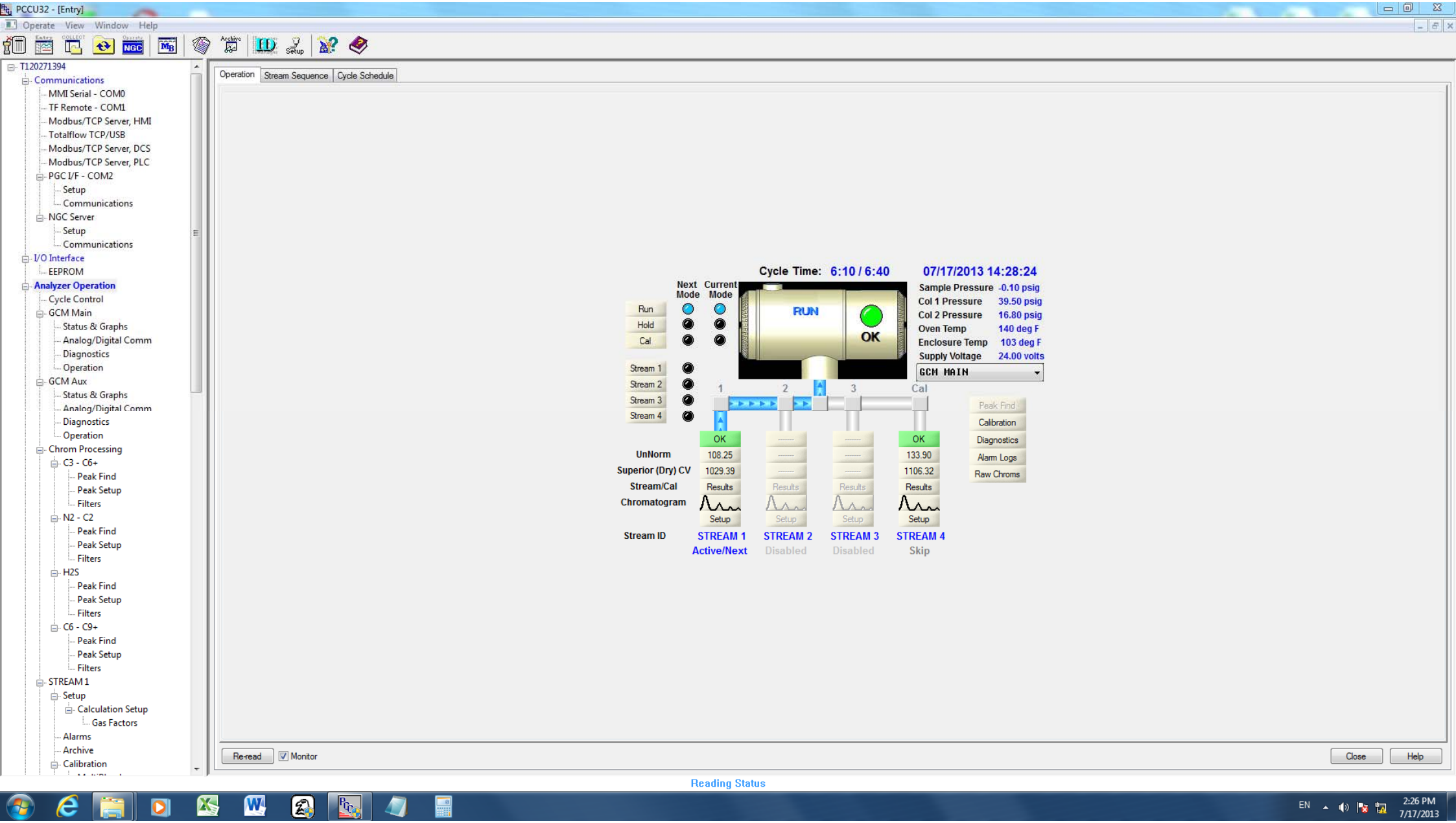
NGC 8206 Technical Description

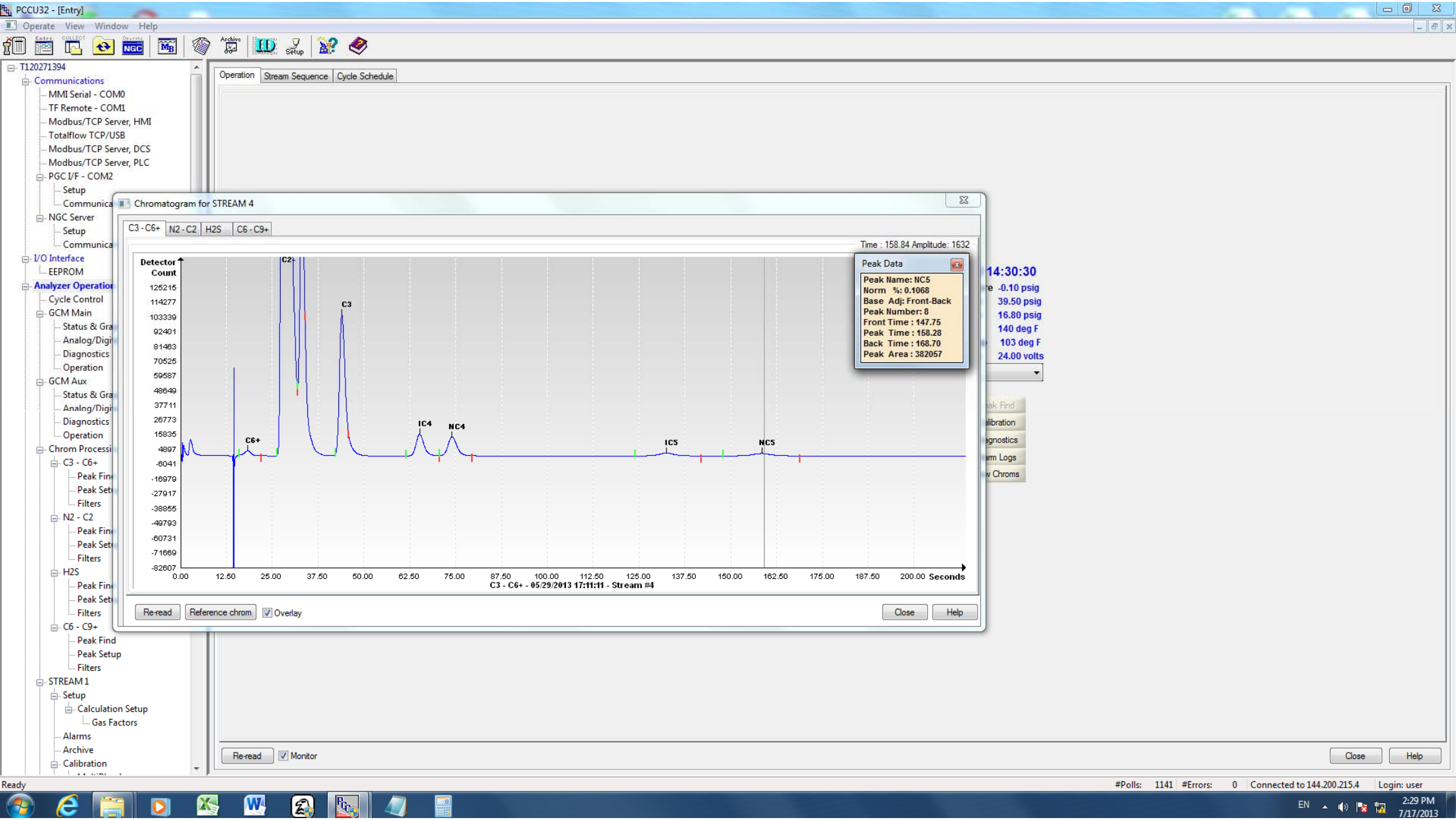


This diagram shows a sample of natural gas with all the components lumped at inject (0 Min.)

The blue components have the highest absorption rate and the green components have the lowest.

The green components elute first and are detected first.


PCCU32 - [Entry]
Operate View Window Help
T120271394
Communications
MMI Serial - COM0
TF Remote - COM1
Modbus/TCP Server, HMI
Totalflow TCP/USB
Modbus/TCP Server, DCS
Modbus/TCP Server, PLC
PGC I/F - COM2
Setup
Communications
NGC Server
Setup
Communications
I/O Interface
EEPROM
Analyzer Operation
Cycle Control
GCM Main
Status & Graphs
Analog/Digital Comm
Diagnostics
Operation
GCM Aux
Status & Graphs
Analog/Digital Comm
Diagnostics
Operation
Chrom Processing
C3 - C6+
Peak Find
Peak Setup
Filters
N2 - C2
Peak Find
Peak Setup
Filters
H2S
Peak Find
Peak Setup
Filters
C6 - C9+
Peak Find
Peak Setup
Filters
STREAM 1
Setup
Calculation Setup
Gas Factors
Alarms
Archive
Calibration
Operation
Stream Sequence
Cycle Schedule
Cycle Time: 6:10 / 6:40
07/17/2013 14:28:24
Next Mode
Current Mode
Run
Hold
Cal
Stream 1
Stream 2
Stream 3
Stream 4
RUN
OK
Sample Pressure -0.10 psig
Col 1 Pressure 39.50 psig
Col 2 Pressure 16.80 psig
Oven Temp 140 deg F
Enclosure Temp 103 deg F
Supply Voltage 24.00 volts
GCM MAIN
1
2
3
Cal
Peak Find
Calibration
Diagnostics
Alarm Logs
Raw Chroms
OK
OK
UnNorm
108.25
133.90
Superior (Dry) CV
1029.39
1106.32
Stream/Cal
Results
Results
Results
Results
Chromatogram
Setup
Setup
Setup
Setup
Stream ID
STREAM 1
Active/Next
STREAM 2
Disabled
STREAM 3
Disabled
STREAM 4
Skip
Re-read
Monitor
Close
Help
Reading Status
EN
2:26 PM
7/17/2013


PCCU32 - [Entry]
Operate View Window Help
T120271394
Communications
MMI Serial - COM0
TF Remote - COM1
Modbus/TCP Server, HMI
Totalflow TCP/USB
Modbus/TCP Server, DCS
Modbus/TCP Server, PLC
PGC I/F - COM2
Setup
NGC Server
I/O Interface
EEPROM
Analyzer Operation
Cycle Control
GCM Main
GCM Aux
Chrom Processi
C3 - C6+
N2 - C2
H2S
C6 - C9+
Peak Find
Peak Setup
Filters
STREAM 1
Calculation Setup
Gas Factors
Alarms
Archive
Calibration
Operation
Stream Sequence
Cycle Schedule
Chromatogram for STREAM 4
C3 - C6+
N2 - C2
H2S
C6 - C9+
Time : 158.84 Amplitude: 1632
Detector Count
125215
114277
103339
92401
81463
70525
59587
48649
37711
26773
15835
4897
-6041
-16979
-27917
-38855
-49793
-60731
-71669
-82607
C2+
C3
C6+
IC4
NC4
IC5
NC5
0.00 12.50 25.00 37.50 50.00 62.50 75.00 87.50 100.00 112.50 125.00 137.50 150.00 162.50 175.00 187.50 200.00 Seconds
C3 - C6+ - 05/29/2013 17:11:11 - Stream #4
Peak Data
Peak Name: NC5
Norm %: 0.1068
Base Adj: Front-Back
Peak Number: 8
Front Time : 147.75
Peak Time : 158.28
Back Time : 168.70
Peak Area : 382057
Re-read
Reference chrom
Overlay
Close
Help
14:30:30
-0.10 psig
39.50 psig
16.80 psig
140 deg F
103 deg F
24.00 volts
Re-read
Monitor
Close
Help
Ready
#Polls: 1141 #Errors: 0
Connected to 144.200.215.4
Login: user
EN
2:29 PM
7/17/2013

PCCU32 - [Entry]

Operate View Window Help

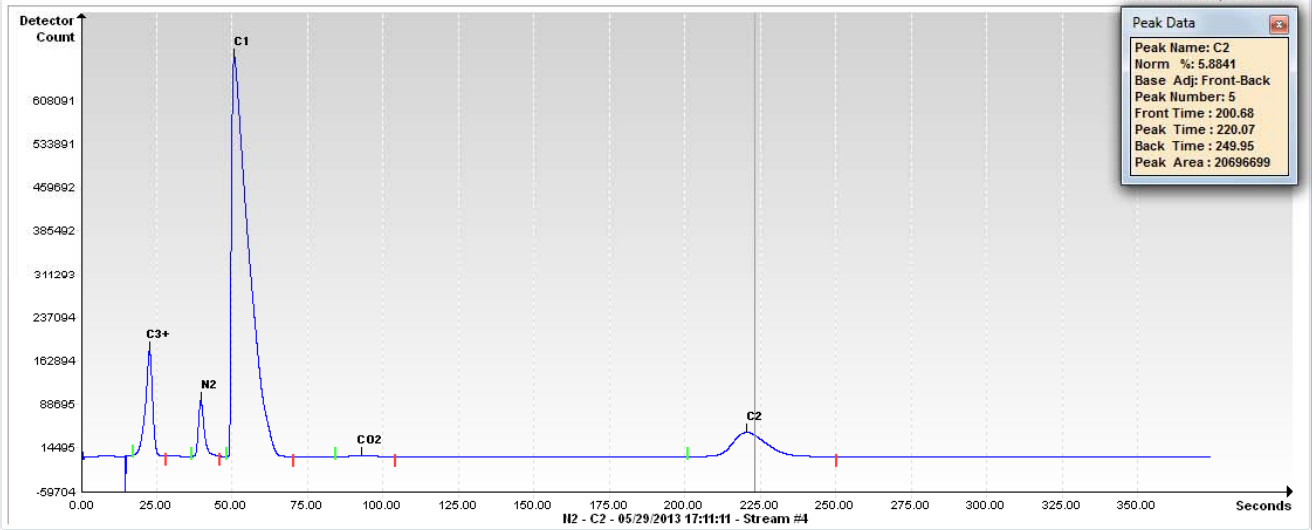
T120271394
- Communications
  - MMI Serial - COM0
  - TF Remote - COM1
  - Modbus/TCP Server, HMI
  - Totalflow TCP/USB
  - Modbus/TCP Server, DCS
  - Modbus/TCP Server, PLC
  - PGC I/F - COM2
    - Setup
    - Communications
  - NGC Server
    - Setup
    - Communications
- I/O Interface
  - EEPROM
- Analyzer Operation
  - Cycle Control
  - GCM Main
    - Status & Graphs
    - Analog/Digital Comm
    - Diagnostics
    - Operation
  - GCM Aux
    - Status & Graphs
    - Analog/Digital Comm
    - Diagnostics
    - Operation
  - Chrom Processing
    - C3 - C6+
      - Peak Find
      - Peak Setup
      - Filters
    - N2 - C2
      - Peak Find
      - Peak Setup
      - Filters
    - H2S
      - Peak Find
      - Peak Setup
      - Filters
    - C6 - C9+
      - Peak Find
      - Peak Setup
      - Filters
  - STREAM 1
    - Setup
      - Calculation Setup
        - Gas Factors
    - Alarms
    - Archive
    - Calibration

Operation | Stream Sequence | Cycle Schedule

Chromatogram for STREAM 4

C3 - C6+ | N2 - C2 | H2S | C6 - C9+

Time : 222.60 Amplitude: 36558



Peak Data

Peak Name: C2
Norm %: 5.8841
Base Adj: Front-Back
Peak Number: 5
Front Time : 200.68
Peak Time : 220.07
Back Time : 249.95
Peak Area : 20696699

Re-read | Reference chrom | Overlay | Close | Help

Re-read | Monitor | Close | Help

Ready

#Polls: 1159 #Errors: 0 Connected to 144.200.215.4 Login: user

EN 2:30 PM 7/17/2013

Totalflow Laptop Calibration Results Report page 1
Printed date: 07/18/2013

Station ID: T120271394
Device ID : STREAM 4 Location: Location of Stream 4

SYSTEM: STATE:
LEASE: PRODUCER:
OPERATOR: BUYER:

Results Date/Time	07/18/2013 09:19
Stream Number	4
Manifold Temp	85.997 (deg F)
Oven Temp	140.000 (deg F)
Calculation Type	AGA-8
Stream Application Rev	2103501-007
Metrology Control Number	2103313-001
Flash Software Part Number	2103600-010
Contract Pressure	14.730 (psia)
Contract Temp	60.000 (deg F)
Carrier Pressure(1)	38.000 (psig)
Carrier Pressure(2)	16.800 (psig)
Sample Pressure	10.566 (psig)

Comp	Response Factor	UnNorm%	Norm%	P Area	Standard Concent.	Old.Resp Factor	%Response Difference
Propane	1.4667	3.1321	3.1300	19418560	3.1300	1.468	-0.0657
Hydrogen Sulfide	0.0000	0.0000	0.0000	0	0.0000	0.720	0.0000
IsoButane	2.5796	0.5318	0.5320	1747061	0.5320	2.579	0.0304
Butane	12.9472	0.5154	0.5110	1464565	0.5110	13.059	-0.8545
NeoPentane	0.0000	0.0000	0.0000	0	0.0000	0.647	0.0000
IsoPentane	0.4387	0.1060	0.1063	399405	0.1063	0.437	0.3277
Pentane	2.1043	0.1064	0.1064	404365	0.1064	2.104	0.0324
Hexane+	0.0000	0.0000	0.0000	0	0.0000	0.308	0.0000
Nitrogen	4.1497	3.2238	3.2300	8358918	3.2300	4.142	0.1884
Methane	1.1677	86.3285	86.3296	177653465	86.3296	1.168	0.0012
CarbonDioxide	1.1941	0.1012	0.1015	316563	0.1015	1.191	0.2537
Ethane	0.9460	5.8891	5.8900	20840160	5.8900	0.946	0.0156
Hexane	0.9266	0.0319	0.0321	346417	0.0321	0.921	0.5808
Heptane+	0.0000	0.0000	0.0000	0	0.0000	0.000	0.0000
Heptane	0.8302	0.0103	0.0105	126468	0.0105	0.817	1.5957
Octane	0.8363	0.0097	0.0104	124353	0.0104	0.783	6.8772
Nonane+	0.8398	0.0000	0.0000	121461	0.0102	0.000	100.0000
Nonane	0.0000	0.0000	0.0102	0	0.0000	0.000	0.0000
Decane	0.0000	0.0000	0.0000	0	0.0000	0.000	0.0000
Undecane	0.0000	0.0000	0.0000	0	0.0000	0.000	0.0000
Dodecane	0.0000	0.0000	0.0000	0	0.0000	0.000	0.0000
Ethane-	0.0000	0.0000	0.0000	0	0.0000	0.000	0.0000
Propane +	0.0000	0.0000	0.0000	0	0.0000	0.000	0.0000
Total		99.9863	100.00		100.0000		100.0000

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Calibration Report 출력

교정 가스 값을 기준으로 각 조성 비율 측정

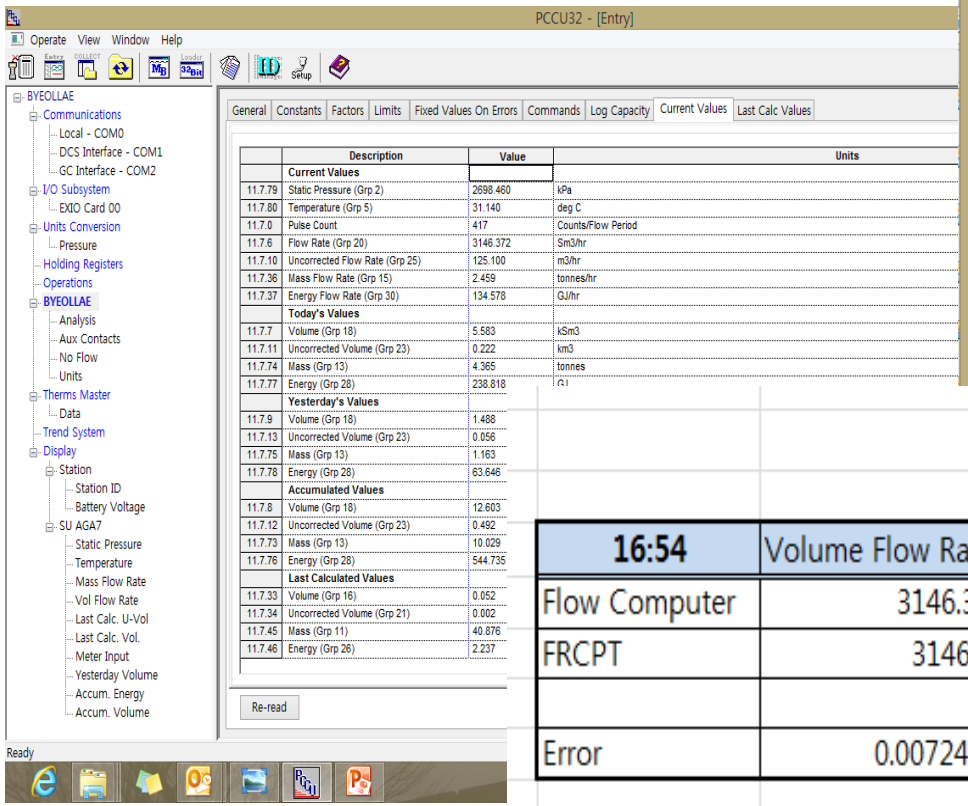
Flow Computer

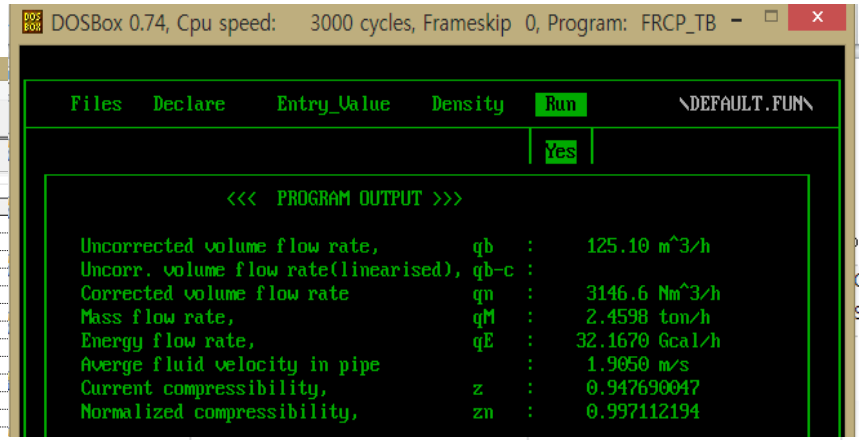
- 신호의 수신, 변환, 유량계산 (순시 값, 적산 값), 데이터 저장
- REDUNDANCY SYSTEM으로 통상적으로 구성
- **센서신호로부터 물리적 값으로 전환하여 유량 값을 계산**

- **0℃ 1 기압 또는 15 ℃ 1 기압 으로 물량 값 보정 계산**

Flow Computer

- 계산 값 확인을 위하여 FRCPT 또는 FRCP Program 사용
- 입증 테스트 시 오차율은 ±0.02% 임





Error율 계산

16:54	Volume Flow Rate (Nm3/h)	Mass Flow Rate (ton/h)	Energy Flow Rate (GJ)		Pulse
Flow Computer	3146.372	2.459	134.578		417
FRCPT	3146.6	2.4598	32.167	4.184	83.4
			134.586728		
Error	0.007245916	0.032522969	0.027133398		

VALMAX TECHNOLOGY CORPORATION

PROJECT REVIEW

Designed by J.I Jeon
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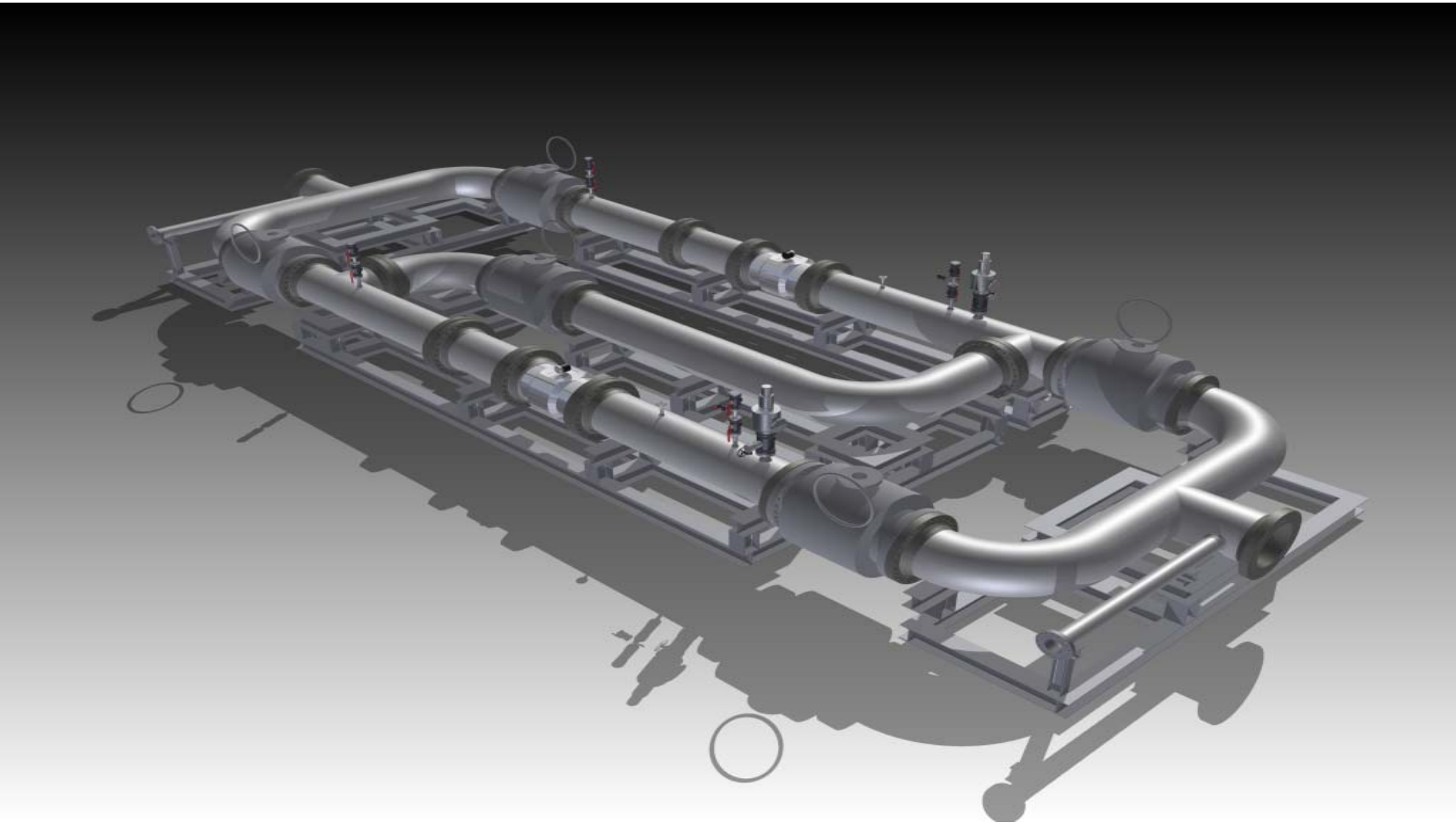
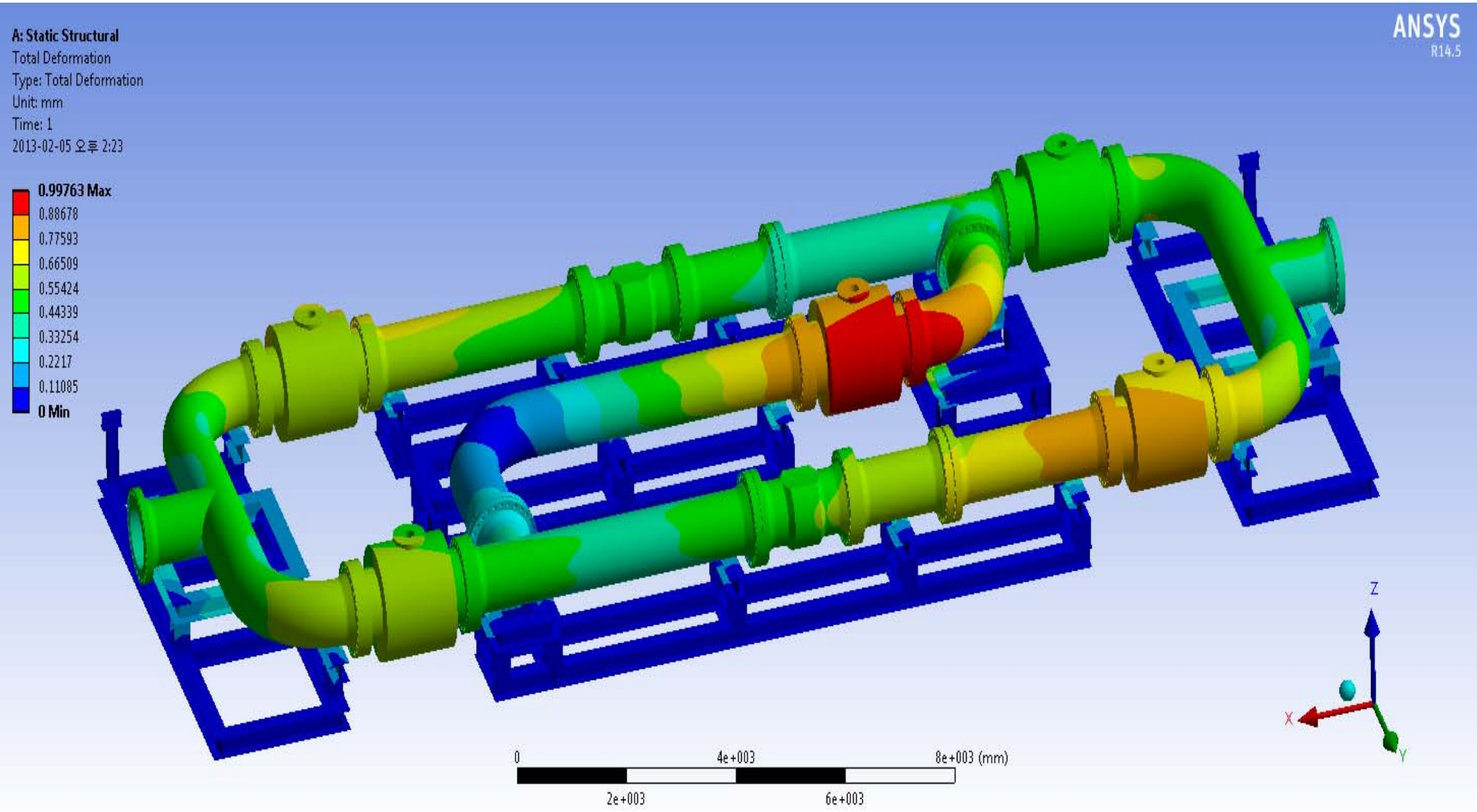
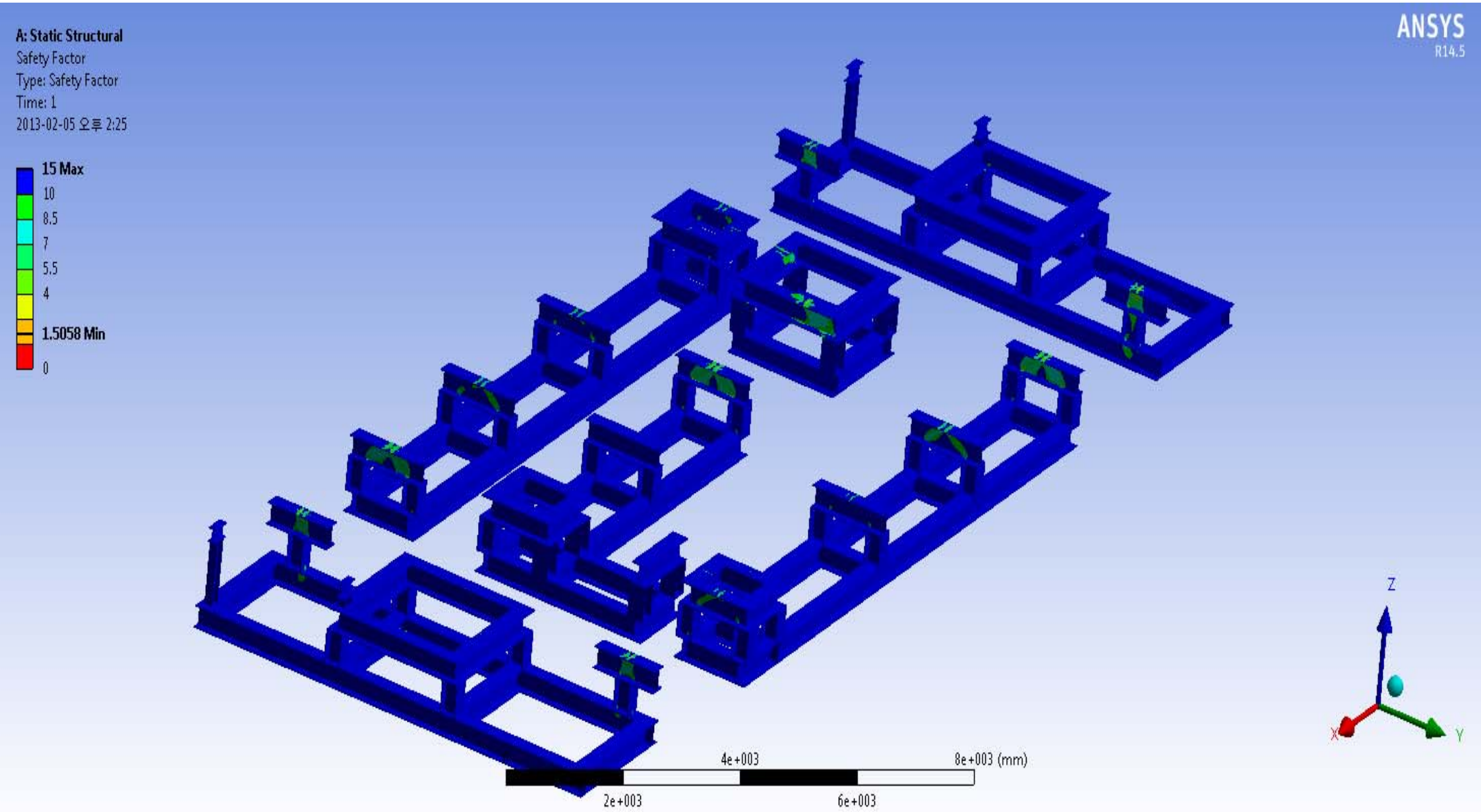
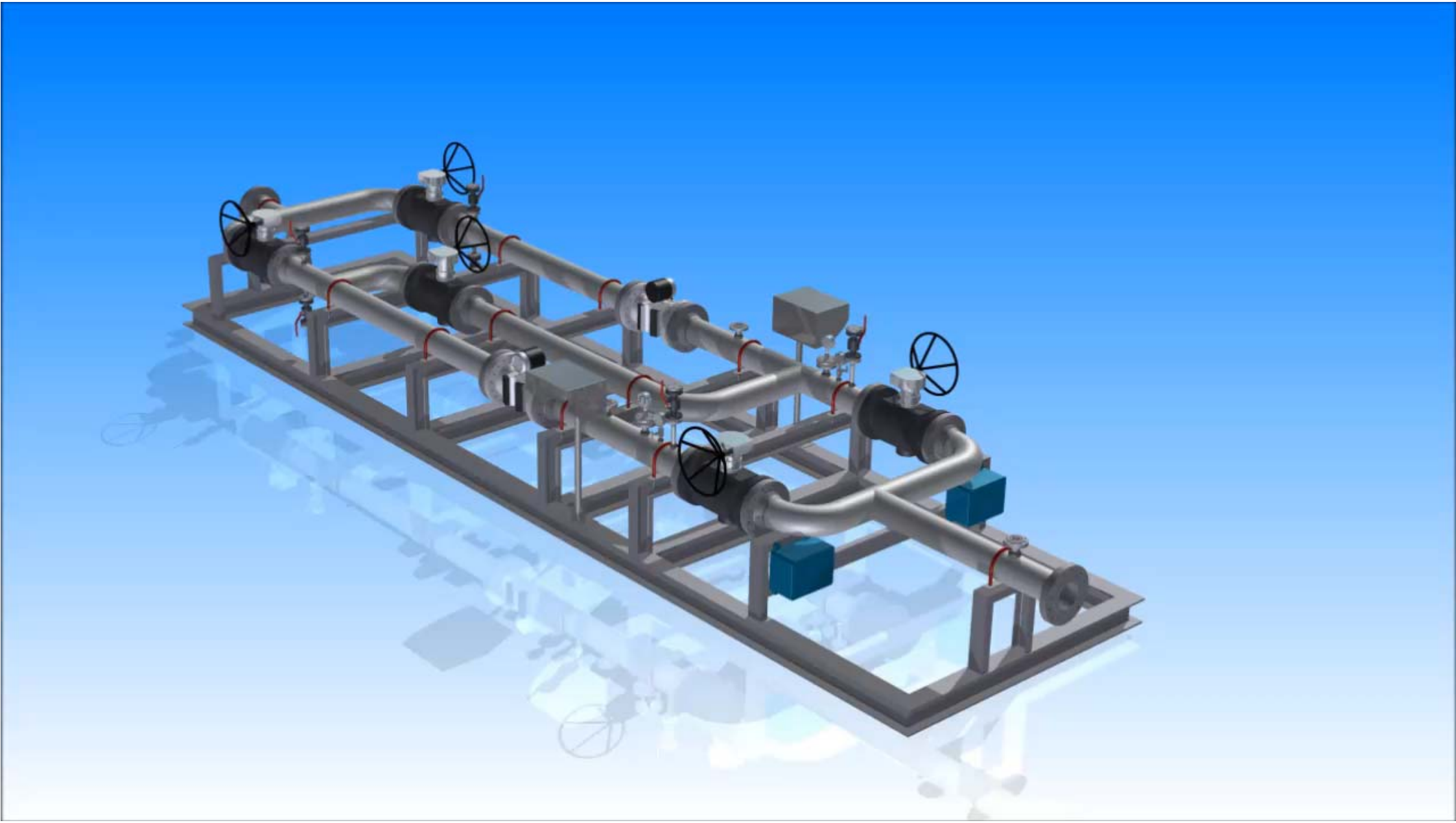



A: Static Structural
Total Deformation
Type: Total Deformation
Unit: mm
Time: 1
2013-02-05 오후 2:23
0.99763 Max
0.88678
0.77593
0.66509
0.55424
0.44339
0.33254
0.2217
0.11085
0 Min
ANSYS
R14.5
Z
X
Y
0
4e+003
8e+003 (mm)
2e+003
6e+003


A: Static Structural
Safety Factor
Type: Safety Factor
Time: 1
2013-02-05 오후 2:25
15 Max
10
8.5
7
5.5
4
1.5058 Min
0
ANSYS
R14.5
4e+003
8e+003 (mm)
2e+003
6e+003
Z
X
Y



QUESTIONS & ANSWERS

Thank you for attention

Valmax Technology Corporation

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