

PROCEDURE MANUAL

SPD0011ERN

PROCESS EVALUATION

REV. : 2

DATE : 2013. 11. 22



**SAMSUNG
ENGINEERING**

SAMSUNG ENGINEERING CO., LTD.

	<u>PROCEDURE</u> MANUAL PROCESS EVALUATION	SPD0011ERN
		REV. : <u>2</u>
		PAGE i OF <u>i</u>
DATE : <u>2013.11.22</u>		

Contents

	PAGE
1. SCOPE -----	3
2. PURPOSE -----	3
3. PROCEDURE -----	3
3.1 Selection of Processes -----	3
3.2 Contact with Licensors -----	3
3.3 Questionnaire to Licensors -----	4
3.3.1 General -----	4
3.3.2 Design Basis -----	4
3.3.3 Technical Matters -----	4
3.3.4 Project Execution Matters -----	6
3.3.5 Contract Terms -----	6
3.4 Treatment of Licensors Information -----	6
3.4.1 Questions to Licensor -----	6
3.4.2 Adjustment of Licensor's Information -----	6
3.4.3 Economic Study Basis -----	7
3.4.4 Investment Cost Estimation -----	7
3.4.5 Economics Study -----	7
4. EVALUATION REPORT -----	7
4.1 Basic Consideration -----	7
4.2 Cover -----	7
4.3 Content -----	8
4.3.1 General -----	8
4.3.2 Supplement -----	8
5. HISTORY -----	12
TABLES AND FIGURES	
TABLE 3-1 CONTENTS OF QUESTIONNAIRE TO LICENSORS -----	9
TABLE 4-1 CONTENTS OF EVALUATION REPORT -----	10
FIG. 4-1. EXAMPLE COVER OF EVALUATION REPORT -----	11

 SAMSUNG ENGINEERING	PROCEDURE MANUAL PROCESS EVALUATION	SPD0011ERN
		REV. : <u>2</u>
		PAGE 3 OF 12

1. SCOPE

This manual describes the procedure for process evaluation.

As there may be several licensed processes for each unit, it is essential to select most attractive process from among those which are available. Sometimes, the contractor is requested to evaluate competing processes on behalf of the client, as a part of the contract.

2. PURPOSE

The process evaluation work is divided into three major categories.

(1) Technical matters

The criteria are as follows:

- (a) Commercial experience
- (b) Process performance
- (c) Outstanding matters, such as mechanical, operational and environmental aspects
- (d) Process guarantee and make good
- (e) Economic feasibility

(2) Project execution matters

The criteria are as follows:

- (a) Royalty or know how fee
- (b) Content of technical information
- (c) Project schedule
- (d) Engineering fee

(3) Contract terms and conditions

These three categories should be carefully evaluated.

3. PROCEDURE

3.1 Selection of Processes

First, suitable processes should be selected based upon the results of discussions with the client.

3.2 Contact with Licensors

With respect to the process licensors, the following actions are required.

- (1) Explain the project briefly.
- (2) Request cooperation in process evaluation.
- (3) Inquires about the necessity of secrecy agreements.
- (4) Explain coordination procedures.

At this stage, a suitable process engineer, who is familiar with the technology, is assigned to deal.

 SAMSUNG ENGINEERING	PROCEDURE MANUAL PROCESS EVALUATION	SPD0011ERN
		REV. : <u>2</u>
		PAGE 4 OF 12

3.3 Questionnaire to Licensors

3.3.1 General

- Questionnaires of the same content should be sent out to each licensor to obtain basic information for the process evaluation.
- Contents of the questionnaires must be that which is necessary and sufficient for the purpose of process evaluation as mentioned in Chapter 2.
- Contents of a typical questionnaire are shown in Table 3-1. Each item of it is explained below.
- Note that the client's approval must be obtained prior to issuing the questionnaires.

3.3.2 Design Basis

- Regarding the design basis, it is important that sufficient data be furnished for the licensors to conduct their studies. Also, it is necessary that the requests of the client included in the design basis without fail.
- Normally, battery limit conditions and utility conditions are not fully identified at the evaluation stage, any missing items which affect process evaluation must be provided.

3.3.3 Technical Matters

(1) Commercial experience

Unless there is a very special reason, those processes which have not yet been adopted for commercial applications or have been used only for limited applications should not be selected.

Hence, inquiries should be made about currently installed capacity: the number of plants currently running; their capacities; date of installation; location; and contact person at each plant who could answer questions regarding current operation. Especially, important is experience in plants of similar operating conditions. A visit to one or more operating facilities may be appropriate.

(2) Process description

Process flow diagrams and process descriptions should be requested to study the contents of the process.

(3) Product yield and properties

Product yield and properties are to be provided from a feed identical or similar to the on which is being considered.

(4) Major operating conditions

Since the operating conditions are required to calculate the utility consumption and investment cost, care must be taken to obtain data and information necessary and sufficient for the purpose.

For instance, the following conditions are required in the case of a hydrodesulfurization processes:

	PROCEDURE MANUAL PROCESS EVALUATION	SPD0011ERN
		REV. : <u>2</u>
DATE : <u>2013.11.22</u>		PAGE 5 OF 12

- (a) Reactor operating pressure and temperature
- (b) Separator pressure and temperature
- (c) Reactor LHSV ([Liquid Hourly Space Velocity](#))
- (d) Recycle H₂ ratio
- (e) H₂ chemical consumption
- (f) H₂ physical consumption
- (g) Minimum H₂ purity in recycle gas
- [\(h\) Make-up H₂ quantity and purity](#)
- [\(i\) H₂ quench information](#)
- [\(j\) H₂ purge rate and purity](#)
- (5) Catalyst information

[Proper catalyst specification is often the most important point in the process evaluation to identify process performance.](#)

Generally, the following are inquired:

 - (a) Catalyst [type and](#) name
 - (b) Recommended supplier
 - (c) Required amount
 - (d) Regeneration [frequency and procedure](#)
 - (e) Guaranteed life
 - (f) Expected [run length / expected life](#)
 - (g) Price
 - [\(h\) Number of beds](#)
 - [\(i\) Maximum bed height](#)
 - [\(j\) Is quench needed?](#)
- (6) Major equipment information, [typically in the form of a sized equipment list](#)
- (7) Utility and chemical consumptions
- (8) Guarantee items and values

If the evaluation period is short, it may be difficult to complete [the](#) necessary calculations to obtain concrete values [for all the items.](#)

In such a case, only the items to be guaranteed should be [determined.](#)

3.3.4 Project Execution Matters

- (1) Royalties and know-how fees: [amount, how amount is determined, payment schedule](#)
- (2) Contents of technical information

Information furnished by licensors varies largely depending on the licensors: it ranges from simple process information to detailed Basic Design Package.

Since [the information](#) not furnished by the licensor must be provided by SECL their preparation costs must be taken into account.
- (3) Project schedule

Generally, the licensor's design work is a critical path in the overall project

	PROCEDURE MANUAL PROCESS EVALUATION	SPD0011ERN
		REV. : <u>2</u>
DATE : <u>2013.11.22</u>		PAGE 6 OF 12

schedule.

Hence, the period of time required for the licensor's design work [to be completed is an important](#) factor to be considered in the process selection.

(4) Engineering fees

If necessary, information should be received [on a piece by piece basis, man-hour basis, or other appropriate basis.](#)

3.3.5 Contract Terms

Copies of the [confidentiality licensing](#), engineering and guarantee and technical service agreements should be requested.

After receipt, they should be subjected to review the legal [and technical](#) personnel.

If the client and/or SECL have/has any special requests, it will be necessary to inform the licensor of them in advance.

3.4 Treatment of Licensers Information

3.4.1 Questions to Licensor

[Any](#) information received from the licensor which is unclear or incomplete, must be [referred back to](#) the licensor [for clarification](#).

3.4.2 Adjustment of Licensor's Information

Since the period of time available for [the process](#) evaluation is [typically](#) short, the licensor will prepare information by utilizing their in-house data.

Hence, their thoughts may be inconsistent in the following points:

- Heat recovery
- Rotary machine driver type
- Assumed utility conditions, etc.

If inconsistent, necessary adjustments must be made [by the licensor](#) to correct the inconsistencies, if their [thoughts](#) are clear.

However, those issues which are unclear, must not be adjusted [based](#) on individual guesswork.

[Instead](#), such [issues, where](#) necessary, should be noted [in](#) the evaluation report [and then clarified later.](#)

3.4.3 Economic Study Basis

[The](#) Economic [basis](#) for [the process](#) evaluation must be clarified [for the points](#) enumerated below.

- (1) Costs of feedstocks and prices of products
- (2) Costs of utilities and chemicals
- (3) Project life
- (4) Service factors

	PROCEDURE MANUAL PROCESS EVALUATION	SPD0011ERN
		REV. : <u>2</u>
		PAGE 7 OF 12

- (5) Depreciation method and years
- (6) Economic study calculation method
- (7) Contingencies
- (8) Inflation rate

3.4.4 Investment Cost Estimation

It is considerably difficult to estimate the investment cost for different cases or conditions from limited information within the short time period typically allowed for a process evaluation.

Hence, when differences in investment cost need to be estimated, the cost estimation must be made by a simple procedure based on the clearly different design conditions, the procedure shown in the evaluation report.

3.4.5 Economics Study

- (1) A comparison table should be prepared based on the information received from each licensor.
- (2) Economic studies should be made based on the comparison table and method and values provided in the economic study basis.

See the Basic-Design Manual [SPD0010ERN](#) Design Economics.

4. EVALUATION REPORT

4.1 Basic Consideration

- (1) Since the process evaluation is to be conducted in the client's interest, it must be carried out with perfect impartiality.
- (2) For the above reason, the use of descriptive sentences should be minimized and the results of the evaluation should be shown in the form of a table or list, as much as possible.
- (3) Descriptive sentences, supported up by the licensor documentation must not be used.
- (4) All communications with the licensor should be recorded and attached to the end of the report.

4.2 Cover

See Fig. 4-1 attached hereto as a typical sample.

4.3 Content

4.3.1 General

See Table 4-1 attached hereto.

4.3.2 Supplement

- (1) Chapter-2 Conclusion and SECL Recommendations Comments should be given on the results of the comparison and SECL recommendations should be made. All these should be

 SAMSUNG ENGINEERING	PROCEDURE MANUAL PROCESS EVALUATION	SPD0011ERN
		REV. : <u>2</u>
		PAGE 8 OF 12
DATE : <u>2013.11.22</u>		

itemized.

(2) Chapter 3.5 Reference

A list of faxes, emails and letters exchanged with the licensor; their numbers and dates should be shown.

(3) Chapter 4.1 Process Description

- (a) A Process
- (b) B Process
- (c) C Process

Simple descriptions should be given and the process flow diagrams should be attached for each process.

(4) Chapter 4.2 Project Execution

The following classifications should be made:

- (a) Royalty or know how fees: amount, how amount was determined, and payment schedule
- (b) Basic design package preparation schedule
- (c) Contents of package
- (d) Engineering fee

(5) Chapter 4.4 Process Performance,

Examples are as follows:

- (a) Yields
- (b) Properties of products
- (c) Guarantee items and make good
- (d) Operating conditions (including hydrogen requirements)
- (e) Catalyst and chemicals
- (f) Utility consumptions

Contents of the process performance vary somewhat from process to process.

(6) Chapter 4.5 Outstanding Matters

The special features shall be described from the following stand points.

- (a) Mechanical aspects
- (b) Operational aspects
- (c) Environmental issues

	PROCEDURE MANUAL PROCESS EVALUATION	SPD0011ERN
		REV. : <u>2</u>
		PAGE 9 OF 12
DATE : <u>2013.11.22</u>		

Table 3-1 Contents of Questionnaire to Licensors

Information to be provided to licensors.

1. DESIGN BASIS

- 1.1 Plant capacity
- 1.2 Feedstock Properties
- 1.3 product Specifications
- 1.4 Utility Conditions
- 1.5 Battery Limit Conditions

Questionnaire

2. TECHNICAL MATTERS

- 2.1 commercial Experience
- 2.2 Process Description
- 2.3 Important Operating Conditions
- 2.4 Catalyst Information
- 2.5 Major Equipment Information
- 2.6 Utility and Chemical Consumptions
- 2.7 Guarantee Items and Values, Make good
- 2.8 Special Considerations

3. COMMERCIAL MATTERS

- 3.1 Royalty or Know How Fee
- 3.2 Contract Terms
- 3.3 Payment Schedule

4. PROJECT EXECUTION MATTERS

- 4.1 Content of Technical Information
- 4.2 Engineering Fee
- 4.3 Project Schedule

	PROCEDURE MANUAL PROCESS EVALUATION	SPD0011ERN
		REV. : <u>2</u>
		PAGE 10 OF 12

Table 4-1 Contents of Evaluation Report

1. INTRODUCTION
 - 1.1 Scope
 - 1.2 Evaluated Processes
2. CONCLUSION AND SECL RECOMMENDATIONS
3. EVALUATION BASIS
 - 3.1 Plant Capacity
 - 3.2 Feedstock Characteristics
 - 3.3 Product Specifications
 - 3.4 Economic Study Basis
 - 3.5 Reference
4. EVALUATION RESULTS FOR PROCESS "A"
 - 4.1 Process Description
 - 4.2 Project Execution
 - 4.3 Commercial Experience
 - 4.4 Process Performance
 - 4.5 Outstanding Matters
 - 4.6 Investment Cost
 - 4.7 Economic Study
5. EVALUATION RESULTS FOR PROCESS "B"
 - 5.1 Process Description
 - 5.2 Project Execution
 - 5.3 Commercial Experience
 - 5.4 Process Performance
 - 5.5 Outstanding Matters
 - 5.6 Investment Cost
 - 5.7 Economic Study
6. EVALUATION RESULTS FOR PROCESS "C"
 - 6.1 Process Description
 - 6.2 Project Execution
 - 6.3 Commercial Experience
 - 6.4 Process Performance
 - 6.5 Outstanding Matters
 - 6.6 Investment Cost
 - 6.7 Economic Study

	PROCEDURE MANUAL PROCESS EVALUATION	SPD0011ERN
		REV. : <u>2</u>
		PAGE 11 OF 12

ATTACHMENT

Information from Licensors

Fig. 4-1 Example Cover of Evaluation Report

PROCESS EVALUATION REPORT
HYDROGEN PRODUCTION (HP)
THE REFINERY MODERNIZATION PROJECT
OF
MINA AL-AHMADI REFINERY,
KUWAIT NATIONAL PETROLEUM COMPANY

April, 1983

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	PROCEDURE MANUAL PROCESS EVALUATION	SPD0011ERN
		REV. : <u>2</u>
		PAGE 12 OF 12
DATE : <u>2013.11.22</u>		

5. HISTORY

개정번호	개 정 일 자	개정 페이지	개 정 사 유
0	98.4.17	전 페이지	신규 제정 - 작성부서 : 공정팀 - 작성자 : 박종현 임종은 - 검토자 : 이봉일 조석범 노재철 - 승인자 : 오성국
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