

KLM Technology Group Project Engineering Standard	 www.klmtechgroup.com	Page : 1 of 19
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KLM Technology Group #03-12 Block Aronia, Jalan Sri Perkasa 2 Taman Tampoi Utama 81200 Johor Bahru Malaysia	PLANT OPERATING MANUALS (PROJECT STANDARDS AND SPECIFICATIONS)	

TABLE OF CONTENT

SCOPE	2
REFERENCES	2
DEFINITIONS AND TERMINOLOGY	2
SYMBOLS AND ABBREVIATIONS	3
UNITS	4
FORMAT	4
General	4
Covers and Size	4
Titles	4
Dividers	5
BASIC CONSIDERATIONS IN PREPARING OPERATING MANUALS	5
Non-licensed Processes	5
Licensed Processes	6
CONTENTS OF OPERATING MANUAL	6
NOTEWORTHY POINTS	7
General	7
Chapter II (Design Basis)	8
Chapter III (Process Description)	10
Chapter IV (Operating Variables and Controls)	10
Chapter V (Auxiliary Systems)	11
Chapter VI (Equipment Operation)	11
Chapter VII (Instrumentation and Control)	12
Chapters VIII-X (Start-Up and Shut-Down)	12
Chapter XI (Emergency Shut-Down Procedure)	12
Chapter XII (Miscellaneous Procedures)	13
Chapter XIII (Safety)	13
Chapter XIV (Analytical Tests)	13
Chapter XV (Catalysts, Chemicals, and Packings)	14
Chapter XVI (Drawings)	14
APPENDIX A	15
APPENDIX B	19

KLM Technology Group Project Engineering Standard	PLANT OPERATING MANUALS (PROJECT STANDARDS AND SPECIFICATIONS)	Page 2 of 19
		Rev: 01
		Feb 2011

SCOPE

This Project Standards and Specifications covers the minimum requirements of format, in preparing process and/or utility units operating manuals, including essential instructions and points of noteworthy.

The purpose of this Manual is to standardize the content and format of operating manuals which shall be prepared by the Contractor. Although operating manuals differ to some extent from process to process, the basic philosophy and general aspects shall conform to the concepts of this Standard.

REFERENCES

Throughout this Standard the following dated and undated standards/codes are referred to. These referenced documents shall, to the extent specified herein, form a part of this standard. For dated references, the edition cited applies. The applicability of changes in dated references that occur after the cited date shall be mutually agreed upon by the Company and the Vendor. For undated references, the latest edition of the referenced documents (including any supplements and amendments) applies.

ISO (International Organization for Standardization)

6708-1980 (E) "Pipe Component Definition of Nominal Size", 1st. Ed., 1980

DEFINITIONS AND TERMINOLOGY

Contractor - The persons, firm or company whose tender has been accepted by the "Employer", and includes the Contractor's personnel representative, successors and permitted assignees.

Licenser or Licensor - A company duly organized and existing under the laws of the said company's country and as referred to in the preamble to the contract.

Project - The equipment, machinery and materials to be procured by the "Contractor" and/or "company" and the works and/or all activities to be performed and rendered by the "Contractor" in accordance with the terms and conditions of the contract documents.

Unit or Units - One or all process, offsite and/or utility Units and facilities as applicable to form a complete operable refinery/ and or plant.

KLM Technology Group Project Engineering Standard	PLANT OPERATING MANUALS (PROJECT STANDARDS AND SPECIFICATIONS)	Page 3 of 19
		Rev: 01
		Feb 2011

SYMBOLS AND ABBREVIATIONS

<u>SYMBOL/ABBREVIATION</u>	<u>DESCRIPTION</u>
API	American Petroleum Institute
BFW	Boiler Feed Water
BhP	Break horsepower
BkW	Break kilowatt
BPSD	Barrel Per Stream Day (bbl/sd)
Cond	Condensate
DN	Diameter Nominal, (mm)
FBP	Final Boiling Point
GN	General
h	hour
HP	High Pressure
IBP	Initial Boiling Point
Kg	kilogram
kJ	kilojoule
kW	kilowatt
L	Liquid
LHV	Low Heating Value
LLP	Low Low Pressure
LP	Low Pressure
Mass (ppm)	Mass parts per million, (mg/kg)
MP	Medium Pressure
MW	Molecular mass (weight)
NPS	Nominal Pipe Size, (inch)
PFD	Process Flow Diagram
P & IDs	Piping & Instrumentation Diagrams
PONA	Paraffinic, Olefinic, Naphthenic, and Aromatic
RVP	Reid Vapor Pressure
s	second
sd	stream day
Sp Gr	Specific Gravity (Relative Mass Density)
UOP K	Universal Oil Products Factor
V	Vapor
Vol	Volume
Wt	Weight (mass)

KLM Technology Group Project Engineering Standard	PLANT OPERATING MANUALS (PROJECT STANDARDS AND SPECIFICATIONS)	Page 4 of 19
		Rev: 01
		Feb 2011

UNITS

This Standard is based on International System of Units (SI) except where otherwise specified.

FORMAT

General

In principle, a separate operating manual shall be prepared for each process and/or utility unit. However, in the case of short volumes, operating manuals for two or maximum three units can be integrated into one book upon approval of the Company. The compiled operating manuals should consist of related units, where possible.

Covers and Size

The format of operating manuals shall essentially conform to the following requirements:

1. Size of covers:
225 mm (Width) × 300 mm (Length) - bound on 300 mm side.
2. Size and type of bottom covers:
 - a. Size : Free thickness, up to 70 mm maximum
 - b. Type : Integral types with covers
3. Color of front and bottom covers: Dark blue without window.
4. Color of title on front and bottom covers: Golden.
5. Form of title character: Helvetica light.
6. Printing of character: Leaf stamping.
7. Size of papers shall be A4 - size (210 mm × 297 mm).

Titles

1. The manual shall be named as: " Operating Manual"
2. The titles on the front cover shall include:
 - a. Company name and logo.

KLM Technology Group Project Engineering Standard	PLANT OPERATING MANUALS (PROJECT STANDARDS AND SPECIFICATIONS)	Page 5 of 19
		Rev: 01
		Feb 2011

- b. Refinery/Factory name.
 - c. Printing of "Operating Manual".
 - d. Plant or unit name.
 - e. Plant or unit number.
 - f. Contractor (s) name and Logo.
 - g. Contract number.
 - h. Date, it shall be referred to the month and year of the plant commissioning date.
3. The titles on the bottom cover shall include all requirements as outlined above.

Dividers

Dividers should be provided to separate each chapter with appropriate designations of the concerned subject.

BASIC CONSIDERATIONS IN PREPARING OPERATING MANUALS

Non-licensed Processes

1. Purpose

The purpose of an operating manual, is not only to help the operation engineers and staff at the customer side to operate the plant safely, but also to present all detailed procedures for the plant start-up and shut down in the various operation cases.

2. Extent of description

- a. Operating manuals should contain all operating procedures, guidance, hints, cautions and trouble shooting guides necessary for plant safe and correct operation.
- b. The detailed operation procedures should also include the sequence of valve operation, time schedule, etc.
- c. The Contractor should carefully study the past history of troubles experienced and counter measures, employed in similar processes and provide the latest instructions.

KLM Technology Group Project Engineering Standard	PLANT OPERATING MANUALS (PROJECT STANDARDS AND SPECIFICATIONS)	Page 6 of 19
		Rev: 01
		Feb 2011

- d. Abnormal levels of operating variables (temperature, pressure, flow rate, fluid level in vessel, etc.) together with appropriate countermeasures should be listed in the operating manual as far as possible to avoid similar troubles.
3. Final check of basic design
 - a. Operating manual, should be checked carefully against basic design latest revision.
 - b. The operation philosophy which was prepared at the early stages of the basic design shall be reviewed.
 - c. The necessary facilities, equipment, instruments and lines, etc., for each operation mode (namely start-up, normal shut down, emergency, regeneration, maintenance, etc.) must be taken into consideration.

Licensed Processes

1. Detail designer shall prepare an operating manual for the Licensed Unit in accordance with the conditions stipulated in this Standard for non-licensed Units and based on the contents of operating manual furnished by the Licensor. All modifications/changes resulted from the detailed engineering activities should be reflected in the final revision of the operating manuals.
2. Before making any unavoidable modifications/changes by the Contractor, it is necessary to obtain the approval of the process licensor.

CONTENTS OF OPERATING MANUAL

1. In order to standardize the quality of the operating manual, the chapters which shall be included in the operating manual, are listed in Appendix A.
2. Some of the items specified in Appendix A may be modified and/or changed depending upon the particular process and shall be approved by the Company.

KLM Technology Group Project Engineering Standard	PLANT OPERATING MANUALS (PROJECT STANDARDS AND SPECIFICATIONS)	Page 7 of 19
		Rev: 01
		Feb 2011

NOTEWORTHY POINTS

General

1. Generally, the necessary documents providing a guide to operation comprise:
 - a. Operating manual.
 - b. Analytical manual.
 - c. Vendor's instruction manuals.
 - d. Safety manual.

Vendor's Instruction Manuals have priority over the operating manual prepared by the Contractor in order to place the responsibility for mal operation on the Vendors.

2. The following figures and tables to be inserted in the operating manual for the operator's convenience and easy comprehension.
 - a. Figures:
 - i) Trip sequence (flow) diagram.
 - ii) Simplified flow scheme of plant heat-up.
 - iii) Simplified flow scheme of catalyst reduction, activation, oxidation and regeneration (generally, for Licensed Units).
 - iv) Simplified flow scheme of feed cut-in, shut-down and other operation modes.
 - v) Furnace drying curve.
 - vi) Other charts as needed.
 - b. Tables:
 - i) Pressure relief valves load summary tables.
 - ii) Setting point list for instruments (especially alarm and trip elements).
 - iii) Analytical schedule.
 - iv) Utility summary tables.
 - v) Heat and material balance tables.
 - vi) Major Equipment Specification Summary.

KLM Technology Group Project Engineering Standard	PLANT OPERATING MANUALS (PROJECT STANDARDS AND SPECIFICATIONS)	Page 8 of 19
		Rev: 01
		Feb 2011

Chapter II (Design Basis)*

1. Sections A, B, C

- a. Type and source of feed and unit different operating modes to be specified.
- b. The characteristics of feed, products and by-products (if necessary) shall be specified. The typical feed and product characteristics for refinery are presented in Appendix B.

* For Chapter I "Introduction" see Appendix A.

2. Section D

Utility conditions shall cover operating pressure and temperature as well as application of each type for all utilities concerned in the plant.

3. Section E

- a. Heat and Material Balance Tables including the following characteristics of each stream as marked on the relevant process flow diagram to be covered in this section.
- b. Enthalpy basis (datum level) for all fluids to be identified. Computer program used for preparation of Heat and Material Balance Tables shall also be clarified.

4. Section F

Utility Summary Tables shall cover the following requirements (where applicable) as shown below typical tables:

- Item number.
- Service.
- Load BkW (BhP), kW.
- Electrical power, kW.
- Steam, 1000 kg/h.
- HP steam, pressure in, bar (ga).
- MP steam, pressure in, bar (ga).
- LP steam, pressure in, bar (ga).
- LLP steam, pressure in, bar (ga).
- Condensate, 1000 kg/h

KLM Technology Group Project Engineering Standard	PLANT OPERATING MANUALS (PROJECT STANDARDS AND SPECIFICATIONS)	Page 9 of 19
		Rev: 01
		Feb 2011

- Cold Cond., Pressure in, bar (ga).
- HP hot Cond., Pressure in, bar (ga).
- LP hot Cond., Pressure in, bar (ga).
- LLP hot Cond., Pressure in, bar (ga).
- BFW, 1000 kg/h
- Pure demineralized water, 1000 kg/h.
- Loss (steam, condensate, BFW, ...), 1000 kg/h.
- Cooling water.
- Tempered water, m3/h.
- Fresh water, m3/h.
- Temperature rise, °C.
- Fuel (LHV)
- Oil, 1000 kJ/s.
- Gas, 1000 kJ/s.
- Nitrogen, Nm3/h.
- Air, Nm3/h.
- Instrument
- Plant.
- Plant water, m3/h.
- Potable water, m3/h.
- Inert gas, Nm3/h.
- Natural gas, Nm3/h.

Utility Summary Tables shall be provided separately for summer and winter operating cases when the unit is operated under design flow rate. Additional cases may be included upon the Company's request.

5. Section G

- a. Effluent summary shall cover all unit effluents except those streams considered as the unit products/byproducts as presented in section C.
- b. The effluent summary shall include the following streams where applicable:

KLM Technology Group Project Engineering Standard	PLANT OPERATING MANUALS (PROJECT STANDARDS AND SPECIFICATIONS)	Page 10 of 19
		Rev: 01
		Feb 2011

- Sour water.
 - Oily water.
 - Spent caustic solution.
 - Chemical sewer.
 - All other disposed liquid and solid wastes.
- c. The following characteristics for each effluent shall be specified.
- Quantity, kg/h and/or m³/h.
 - Impurities such as H₂S, NH₃, Oil, Cl⁻, Na⁺, etc. in mass ppm (wt), (mg/kg)
 - Sources including all equipment involved.
 - Destinations such as oily water sewer, non oily water sewer, chemical sewer, etc.

Chapter III (Process Description)

1. Section A

The following requirements shall be included under the "Nature of Process".

- Introduction.
- Chemistry of the process.
- Typical reactions.
- Reaction rates and heats of reaction.

2. Section B

Detailed line up of the process flow separately for each section of the unit to be provided.

Chapter IV (Operating Variables and Controls)

1. Section A

This section embodies the main process features and is prepared to help the plant operators overcome troubles not mentioned in the next chapters (start-up and shut-down procedures). Any operating variable such as pressure, temperature, chemical additions, feedstock properties, hydrogen to