MODULE 1

Construction and Engineering

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INTRODUCTION

This module consists of two learning activities. Both have the same format in which you will find four parts. The first part contains (a) original texts written in English as the source language (SL). The first two paragraphs of each text, translated into Bahasa Indonesia, are intended as model translations along with a brief explanation. The second part provides you with a number of translation exercises with alternative translation versions. However, it is advisable that you do each of the exercises by yourself or in groups first before checking them with the keys. The third part has a summary of those translation aspects highlighted in the learning activity concerned. The last part gives you a formative test as freer practice. Alternative translation versions together with some comments are available in the key to the formative test section at the end of this module.

After learning this module, you are expected to be able to translate various texts on Construction and Engineering from English into Bahasa Indonesia as accurately, clearly and naturally as possible.

Before you move on to Learning Activity 1, it is necessary for you to look at things you have to bear in mind while you are translating. You should have learned these things in the Theory of Translation course (BING3315):

1. Meanings transferred into the target language are not restricted by the source language patterns. In other words, it should not read as translation.
2. Meaning in the source language should be conveyed accurately in the target language. There should no misinterpretation or misleading language.
3. Be aware of the notion register (i.e. vocabulary selection, style and grammatical features) used in a particular context.
4. Make sure you do not lose certainty of meaning in the source texts.

5. There is no such thing as “free translation”. Your translation should only be based on meanings in the source language.
6. Do not use ‘everyday’ language.

All the above criteria will be addressed in the section of key to exercises. They will then be summarized in the Summary section.

LEARNING ACTIVITY 1

English–Bahasa Indonesia Translation

Read the following text very carefully to get a general impression of it, analyze it and then do the exercises that follow.

Manufacturing Engineering

Introduction

Manufacturing engineering may be defined as designing the production process for a product. Although there is a large difference of opinion on exactly what is included in the design of a production process, almost all people would generally agree with the above definition. Production or manufacturing engineering includes all considerations pertaining to the process of production. This includes such functions as the following:

1. Evaluating the manufacturability of the product.
2. Selecting processes and setting process parameters such as cutting tool material, size, and shape; cutting speed; depth *of* cut; and so on.
3. Designing work-holding devices (jigs and fixtures) to secure and control the position of the workpiece during manufacture.
4. Estimating the cost of manufacturing the part.
5. Assuring the quality of the part produced.

The rate of technological change in manufacturing engineering is phenomenal likely to increase. “Keeping up” is already a very difficult TASK. The future is likely to see a progressive manufacturing engineer spending 15 to 25% of his or her time simply studying new technology. Computerization, integration of controls, robotization, and coordination of manufacturing activities are areas where change is likely to be most rapid. It is important to note, however, that in spite of the new technology, the basics still apply. For example, the most sophisticated computer controlled machine center still performs its functions according to basic metal cutting theory. It is vital for the manufacturing engineer to know and understand the basics of manufacturing engineering.

This chapter discusses some of the primary areas of manufacturing engineering. Since much industrial engineering has been applied to the metal working industry, we concentrate on that particular industry. The reader should be aware that industrial engineering techniques can be applied in any operating system, such as manufacturing, service, and governmental activities. Fully 60% of the American work force functions in service and governmental areas; but the limited length of this chapter prohibits any detailed discussion of those areas.

Product-Production Design Interaction

Product design requires that a person develop and evaluate the ability of the part to perform its intended function. Part characteristics such as size, shape, strength, reliability, safe operating range, and so on, are evaluated using knowledge of physics, strength of materials, tribology, and so on, often using computerized analysis. Manufacturing engineering develops and evaluates the cost of producing the part and uses knowledge of the relative cost, capabilities, and limitations of the various alternative processing methods available to produce the particular part shape, as well as detailed knowledge of cutting tools, machine tools, skill levels of workers, similarity to other parts being produced, and so on. Unfortunately, few industrial engineers are trained in product design and few product designers are trained in manufacturing engineering. This makes their interaction exceptionally important.

In every manufacturing operation, some variation in the size of the individual parts produced by the process will inevitably occur due to a variety of causes, such as tool wear, operator error, and material variations. The range of part sizes that can be used without compromising part function or reliability, that is, the variation in each dimension of the product that can be tolerated, is referred to as the tolerance for the product. The part designer, who is most concerned with product function, would want the tolerances set as small as possible to assure that the part will function without any problems. The manufacturing engineer, who is most concerned with product cost, wants the largest possible tolerances to be specified, as this often gives him or her a wider choice of processes to be used in manufacturing the part. This wider choice will often result in a reduction in product cost. Sometimes, a product designer may specify very tight tolerances on the product because he or she does not realize the cost of machining to exceptionally tight tolerances or the inability of machines to produce unusual configurations. Often, the manufacturing engineer will assume that these tight tolerances or unusual configurations are necessary (when in fact they are not) and design the process to produce them. This adds unnecessary cost to the product.

Ideally, a manufacturing engineer should work with the product designer from the very beginning to ensure producibility. If it is not possible to have this early interaction, the manufacturing engineer should inform the design engineer of unusually costly operations. By having this information, the design engineer can frequently avoid certain costly operations. This interaction must happen and occur as early as possible in the design of products.

Employee participation is also vital in this interaction phase. None one knows the details of a job better than the person doing it, so this employee must be encouraged for industry to remain competitive. In fact (as will be seen later), the use of employee skills in some type of participative management may be the most exciting trend today.

It is difficult to overemphasize the value of input from the hourly shop floor workers in planning and implementing automation systems. No one knows the nitty-gritty of a job better than the person who does it.

Process Engineering

Process engineering is concerned with the design of the actual process to be used in the manufacture of the product. In designing the processes to be used, a six-step sequence should be undertaken: defining the product structure and specifications, assessing each component's manufacturability, listing the different processes capable to manufacturing the component, evaluating the cost of each of the alternative processes, determining the sequence in which the operation are to be performed, and documenting the process.

Defining Product Structure and Specifications

Product structures are often shown in a hierarchical chat that shows all of the subassemblies, sub-subassemblies, components, and raw materials that comprise the product. Figure 3.1 shows the product structure for a product assembled from two subassemblies (S_i), each of which is composed of sub-subassemblies (SS_j), components (C_k), and raw materials (R_I).

This type of chart clearly defines "what goes into what" and on which the five levels the item belongs. More complex products would have more levels in their product structures. In Figure 3.1 each horizontal line indicates that an assembly operation must be designed to join its constituent parts. For example, the horizontal line linking subassemblies 1 and 2 indicates that a process to connect these two subassemblies must be designed. Note that sub-subassemblies, components, and/or raw materials can "go into" the subassembly; the hierarchy of the product structure dictates only that the horizontal line be above the highest-level item (subassembly, component, raw material) in the assembly, component, raw material) in the assembly. Also shown in Figure 3.1 are components that are purchased already fabricated and/or assembled and thus have no raw materials that must be processed by this facility. Vertical lines in the product structure indicate that the lower-level item is modified by a unique number and incorporated in this number is the level of the item. This numbering is helpful of when scheduling the production of the item, as we shall see in Chapter 7.

The number of each item required to make one of the next-higher level item is also shown in the product structure. Figure 3.1 shows that three of subassembly 1 are required to make one unit of the product and that two sub-subassembly 1s are needed for each subassembly 1. This means that six units of sub-subassembly 1 are needed to make the product. These data are used when determining the number of each item that will be required to meet the sales forecast for our product. (Introduction to Industrial and Systems Engineering by Wayne C Tuner)

■ **TASK 1:**
Now, learn the first model answer below together with a short explanation about it. Pay special attention to the underlined words.

MODEL 1

Source Language
Paragraph 1 **Manufacturing Engineering** **Introduction** Manufacturing engineering may be defined as <u>designing</u> the production process for a product. Although there is a large difference of opinion on exactly what is included in the design of a production process, almost all people would generally agree with the above definition. Production or manufacturing engineering includes all considerations pertaining to the process of production. This includes such functions as the following:

1. Evaluating the manufacturability of the product.
2. Selecting processes and setting process parameters such as cutting tool material, size, and shape; cutting speed; depth of cut; and so on.
3. Designing work-holding devices (jigs and fixtures) to secure and control the position of the workpiece during manufacture.
4. Estimating the cost of manufacturing the part.
5. Assuring the quality of the part produced.

Target Language

Paragraph 1

Perekayasaan Manufaktur

Pendahuluan

Perekayasaan manufaktur dapat didefinisikan sebagai perancangan proses produksi sebuah produk. Meskipun terdapat perbedaan pendapat yang besar mengenai apa sebetulnya yang termasuk ke dalam desain sebuah proses produksi, pada umumnya hampir semua orang akan setuju dengan definisi di atas. Produksi atau perekayasaan manufaktur meliputi semua pertimbangan yang berkaitan dengan proses produksi tersebut meliputi fungsi-fungsi berikut ini.

1. Mengevaluasi manufakturibilitas dari produk tersebut.
2. Memilih proses dan menyiapkan parameter proses seperti bahan untuk alat pemotong, ukuran, dan bentuk; kecepatan memotong; kedalaman potongan; dst.
3. Merancang alat-alat pemegang benda (jigs and fixtures) guna menjamin dan mengontrol posisi benda yang dikerjakan selama pembuatan.
4. Memperkirakan biaya pembuatan produk.
5. Menjamin kualitas dari produk.

Penjelasan:

Setelah melakukan analisis terhadap fungsi teks sumber (TSu) di atas yang bersumber dari buku teks/referensi maka diketahui bahwa teks tersebut termasuk jenis teks informatif (*informative text*). Sesuai namanya, ia berfungsi memberi informasi, pengetahuan, pendapat dan lain-lain secara logis kepada pembaca serta bersifat referensial. Fungsi tersebut seyogianya juga tercermin dalam hasil terjemahan/teks sasaran (TSa).

Dilihat dari jenis teks maka TSu di atas dapat dikategorikan ke dalam teks khusus (*technical text*) yang di dalam ditemukan sejumlah terminologi yang merupakan spesifik topik “perekayasaan manufaktur”. Hal tersukar adalah mencari padanannya dalam BSa.

Setelah melakukan analisis terhadap fungsi TSu, kemudian barulah Anda mengkaji aspek linguistik dari TSu. Tugas berikutnya adalah mencari padanannya dalam bahasa sasaran (BSa) sesuai konteks situasi di mana unsur-unsur linguistik tersebut muncul, termasuk mempertimbangkan latar belakang budaya bahasa sasaran (BSa). Misalnya, verba yang digarisbawahi dalam konstruksi kalimat *'Manufacturing engineering may be defined as <u>designing</u> the production process for a product'* diterjemahkan menjadi kata benda 'perancangan' seperti dalam kalimat 'Perekayasaan manufaktur dapat didefinisikan sebagai <u>perancangan</u> proses produksi sebuah produk'; dan bukan 'merancang' sebagai verba. Dalam hal ini, telah terjadi pergeseran bentuk.

Konsep *gerund* dalam bahasa Inggris ditandai dengan penambahan bentuk '-ing' pada kata dasar, seperti '*evaluating'* (mengevaluasi), '*selecting'* (memilih), '*designing'* (merancang), '*estimating'* (memperkirakan), dan '*assuring*' (menjamin), yang dalam bahasa Indonesia tidak mengalami pergeseran bentuk. Hal yang penting adalah menjaga konsistensi dalam penggunaan bentuk aktif yang ditandai dengan penggunaan prefiks 'me-' dalam TSa, seperti halnya penggunaan bentuk '-*ing*' dalam TSu.

- **TASK 2:**
  Now, learn the second model answer below together with a short explanation about it. Pay special attention to the underlined words.

MODEL 2

Source Language
Paragraph 2 The rate of technological change in manufacturing engineering is phenomenal likely to increase. "Keeping up" is already a very difficult TASK. The future is likely to see a progressive manufacturing engineer spending 15 to 25% of his or her time simply studying new technology. Computerization, integration of controls, robotization, and coordination of manufacturing activities are areas where change is likely to be most rapid. It is important to note, however, that in spite of the new technology, the basics still apply. For example, the most sophisticated computer controlled machine center still performs its functions according to basic metal cutting theory. It is vital for the manufacturing engineer to know and understand the basics of manufacturing engineering.

Target Language
Kecepatan perubahan teknologi dalam perekayasaan manufaktur secara fenomenal mungkin akan bertambah. "Berpacu" telah merupakan sebuah tugas yang sulit. Pada masa mendatang mungkin dapat dilihat seorang insinyur manufaktur yang progresif yang menghabiskan 15–20% waktunya hanya untuk mempelajari teknologi baru. Komputerisasi, kontrol yang terintegrasi, robotisasi, dan kombinasi kegiatan manufaktur merupakan daerah-daerah di mana perubahan yang mungkin terjadi secara paling cepat. Namun, perlu dicatat bahwa di samping teknologi baru, dasar-dasar masih diterapkan. Misalnya, pusat mesin yang dikontrol dengan komputer tercanggih masih melakukan fungsinya menurut teori pemotongan metal dasar. Sangat penting bagi insinyur manufaktur untuk mengetahui dan memahami dasar-dasar perekayasaan manufaktur tersebut.

Penjelasan:

Pola kolokasi tidak lazim dijumpai dalam kalimat *"Keeping up" is already a very difficult TASK.* Kata kerja frasa (*phrasal verb*) "*keep up*" secara kontekstual ternyata tidak begitu sukar dijumpai padanannya dalam bahasa Indonesia, yaitu kata "berpacu". Dalam beberapa kasus, pola kolokasi seperti itu mungkin cukup sulit dicarikan padanannya. Lihat kembali Buku Materi Pokok mata kuliah "Teori Terjemahan" (kode: BING3315).

EXERCISES

■ **TASK 3**

Now, translate each of the following extract into Bahasa Indonesia as accurately, clearly and naturally as possible. Pay special attention to the underlined words. Write your translation in the space available.

Source Language
Paragraph 3 This chapter discusses some of the primary areas of manufacturing engineering. Since much industrial engineering has been applied to the metal working industry, we concentrate on that particular industry. The reader should be aware that industrial engineering techniques can be applied in any operating system, such as manufacturing, service, and governmental activities. Fully 60% of the American work force functions in service and governmental areas; but the limited length of this chapter prohibits any detailed discussion of those areas.

Target Language

■ **TASK 4**

Now, translate each of the following extract into Bahasa Indonesia as accurately, clearly and naturally as possible. Pay special attention to the underlined words. Write your translation in the space available.

Source Language
Paragraph 4 **Product-Production Design Interaction** Product design requires that a person develop and evaluate the ability of the part to perform its intended function. Part characteristics such as size, shape, strength, reliability, safe operating range, and so on, are evaluated using knowledge of physics, strength of materials, tribology, and so on, often using computerized analysis. Manufacturing engineering develops and evaluates the cost of producing the part and uses knowledge of the relative cost, capabilities, and limitations of the various alternative processing methods available to produce the particular part shape, as well as detailed knowledge of cutting tools, machine tools, skill levels of workers, similarity to other parts being produced, and so on. Unfortunately, few industrial engineers are trained in product design and few product designers are trained in manufacturing engineering. This makes their interaction exceptionally important.
Target Language

■ TASK 5

Now, translate each of the following extract into Bahasa Indonesia as accurately, clearly and naturally as possible. Pay special attention to the underlined words. Write your translation in the space available.

Source Language
Paragraph 5 In every manufacturing operation, some variation in the size of the individual parts produced by the process will inevitably occur due to a variety of causes, such as tool wear, operator error, and material variations. The range of part sizes that can be used without compromising part function or reliability, that is, the variation in each dimension of the product that can be tolerated, is referred to as the tolerance for the product. The part designer, who is most concerned with product function, would want the tolerances set as small as possible to assure that the part will function without any problems. The manufacturing engineer, who is most concerned with product cost, wants the largest possible tolerances to be specified, as this often gives him or her <u>a wider choice of processes</u> to be used in manufacturing the part. This wider choice will often result in a reduction in product cost. Sometimes, a product designer may specify very tight tolerances on the product because he or she does not realize the cost of machining to exceptionally tight tolerances or the inability of machines to produce unusual configurations. Often, the manufacturing engineer will assume that these tight tolerances or unusual configurations are necessary (when in fact they are not) and design the process to produce them. This adds unnecessary cost to the product.
Target Language

■ **TASK 6**

Now, translate each of the following extract into Bahasa Indonesia as accurately, clearly and naturally as possible. Pay special attention to the underlined words. Write your translation in the space available.

Source Language
Paragraph 6 Ideally, a manufacturing engineer should work with the product designer <u>from the very beginning</u> to ensure producibility. If it is not possible to have this early interaction, the manufacturing engineer should inform the design engineer of unusually costly operations. By having this information, the design engineer can frequently avoid certain costly operations. This interaction must happen and occur as early as possible in the design of products.
Target Language

■ **TASK 7**

Now, translate each of the following extract into Bahasa Indonesia as accurately, clearly and naturally as possible. Pay special attention to the underlined words. Write your translation in the space available.

Source Language
Paragraph 7 Employee participation is also vital in this interaction phase. None one knows the details of a job better than the person doing it, so this employee must be encouraged for industry to remain competitive. In fact (as will be seen later), the use of employee skills in some type of participative management may be the most exciting trend today.

Target Language

■ **TASK 8**

Now, translate each of the following extract into Bahasa Indonesia as accurately, clearly and naturally as possible. Pay special attention to the underlined words. Write your translation in the space available.

Source Language
Paragraph 1 It is difficult to overemphasize the value of input from the hourly shop floor workers in planning and implementing automation systems. No one knows the nitty-gritty of a job better than the person who does it.
Target Language

■ **TASK 9**

Now, translate each of the following extract into Bahasa Indonesia as accurately, clearly and naturally as possible. Pay special attention to the underlined words. Write your translation in the space available.

Source Language
Paragraph 9 **Process Engineering** Process engineering is concerned with the design of the actual process <u>to be used</u> in the manufacture of the product. In designing the processes <u>to be used</u>, a six-step sequence <u>should be undertaken</u>: defining the product

structure and specifications, assessing each component's manufacturability, listing the different processes capable to manufacturing the component, evaluating the cost of each of the alternative processes, determining the sequence in which the operation are to be performed, and documenting the process.
Target Language

■ **TASK 10**

Now, translate each of the following extract into Bahasa Indonesia as accurately, clearly and naturally as possible. Pay special attention to the underlined words. Write your translation in the space available.

Source Language
Paragraph 10 **Defining Product Structure and Specifications** Product structures are often shown in a hierarchical chat that shows all of the subassemblies, sub-subassemblies, components, and raw materials that comprise the product. Figure 3.1 shows the product structure for a product assembled from two subassemblies (S_i), each of which is composed of sub-subassemblies (SS_j), components (C_k), and raw materials (R_I).
Target Language

■ TASK 11

Now, translate each of the following extract into Bahasa Indonesia as accurately, clearly and naturally as possible. Pay special attention to the underlined words. Write your translation in the space available.

Source Language
Paragraph 11 This type of chart clearly <u>defines</u> "what goes into what" and on which the five levels the item belongs. More complex products would have more levels in their product structures. In Figure 3.1 each horizontal line indicates that an assembly operation must be designed to join its constituent parts. For example, the horizontal line linking subassemblies 1 and 2 indicates that a process to connect these two subassemblies must be designed. <u>Note</u> that sub-subassemblies, components, and/or raw materials can "go into" the subassembly; the hierarchy of the product structure dictates only that the horizontal line be above the highest-level item (subassembly, component, raw material) in the assembly, component, raw material) in the assembly. Also shown in Figure 3.1 are components that are purchased already fabricated and/or assembled and thus have no raw materials that must be processed by this facility. Vertical lines in the product structure indicate that the lower-level item is modified by a unique number and incorporated in this number is the level of the item. This numbering is helpful of when scheduling the production of the item, as we shall see in Chapter 7.
Target Language

Key to Exercises: Possible Answers

■ **TASK 3**

Source Language
Paragraph 3 This chapter discusses some of the primary areas of manufacturing engineering. Since much industrial engineering has been applied to the metal working industry, we concentrate on that particular industry. The reader should be aware that industrial engineering techniques can be applied in any operating system, such as manufacturing, service, and governmental activities. Fully 60% of the American work force functions in service and governmental areas; but the limited length of this chapter prohibits any detailed discussion of those areas.
Target Language
Paragraf 3 Dalam bab ini dibahas beberapa bagian utama dari perekayasaan manufaktur. Karena kebanyakan perekayasaan industri telah diterapkan pada industri metal maka kita pusatkan perhatian kita pada industri khusus tersebut. Pembaca harus menyadari bahwa teknik perekayasaan industri dapat diterapkan pada sistem operasi, seperti manufaktur, jasa, dan kegiatan pemerintah. 60% dari angkatan kerja Amerika secara penuh berfungsi dalam bidang jasa dan pemerintahan. Namun, karena keterbatasan panjangnya bab ini sehingga pembahasan secara rinci mengenai daerah-daerah ini tidak dapat dilakukan.

Penjelasan:

Dalam bahasa Inggris sangat lazim mengatakan "*This chapter discusses'* seperti dalam kalimat "*This chapter discusses some of the primary areas of manufacturing engineering"* yang merupakan kalimat aktif. Artinya benda, yaitu '*chapter'* dapat melakukan pekerjaan seperti manusia, sementara menurut tata bahasa Indonesia tidak tepat mengatakan hal demikian. Untuk menghindari hal ini, sebaiknya kalimat di atas diubah menjadi kalimat pasif sehingga menjadi 'Dalam bab ini dibahas beberapa bagian utama dari perekayasaan manufaktur.' Teknik mengubah bentuk atau konstruksi seperti ini diperbolehkan dalam penerjemahan sepanjang tidak menyalahi aspek kewajaran dalam BSa.

■ TASK 4

Source Language
Paragraph 4 **Product-Production Design Interaction** Product design requires that a person develop and evaluate the ability of the part to perform its intended function. Part characteristics such as size, shape, strength, reliability, safe operating range, and so on, are evaluated using knowledge of physics, strength of materials, tribology, and so on, often using computerized analysis. <u>Manufacturing engineering develops and evaluates the cost of producing the part and uses knowledge of</u> the relative cost, capabilities, and limitations of the various alternative processing methods available to produce the particular part shape, as well as detailed knowledge of cutting tools, machine tools, skill levels of workers, similarity to other parts being produced, and so on. Unfortunately, few industrial engineers are trained in product design and few product designers are trained in manufacturing engineering. This makes their interaction exceptionally important.
Target Language
Paragraf 4 **Interaksi Desain Produksi dan Produk** Desain produk menghendaki bahwa seseorang mengembangkan dan mengevaluasi kemampuan produk tersebut melakukan fungsi yang telah ditentukan. Sifat-sifat produk, seperti ukuran, kekuatan, kelayakan, jangkauan operasi yang aman, dst dievaluasi dengan menggunakan ilmu fisika. Kekuatan bahan, *tribology*, dst, sering kali menggunakan analisis komputer. <u>Dalam perekayasaan manufaktur dikembangkan dan dievaluasi biaya produksi produk dan digunakan ilmu </u>tentang biaya relatif, kapabilitas, dan keterbatasan dari metode proses alternatif yang ada guna menghasilkan bentuk produk yang khusus, serta pengetahuan yang rinci mengenai alat potong, peralatan mesin, tingkat keterampilan para pekerja, kesamaan dengan produk-produk lain yang sedang dibuat, dst. Namun, tidak banyak para insinyur industri yang dilatih dalam desain produk dan tidak banyak perancang produk yang dilatih dalam perekayasaan manufaktur. Hal ini membuat interaksinya sangat penting.

Penjelasan:

Perbedaan sudut pandang (modulasi) yang berbeda terhadap pokok masalah dapat dilihat pada bagian yang digarisbawahi pada kolom TSu dan TSa di atas.

Selain itu, agar hasil terjemahan di atas lebih mudah dipahami oleh pembaca TSa maka kalimat kompleks dalam TSu perlu lebih disederhanakan.

■ TASK 5

Source Language
Paragraph 5 In every manufacturing operation, some variation in the size of the individual parts produced by the process will inevitably occur due to a variety of causes, such as tool wear, operator error, and material variations. The range of part sizes that can be used without compromising part function or reliability, that is, the variation in each dimension of the product that can be tolerated, is referred to as the tolerance for the product. The part designer, who is most concerned with product function, would want the tolerances set as small as possible to assure that the part will function without any problems. The manufacturing engineer, who is most concerned with product cost, wants the largest possible tolerances to be specified, as this often gives him or her <u>a wider choice of processes</u> to be used in manufacturing the part. This wider choice will often result in a reduction in product cost. Sometimes, a product designer may specify very tight tolerances on the product because he or she does not realize the cost of machining to exceptionally tight tolerances or the inability of machines to produce unusual configurations. Often, the manufacturing engineer will assume that these tight tolerances or unusual configurations are necessary (when in fact they are not) and design the process to produce them. This adds unnecessary cost to the product.
Target Language
Paragraf 5 Dalam setiap operasi manufaktur, beberapa variasi ukuran dari setiap produk yang dihasilkan oleh proses tersebut tidak dapat dihindari karena berbagai sebab seperti *tool wear*, kesalahan operator, dan variasi material. Keragaman ukuran produk yang dapat digunakan tanpa mempedulikan fungsi produk atau kehandalan, yaitu, variasi dalam setiap dimensi produk yang dapat ditolerir, mengacu pada toleransi produk tersebut. Perancang produk yang sangat peduli dengan fungsi produk, menginginkan toleransi tersebut dibuat sekecil mungkin guna menjamin bahwa produk tersebut akan berfungsi tanpa masalah. Insinyur manufaktur yang sangat peduli dengan biaya produk menginginkan toleransi terbesar yang dapat diberikan karena hal ini sering kali memberinya <u>pilihan proses yang lebih banyak</u> yang digunakan dalam membuat produk tersebut. Sering kali pilihan yang banyak ini akan menyebabkan pengurangan dalam biaya produk. Kadang-kadang, seorang perancang produk mungkin saja menentukan toleransi yang sangat

ketat terhadap produk tersebut karena ia tidak menyadari biaya mesin sampai pada toleransi yang amat sangat tinggi atau ketidakmampuan mesin untuk menghasilkan konfigurasi yang tidak umum. Sering kali insinyur manufaktur akan menyangka bahwa toleransi yang ketat atau konfigurasi yang tidak lazim ini adalah perlu (ketika kenyataannya tidak), dan merancang proses untuk membuatnya. Hal ini menambah biaya yang tidak perlu terhadap produk tersebut.

Penjelasan:

Seperti telah disinggung dalam penjelasan pada TASK 4 di atas maka hasil terjemahan perlu lebih disederhanakan lagi agar mudah dimengerti oleh pembaca mengingat rumitnya konstruksi TSu.

Selain itu, pola kolokasi seperti *'a wider choice of processes'* dalam TSu lebih tepat diterjemahkan menjadi 'pilihan proses yang lebih banyak', dan bukan 'pilihan yang lebih luas' yang sepertinya memang kurang lazim dalam bahasa Indonesia.

■ TASK 6

Source Language
Paragraph 6 Ideally, a manufacturing engineer should work with the product designer from the very beginning to ensure producibility. If it is not possible to have this early interaction, the manufacturing engineer should inform the design engineer of unusually costly operations. By having this information, the design engineer can frequently avoid certain costly operations. This interaction must happen and occur as early as possible in the design of products.
Target Language
Paragraf 6 Idealnya, seorang insinyur manufaktur harus bekerja dengan perancang produk dari awal sekali untuk menjamin produktibilitas. Jika interaksi awal ini tidak dimungkinkan maka insinyur manufaktur seharusnya memberitahu insinyur perancang tentang operasi yang memakan biaya yang tidak lazim. Dengan mempunyai informasi ini, insinyur perancang tersebut sering kali dapat mencegah operasi tertentu yang memakan biaya. Interaksi ini harus terjadi dan berlangsung sedini mungkin dalam perancangan produk.

Penjelasan:

Perlu dihindari agar tidak ada makna yang hilang (*loss of emaning*) dalam proses pengalihan makna tersebut. Misalnya, kata *very* dalam kalimat *'Ideally, a manufacturing engineer should work with the product designer from the very beginning to ensure producibility.*' tetap harus dimunculkan padanannya dalam hasil terjemahan yang dalam konteks di atas diterjemahkan menjadi 'dari awal sekali'.

■ TASK 7

Source Language
Paragraph 7 Employee participation is also vital in this interaction phase. No one knows the details of a job better than the person doing it, so this employee must be encouraged for industry to remain competitive. In fact (as will be seen later), the use of employee skills in some type of participative management may be the most exciting trend today.
Target Language
Paragraf 7 Partisipasi karyawan juga sangat penting dalam tahap interaksi ini. Tak seorang pun mengetahui rincian sebuah pekerjaan dengan lebih baik daripada orang yang mengerjakannya. Oleh karena itu, karyawan ini harus dimotivasi terhadap industri agar supaya tetap kompetitif. Sebetulnya, (seperti yang dapat dilihat kemudian), penggunaan keterampilan karyawan dalam beberapa jenis manajemen partisipatif mungkin saja merupakan tren yang menyenangkan pada saat ini.

Penjelasan:

Penggunaan partikel 'pun' dalam TSa di atas sangat dianjurkan sehingga faktor kewajaran dalam BSa dapat terpenuhi, termasuk penyederhanaan kalimat yang digarisbawahi (kalimat kompleks) menjadi dua kalimat sederhana.

■ TASK 8

Source Language
Paragraph 8 It is difficult to overemphasize the value of input from the hourly shop floor workers in planning and implementing automation systems. No one knows the nitty-gritty of a job better than the person who does it.
Target Language
Paragraf 8 Sulit untuk terlalu memberi penekanan pada nilai input dari para pekerja bawah dalam merencanakan dan melaksanakan sistem otomatis. Tak seorang pun lebih tahu tentang seluk-beluk sebuah pekerjaan selain orang yang mengerjakannya.

Penjelasan:

Pola kalimat bahasa Inggris seperti *'It + is + to infinitive'* sangat umum seperti dalam kalimat *'<u>It is difficult to overemphasize</u> the value of input from the hourly shop floor workers in planning and implementing automation systems*'. Namun, perlu kehati-hatian dalam menerjemahkannya sebab pola tersebut mungkin saja terbaca dalam hasil terjemahan Anda sehingga tidak jarang kita temukan konstruksi tersebut diterjemahkan menjadi seperti '<u>Adalah</u> sulit untuk terlalu memberi penekanan pada nilai input dari para pekerja bawah dalam merencanakan dan melaksanakan sistem otomatis.' Sebaiknya Anda tidak menggunakan kata 'adalah' karena sepertinya kata tersebut terikat dengan pola '*It is* .... .'

Selain itu, perhatikan juga bagaimana kata majemuk seperti *'the nitty-gritty'* diterjemahkan menjadi adverbia 'seluk-beluk'. Kemampuan bahasa Anda sebagai seorang penerjemah amat dituntut di sini karena mungkin tidak semua kamus memuat kata bentukan tersebut. Barangkali yang ada adalah kata-kata terpisah seperti '*nitty'* dan '*gritty'* yang maknanya bisa jadi berbeda dengan makna apabila kedua kata tersebut digabung menjadi satu kata seperti dalam konstruksi '*nitty-gritty'*.

■ TASK 9

Source Language

Paragraph 9

Process Engineering

Process engineering is concerned with the design of the actual process to be used in the manufacture of the product. In designing the processes to be used, a six-step sequence should be undertaken: defining the product structure and specifications, assessing each component's manufacturability, listing the different processes capable to manufacturing the component, evaluating the cost of each of the alternative processes, determining the sequence in which the operation are to be performed, and documenting the process.

Target Language

Paragraf 9

Proses Perekayasan

Proses perekayasaan berkaitan dengan perancangan proses yang sesungguhnya untuk digunakan dalam pembuatan produk. Dalam merancang proses yang akan digunakan, enam tahap secara berurutan harus ditempuh: definisikan struktur produk, nilai manufakturabilitas setiap komponen, buatkan daftar proses-proses yang berbeda yang mampu menghasilkan komponen tersebut, evaluasi biaya setiap alternatif proses, tentukan urutan operasi yang akan dilaksanakan, dan buat dokumentasi proses tersebut.

Penjelasan:

Nuansa kalimat pasif cukup kentara dalam TSu di atas. Seyogianya nuansa pasif ini juga tercermin dalam hasil terjemahan Anda mengingat teks tersebut berbicara tentang suatu proses, dalam hal ini proses perekayasaan. Oleh karena itu, sebuah teks mungkin saja memiliki lebih dari satu fungsi teks; dalam hal ini tidak hanya fungsi informatif saja tetapi juga fungsi vokatif/operatif. Perhatikan bagian-bagian yang digarisbawahi di atas.

■ TASK 10

Source Language

Paragraph 10

Defining Product Structure and Specifications

Product structures are often shown in a hierarchical chat that shows all of the subassemblies, sub-subassemblies, components, and raw materials that comprise the product. Figure 3.1 shows the product structure for a product

assembled from two subassemblies (S_i), each of which is composed of sub-subassemblies (SS_j), components (C_k), and raw materials (R_I).
Target Language
Paragraf 10 **Mendefinisikan Struktur Produk dan Spesifikasi** Struktur produk sering kali ditunjukkan dalam sebuah bagan yang hierarkis yang memperlihatkan seluruh sub-perakitan, sub-subperakitan, komponen, dan bahan mentah yang membentuk produk tersebut. Bagan 3.1 memperlihatkan struktur produk untuk sebuah produk yang dirakit dari dua sub-perakitan (S_i), masing-masing terdiri atas sub-subperakitan (SS_j), komponen (C_k), dan bahan mentah (R_I).

Penjelasan:

Konsep terminologi atau penggunaan istilah-istilah teknis dalam bidang tertentu merupakan sesuatu yang harus disadari betul oleh seorang penerjemah. Yang perlu dihindari adalah penggunaan padanan kata atau istilah yang umum untuk kata-kata atau istilah-istilah teknis dalam terjemahan. Misalnya, kata-kata seperti *subassemblies*, *sub-subassemblies, components*, *raw materials* dan *product structure* merupakan beberapa istilah teknis yang dipakai dalam dunia perekayasaan. Oleh karena itu, sebelum menerjemahkan, seorang penerjemah tidak salahnya melakukan survei terlebih dahulu ke pabrik perakitan, misalnya, untuk memastikan padanan istilah yang lazim dipakai dalam konteks tersebut di atas.

■ TASK 11

Source Language
Paragraph 11 This type of chart clearly defines "what goes into what" and on which the five levels the item belongs. More complex products would have more levels in their product structures. In Figure 3.1 each horizontal line indicates that an assembly operation must be designed to join its constituent parts. For example, the horizontal line linking subassemblies 1 and 2 indicates that a process to connect these two subassemblies must be designed. Note that sub-subassemblies, components, and/or raw materials can "go into" the subassembly; the hierarchy of the product structure dictates only that the horizontal line be above the highest-level item (subassembly, component, raw material) in the assembly, component, raw material) in the assembly. Also shown in Figure 3.1 are components that are purchased already fabricated and/or

assembled and thus have no raw materials that must be processed by this facility. Vertical lines in the product structure indicate that the lower-level item is modified by a unique number and incorporated in this number is the level of the item. This numbering is helpful of when scheduling the production of the item, as we shall see in Chapter 7.
Target Language
Paragraf 11 Bagan ini secara jelas menggambarkan "apa masuk ke mana" dan masuk ke mana kelima tingkatan tersebut. Produk-produk yang lebih rumit akan memiliki lebih banyak tingkatan dalam struktur produknya. Dalam Bagan 3.1 setiap garis horizontal menunjukkan bahwa sebuah operasi perakitan harus dirancang untuk menghubungkan bagian-bagian pembentuknya. Misalnya, garis horizontal yang menghubungkan subperakitan 1 dan 2 menunjukkan bahwa sebuah proses yang menghubungkan kedua subperakitan ini harus dirancang. Perlu dicatat bahwa sub-subperakitan, komponen, dan/atau bahan mentah dapat "masuk" ke dalam subperakitan tersebut; hierarki struktur produk tersebut hanya menunjukkan bahwa garis horizontal ada di atas objek pada level teratas (subperakitan, komponen, bahan mentah) dalam perakitan tersebut, Dalam Bagan 3.1 juga ditunjukkan komponen-komponen yang dibeli jadi dan/atau yang dirakit. Dan oleh karena itu, tidak ada bahan mentah yang harus diproses dengan fasilitas ini. Garis vertikal dalam struktur produk tersebut menunjukkan bahwa objek pada tingkatan paling bawah dimodifikasi dengan sebuah nomor yang unik, dan yang disatukan dalam nomor ini adalah tingkatan objek tersebut. Penomoran ini menolong ketika membuat jadwal produksi dari barang tersebut, seperti yang dapat dilihat dalam Bab 7.

Penjelasan:

Ketika melakukan analisis terhadap TSu, diperlukan kehati-hatian dalam memahami salah satu polisemi atau variasi makna dari sebuah kata dalam konteks tertentu. Oleh karena itu, gunakan kamus monolingual bahasa Inggris yang memang berkualitas. Misalnya, padanan yang tepat untuk kata *define* (verba) dalam TSu di atas adalah 'menggambarkan' atau 'digambarkan', dan bukan 'mendefinisikan' atau 'didefinisikan'.

Pemilihan padanan klausa 'perlu dicatat' dalam TSa untuk kata *note* (verba) dalam TSu memperlihatkan betapa faktor kewajaran (*naturalness*) dalam TSa sangat menentukan berhasil atau tidaknya proses komunikasi tersebut.

SUMMARY

Dalam Kegiatan Belajar 1 di atas Anda telah belajar tentang beberapa hal penting sebagai berikut.

1. Analisis terhadap TSu merupakan tahap awal dalam kegiatan penerjemahan untuk mengetahui fungsi TSu atau tujuan komunikasi. Sebuah teks mungkin saja memiliki lebih dari satu fungsi atau tujuan komunikasi. Terbukti bahwa TSu pada Kegiatan Belajar 1 memiliki fungsi informatif (lebih dominan) dan teks vokatif/ imperatif dan termasuk jenis teks khusus yang ditandai dengan penggunaan terminologi di bidang perekayasaan dan struktur kalimat pasif yang relatif dominan. Analisis terhadap aspek linguistik TSu dilakukan (setelah melakukan analisis terhadap fungsi TSu) sebelum mencari padanannya dalam bahasa sasaran (BSa) sesuai konteks situasi di mana unsur-unsur linguistik tersebut muncul, termasuk pertimbangan akan latar belakang budaya bahasa sasaran (BSa).
2. Pengetahuan tentang aplikasi penerjemahan pola kolokasi dalam TSu dan TSa, misalnya *perform* (verba) + *function* (nomina) yang sepadan dengan ‘melakukan fungsi’, sangat diperlukan oleh penerjemah.
3. Teknik pergeseran bentuk (transposisi) dan perbedaan sudut pandang (modulasi) terbukti sangat ampuh dalam upaya memenuhi faktor kewajaran dalam BSa atau tidak terikat dengan konstruksi atau pola dalam TSu.
4. Kemampuan dalam polisemi dan padanannya yang tepat dalam TSa sangat dibutuhkan dari seorang penerjemah sebab terkait dengan pentingnya penafsiran atau interpretasi yang tepat terhadap maksud penulis dalam TSu.

FORMATIVE TEST 1

Read the following paragraph along with its translation version. Pay special attention to the underlined parts where there are rooms for improvement on the basis of the assessment criteria in the band descriptors provided for you (see Appendix). Discuss these weaknesses with your friends, and then revise them. Compare your answers with the key to Formative Test 1.

■ TASK 1

Source Language
Paragraph 12 The number of each item required to make one of the next-higher level item is also shown in the product structure. Figure 3.1 shows that three of subassembly 1 are required to make one unit of the product and that two sub-subassembly 1s are needed for each subassembly 1. This means that six units of sub-subassembly 1 are needed to make the product. These data are used when determining the number of each item that will be required to meet the sales forecast for our product.
Target Language
Paragraf 12 Jumlah setiap produk yang memerlukan untuk membuat satu produk pada level berikutnya yang lebih tinggi juga menunjukkan dalam struktur produk tersebut. Bagan 3.1 menunjukkan bahwa tiga subperakitan 1 memerlukan untuk membuat satu unit produk, dan bahwa dua sub-subperakitan 1s memerlukan untuk setiap subperakitan 1. Ini berarti bahwa enam unit sub-subperakitan 1 membutuhkan untuk membuat produk tersebut. Data ini menggunakan pada waktu menentukan jumlah setiap produk yang memerlukan untuk memenuhi perkiraan penjualan dari produk kita.

LEARNING ACTIVITY 2

English–Bahasa Indonesia Translation

Read the following text very carefully to get a general impression of it, analyze it and then do the exercises that follow.

Engineering

Engineering is the application of science to the needs of humanity. This is accomplished through knowledge, mathematics and practical experience applied to the design of useful objects or processes. Professional practitioners of engineering are called engineers.

Compared to other professions

Engineering is concerned with the implementation of a solution to a practical problem. A scientist may ask "why?" and proceed to research the answer to the question. By contrast, engineers want to know *how* to solve a problem and how to implement that solution. Otherwise stated, scientists investigate phenomena that already exist, whereas engineers create what has never existed.

The terms "engineer" and "technologist" are not interchangeable; both describe different types of work and different professions. To illustrate: Once engineers have found a solution for the problem at hand, their work stops, and technologists begin the work of improving the solution. This process is dependent on various factors that vary with time. A solution that could be a practical application of a scientific fact does not satisfy a technologist. A technologist endeavours to bring it within the economic constraints so that the common person not only understands and marvels at science but also is able to enjoy it and loses fear of it by constant interaction.

On November 21, 1877, Thomas A. Edison developed the phonograph -- a remarkable feat of engineering. Then, he directed his assistant (the technologist) to improve the device further by removing harmonics from the sound output.

The TASK of engineering

The engineer must identify and understand the relevant constraints in order to produce a successful design. Constraints include available resources, physical or technical limitations, flexibility for future modifications and additions, and other factors such as requirements for cost, manufacturability, serviceability, and marketing and aesthetic, social, or ethic considerations. By understanding the constraints, engineers deduce specifications for the limits within which an object or system may be produced and operated. Engineering is therefore influenced by many considerations.

Problem solving

Engineers use their knowledge of science and mathematics, and appropriate experience, to find suitable solutions to a problem. Creating an appropriate mathematical model of a problem allows them to analyze it (perhaps, but exceptionally, definitively), and to test potential solutions. If multiple reasonable solutions exist, engineers evaluate the different design choices on their merits and choose the solution that best meets the requirements.

Engineers typically attempt to predict how well their designs will perform to their specifications prior to full-scale production. They use, among other things: prototypes, scale models, simulations, destructive tests, and stress tests. Testing ensures that products will perform as expected. Engineers as professionals take seriously their responsibility to produce designs that will perform as expected and will not cause unintended harm to the public at large. Engineers typically include a factor of safety in their designs to reduce the risk of unexpected failure.

Use of computers

Computers, and design software, play an increasingly important role. Using computer aided design (CAD) software, engineers are able to capture more information about their designs. The computer can automatically translate some models to instructions suitable for automatic machinery (e.g., CNC) to fabricate (part of) a design. The computer also allows increased reuse of previously developed designs by presenting an engineer with a library of predefined parts ready to be used in designs.

Additionally, engineers make use of a variety of circuit schematics software to aid in the creation of a circuit designs that perform an electronic TASK when used for a printed circuit board (PCB) or a computer chip.

Etymology

It is a myth that *engineer* originated to describe those who built engines. In fact, the words *engine* and *engineer* (as well as *ingenious*) developed in parallel from the Latin root *ingeniosus*, meaning 'skilled'. An engineer is thus a clever, practical, problem solver. The spelling of *engineer* was later influenced by back-formation from *engine*. The term later evolved to include all fields where the skills of application of the scientific method are used. In some other languages, such as Arabic, the word for "engineering" also means “geometry”.

Connections to other disciplines

Science attempts to explain newly observed and unexplained phenomena, often creating mathematical models of observed phenomena. Technology and engineering are attempts at practical application of knowledge (often from science). Scientists work on science; engineers work on technology. However, there is often an overlap between science and engineering. It is not uncommon for scientists to become involved in the practical application of their discoveries; thereby becoming, for the moment, engineers. Conversely, in the process of developing technology engineers sometimes find themselves exploring new phenomena, thus becoming, for the moment, scientists.

There are also close connections between the workings of engineers and artists; they are direct in some fields, for example, architecture and industrial design, and indirect in others. Artistic and engineering creativity may be fundamentally connected. (Wikipedia, the free encyclopedia).

■ **TASK 1:**
Now, learn the first model answer below.

MODEL 1

Source Language
Paragraph 1 **Engineering** Engineering is the application of science to the needs of humanity. This is accomplished through knowledge, mathematics and practical experience applied to the design of useful objects or processes. Professional practitioners of engineering are called engineers.
Target Language
Paragraf 1 **Perekayasaan** Perekayasaan merupakan penerapan ilmu pengetahuan untuk kebutuhan kemanusiaan. Hal ini dilakukan melalui pengetahuan, matematika, dan pengalaman praktis yang diterapkan pada perancangan objek-objek atau proses yang bermanfaat. Para praktisi profesional perekayasaan disebut dengan insinyur

■ **TASK 2:**
Now, learn the first model answer below.

MODEL 2

Source Language
Paragraph 2 **Compared to other professions** Engineering is concerned with the implementation of a solution to a practical problem. A scientist may ask “why?” and proceed to research the answer to the question. By contrast, engineers want to know *how* to solve a problem and how to implement that solution. Otherwise stated, scientists investigate phenomena that already exist, whereas engineers create what has never existed.

Target Language
Paragraf 2 **Perbandingan dengan Profesi yang lain** Perekayasaan berkaitan dengan pelaksanaan sebuah solusi terhadap sebuah masalah praktis. Seorang ilmuwan mungkin saja bertanya "kenapa?" dan terus meneliti untuk mencari jawaban atas masalah tersebut. Sebaliknya, para insinyur ingin mengetahui bahwa bagaimana menyelesaikan sebuah masalah, dan bagaimana melaksanakan solusi tersebut. Dengan kata lain, para ilmuwan meneliti fenomena yang sudah ada, sementara insinyur menciptakan apa yang tidak pernah ada.

EXERCISES

■ TASK 3

Now, translate each of the following extract into Bahasa Indonesia as accurately, clearly and naturally as possible.

Source Language
Paragraph 3 The terms “engineer” and “technologist” are not interchangeable; both describe different types of work and different professions. To illustrate: Once engineers have found a solution for the problem at hand, their work stops, and technologists begin the work of improving the solution. This process is dependent on various factors that vary with time. A solution that could be a practical application of a scientific fact does not satisfy a technologist. A technologist endeavours to bring it within the economic constraints so that the common person not only understands and marvels at science but also is able to enjoy it and loses fear of it by constant interaction.
Target Language

■ TASK 4

Now, translate each of the following extract into Bahasa Indonesia as accurately, clearly and naturally as possible.

Source Language
Paragraph 4 On November 21, 1877, Thomas A. Edison developed the phonograph -- a remarkable feat of engineering. Then, he directed his assistant (the technologist) to improve the device further by removing harmonics from the sound output.
Target Language

■ TASK 5

Now, translate each of the following extract into Bahasa Indonesia as accurately, clearly and naturally as possible.

Source Language
Paragraph 5 **The TASK of engineering** The engineer must identify and understand the relevant constraints in order to produce a successful design. Constraints include available resources, physical or technical limitations, flexibility for future modifications and additions, and other factors such as requirements for cost, manufacturability, serviceability, and marketing and aesthetic, social, or ethic considerations. By understanding the constraints, engineers deduce specifications for the limits within which an object or system may be produced and operated. Engineering is therefore influenced by many considerations.
Target Language

■ **TASK 6**

Now, translate each of the following extract into Bahasa Indonesia as accurately, clearly and naturally as possible.

Source Language
Paragraph 6 **Problem solving** Engineers use their knowledge of science and mathematics, and appropriate experience, to find suitable solutions to a problem. Creating an appropriate mathematical model of a problem allows them to analyze it (perhaps, but exceptionally, definitively), and to test potential solutions. If multiple reasonable solutions exist, engineers evaluate the different design choices on their merits and choose the solution that best meets the requirements.
Target Language

■ **TASK 7**

Now, translate each of the following extract into Bahasa Indonesia as accurately, clearly and naturally as possible.

Source Language
Paragraph 7 Engineers typically attempt to predict how well their designs will perform to their specifications prior to full-scale production. They use, among other things: prototypes, scale models, simulations, destructive tests, and stress tests. Testing ensures that products will perform as expected. Engineers as professionals take seriously their responsibility to produce designs that will perform as expected and will not cause unintended harm to the public at large. Engineers typically include a factor of safety in their designs to reduce the risk of unexpected failure.

Target Language

■ **TASK 8**

Now, translate each of the following extract into Bahasa Indonesia as accurately, clearly and naturally as possible.

Source Language
Paragraph 8 **Use of computers** Computers, and design software, play an increasingly important role. Using computer aided design (CAD) software, engineers are able to capture more information about their designs. The computer can automatically translate some models to instructions suitable for automatic machinery (e.g., CNC) to fabricate (part of) a design. The computer also allows increased reuse of previously developed designs by presenting an engineer with a library of predefined parts ready to be used in designs.
Target Language

■ **TASK 9**

Now, translate each of the following extract into Bahasa Indonesia as accurately, clearly and naturally as possible.

Source Language
Paragraph 9 Additionally, engineers make use of a variety of circuit schematics software to aid in the creation of a circuit designs that perform an electronic TASK when used for a printed circuit board (PCB) or a computer chip.
Target Language

■ **TASK 10**

Now, translate each of the following extract into Bahasa Indonesia as accurately, clearly and naturally as possible.

Source Language
Paragraph 10 **Etymology** It is a myth that *engineer* originated to describe those who built engines. In fact, the words *engine* and *engineer* (as well as *ingenious*) developed in parallel from the Latin root *ingeniosus*, meaning 'skilled'. An engineer is thus a clever, practical, problem solver. The spelling of *engineer* was later influenced by back-formation from *engine*. The term later evolved to include all fields where the skills of application of the scientific method are used. In some other languages, such as Arabic, the word for "engineering" also means "geometry".
Target Language

■ TASK 11

Now, translate each of the following extract into Bahasa Indonesia as accurately, clearly and naturally as possible.

Source Language
Paragraph 11 **Connections to other disciplines** Science attempts to explain newly observed and unexplained phenomena, often creating mathematical models of observed phenomena. Technology and engineering are attempts at practical application of knowledge (often from science). Scientists work on science; engineers work on technology. However, there is often an overlap between science and engineering. It is not uncommon for scientists to become involved in the practical application of their discoveries; thereby becoming, for the moment, engineers. Conversely, in the process of developing technology engineers sometimes find themselves exploring new phenomena, thus becoming, for the moment, scientists.
Target Language

Key to Exercises: Possible Answers

■ TASK 3

Source Language
Paragraph 3 The terms "engineer" and "technologist" are not interchangeable; both describe different types of work and different professions. To illustrate: Once engineers have found a solution for the problem at hand, their work stops, and technologists begin the work of improving the solution. This process is dependent on various factors that vary with time. A solution that could be a practical application of a scientific fact does not satisfy a technologist. A technologist endeavours to bring it within the economic constraints so that the common person not only understands and marvels at science but also is able to enjoy it and loses fear of it by constant interaction.

Target Language
Paragraf 3 Istilah “insinyur” dan “pakar teknologi” tidak dapat dipertukarkan. Keduanya menjelaskan pekerjaan dan profesi yang berbeda. Sebagai ilustrasi: Begitu para insinyur telah menemukan sebuah solusi terhadap sebuah masalah yang sedang ditangani, pekerjaan mereka berhenti, dan para pakar teknologi memulai pekerjaan meningkatkan solusi tersebut. Proses ini tergantung pada berbagai faktor yang bervariasi menurut waktu. Sebuah solusi yang mungkin saja merupakan sebuah aplikasi praktis dari sebuah fakta ilmiah yang tidak memuaskan seorang pakar teknologi. Seorang pakar teknologi berusaha keras untuk membawanya ke dalam kendala-kendala ekonomi sehingga orang awam tidak hanya mengerti dan menghargai ilmu pengetahuan tetapi juga dapat menikmatinya dan menghilangkan rasa takut terhadapnya dengan berinteraksi secara terus-menerus.

■ TASK 4

Source Language
Paragraph 4 On November 21, 1877, Thomas A. Edison developed the phonograph -- a remarkable feat of engineering. Then, he directed his assistant (the technologist) to improve the device further by removing harmonics from the sound output.
Target Language
Paragraf 4 Pada tanggal 12 November 1877, Thomas A. Edison mengembangkan fonograf – sebuah prestasi perekayasaan yang luar biasa. Kemudian, ia mengarahkan asistennya (pakar teknologi) untuk lebih lanjut meningkatkan alat tersebut dengan menyingkirkan harmonika dari output bunyi.

■ TASK 5

Source Language
Paragraph 5 **The TASK of engineering** The engineer must identify and understand the relevant constraints in order to produce a successful design. Constraints include available resources, physical or technical limitations, flexibility for future modifications and additions, and other factors such as requirements for cost, manufacturability, serviceability, and marketing and aesthetic, social, or ethic considerations. By understanding the constraints, engineers deduce specifications for the limits

within which an object or system may be produced and operated. Engineering is therefore influenced by many considerations.
Target Language
Paragraf 5 **Tugas Perekayasaan** Insinyur harus mengidentifikasi dan memahami kendala-kendala yang relevan dalam menghasilkan sebuah desain yang sukses. Kendala-kendala tersebut meliputi sumber daya yang ada, keterbatasan-keterbatasan fisik dan teknis, fleksibilitas modifikasi dan tambahan pada masa depan, dan faktor-faktor lain, seperti kebutuhan biaya, manufakturabilitas, kemampuan servis, pemasaran dan perimbangan- perimbangan keindahan, sosial atau etika. Dengan memahami kendala-kendala tersebut, para insinyur membuat spesifikasi berdasarkan keterbatasan tersebut. Dengan keterbatasan tersebut sebuah objek atau sistem mungkin saja dihasilkan dan dioperasikan. Oleh karena itu, perekayasaan dipengaruhi oleh banyak pertimbangan.

■ **TASK 6**

Source Language
Paragraph 6 **Problem solving** Engineers use their knowledge of science and mathematics, and appropriate experience, to find suitable solutions to a problem. Creating an appropriate mathematical model of a problem allows them to analyze it (perhaps, but exceptionally, definitively), and to test potential solutions. If multiple reasonable solutions exist, engineers evaluate the different design choices on their merits and choose the solution that best meets the requirements.
Target Language
Paragraf 6 **Pemecahan Masalah** Para insinyur menggunakan pengetahuan mereka tentang ilmu pengetahuan dan matematika serta pengalaman yang relevan untuk menemukan solusi yang tepat terhadap sebuah masalah. Pembuatan sebuah model matematis sebuah masalah yang tepat memungkinkan mereka untuk menganalisisnya (mungkin, tetapi luar biasa, pasti), dan untuk menguji solusi-solusi yang potensial. Jika terdapat solusi ganda yang ada dan yang masuk akal, para insinyur mengevaluasi pilihan desain yang berbeda mengenai kehebatannya dan memilih solusi yang sangat sesuai dengan kebutuhan.

■ TASK 7

Source Language
Paragraph 7 Engineers typically attempt to predict how well their designs will perform to their specifications prior to full-scale production. They use, among other things: prototypes, scale models, simulations, destructive tests, and stress tests. Testing ensures that products will perform as expected. Engineers as professionals take seriously their responsibility to produce designs that will perform as expected and will not cause unintended harm to the public at large. Engineers typically include a factor of safety in their designs to reduce the risk of unexpected failure.
Target Language
Paragraf 7 Para insinyur secara khusus mencoba memperkirakan seberapa bagus desain mereka dalam memenuhi spesifikasi sebelum produksi dalam skala besar. Mereka menggunakan prototipe, model berskala, simulasi, tes penghancuran, dan tes tekanan, di samping benda yang lain. Pengetesan memastikan bahwa produk akan mempunyai kinerja seperti yang diharapkan. Para insinyur seperti halnya para profesional memiliki tanggung jawab yang serius dalam membuat desain yang akan berkinerja seperti yang diharapkan dan tidak akan menyebabkan kerugian yang tidak diharapkan terhadap masyarakat secara luas. Para insinyur secara khusus memasukkan sebuah faktor keselamatan dalam desain mereka guna mengurangi kegagalan yang tidak diharapkan.

■ TASK 8

Source Language
Paragraph 8 **Use of computers** Computers, and design software, play an increasingly important role. Using computer aided design (CAD) software, engineers are able to capture more information about their designs. The computer can automatically translate some models to instructions suitable for automatic machinery (e.g., CNC) to fabricate (part of) a design. The computer also allows increased reuse of previously developed designs by presenting an engineer with a library of predefined parts ready to be used in designs.

Target Language
Paragraf 8 **Penggunaan Komputer** Komputer dan perangkat desain memainkan sebuah peran yang semakin penting. Dengan menggunakan perangkat desain berbantuan komputer (*computer aided design/CAD*), para insinyur mampu menangkap lebih banyak informasi tentang desain mereka. Komputer tersebut secara otomatis dapat menerjemahkan beberapa model ke dalam instruksi-instruksi yang sesuai untuk mesin otomatis (misalnya CNC) untuk membuat sebuah (atau bagian dari) desain. Komputer tersebut juga memungkinkan digunakannya kembali desain-desain yang dikembangkan sebelumnya dengan menyediakan sebuah perpustakaan untuk seorang insinyur yang berisi objek-objek yang siap digunakan dalam desain.

■ TASK 9

Source Language
Paragraph 9 Additionally, engineers make use of a variety of circuit schematics software to aid in the creation of a circuit designs that perform an electronic TASK when used for a printed circuit board (PCB) or a computer chip.
Target Language
Paragraf 9 Di samping itu, para insinyur memanfaatkan berbagai perangkat lunak skematis sirkit (*circuit schematics software*) guna membantu dalam pembuatan sebuah desain sirkit yang mampu melaksanakan sebuah tugas elektronik bila digunakan untuk membuat sebuah board sirkit cetak (*printed circuit board/PCB*) atau sebuah chip komputer.

■ TASK 10

Source Language
Paragraph 10 **Etymology** It is a myth that *engineer* originated to describe those who built engines. In fact, the words *engine* and *engineer* (as well as *ingenious*) developed in parallel from the Latin root *ingeniosus*, meaning ‘skilled’. An engineer is thus a clever, practical, problem solver. The spelling of *engineer* was later influenced by back-formation from *engine*. The term later evolved to include all fields where the skills of application of the scientific method are used. In some other languages, such as Arabic, the word for “engineering” also means “geometry”.

Target Language
Paragraf 10 **Etimologi** Pada awalnya, (tugas) insinyur untuk menjelaskan mereka yang membuat mesin adalah sebuah mitos. Sesungguhnya, kata *engine* dan *engineer* (serta *ingenious*) berkembang secara paralel dari akar kata bahasa Latin *ingeniosus*, yang berarti 'keterampilan'. Oleh karena itu, seorang insinyur adalah seorang yang mampu menyelesaikan masalah secara praktis dan cerdas. Ejaan kata *engineer* kemudian dipengaruhi oleh proses pembentukan kata kembali (*back-formation*) dari kata *engine*. Istilah tersebut kemudian berkembang yang meliputi semua bidang di mana keterampilan dalam menerapkan metode ilmiah digunakan. Dalam beberapa bahasa seperti bahasa Arab, kata untuk "engineering" juga berarti "geometri".

■ TASK 11

Source Language
Paragraph 11 **Connections to other disciplines** Science attempts to explain newly observed and unexplained phenomena, often creating mathematical models of observed phenomena. Technology and engineering are attempts at practical application of knowledge (often from science). Scientists work on science; engineers work on technology. However, there is often an overlap between science and engineering. It is not uncommon for scientists to become involved in the practical application of their discoveries; thereby becoming, for the moment, engineers. Conversely, in the process of developing technology engineers sometimes find themselves exploring new phenomena, thus becoming, for the moment, scientists.
Target Language
Paragraf 11 **Kaitan dengan Disiplin Ilmu yang Lain** Sains mencoba menjelaskan fenomena yang baru diamati dan yang tidak bisa dijelaskan. Hal ini sering kali dilakukan dengan menciptakan model matematis dari fenomena yang sedang diamati. Teknologi dan perekayasaan merupakan upaya-upaya aplikasi praktis dari pengetahuan (sering kali dari ilmu pengetahuan). Para ilmuwan mempelajari ilmu pengetahuan; para insinyur mempelajari tekonologi. Namun, sering kali terdapat tumpang-tindih antara ilmu pengetahuan dan perekayasaan. Menjadi terlibat dalam aplikasi praktis dari hasil penemuan mereka merupakan hal yang umum bagi para ilmuwan. Oleh karena itu, buat sementara, mereka menjadi insinyur.

Sebaliknya, dalam proses pengembangan teknologi, kadang-kadang para insinyur menyadari bahwa mereka sedang melakukan eksplorasi terhadap fenomena baru, sehingga buat sementara mereka menjadi ilmuwan.

SUMMARY

Dalam Kegiatan Belajar 2 di atas Anda telah belajar tentang beberapa hal penting sebagai berikut.

1. Analisis terhadap TSu merupakan tahap awal dalam kegiatan penerjemahan untuk mengetahui fungsi TSu atau tujuan komunikasi. Sebuah teks mungkin saja memiliki lebih dari satu fungsi atau tujuan komunikasi.
2. Pengetahuan tentang aplikasi penerjemahan pola kolokasi dalam TSu dan Tsa sangat diperlukan oleh penerjemah.
3. Kemampuan dalam polisemi dan padanannya yang tepat dalam TSa sangat dibutuhkan dari seorang penerjemah sebab terkait dengan pentingnya penafsiran atau interpretasi yang tepat terhadap maksud penulis dalam TSu.

FORMATIVE TEST 2

Now, translate each of the following extract into Bahasa Indonesia as accurately, clearly and naturally as possible. Compare your answers with the key to Formative Test 2.

■ TASK 1

Source Language
Paragraph 12 There are also close connections between the workings of engineers and artists; they are direct in some fields, for example, architecture and industrial design, and indirect in others. Artistic and engineering creativity may be fundamentally connected.
Target Language

Key to Formative Test

Formative Test 1

■ TASK 1

Source Language
Paragraph 12 The number of each item required to make one of the next-higher level item is also shown in the product structure. Figure 3.1 shows that three of subassembly 1 are required to make one unit of the product and that two sub-subassembly 1s are needed for each subassembly 1. This means that six units of sub-subassembly 1 are needed to make the product. These data are used when determining the number of each item that will be required to meet the sales forecast for our product.
Target Language
Paragraf 12 Jumlah setiap produk yang diperlukan untuk membuat satu produk pada level berikutnya yang lebih tinggi juga ditunjukkan dalam struktur produk tersebut. Bagan 3.1 menunjukkan bahwa tiga subperakitan 1 diperlukan untuk membuat satu unit produk, dan bahwa dua sub-subperakitan 1s diperlukan untuk setiap subperakitan 1. Ini berarti bahwa enam unit sub-subperakitan 1 dibutuhkan untuk membuat produk tersebut. Data ini digunakan pada waktu menentukan jumlah setiap produk yang diperlukan untuk memenuhi perkiraan penjualan dari produk kami.

Penjelasan:

Mengingat jenis TSu di atas termasuk ke dalam jenis teks khusus yang menggambarkan tentang sebuah proses, penggunaan bentuk pasif lebih dominan sehingga beberapa verba, seperti ’memerlukan’, ’menunjukkan’, ’membutuhkan’, ’menggunakan’ harus diubah menjadi bentuk pasif, seperti ’diperlukan’, ’ditunjukkan’, ’dibutuhkan’, ’digunakan’. Pemilihan pronomina ’kami’ dalam TSa di atas terasa lebih tepat daripada ’kita’.

Formative Test 2

■ **TASK 1**

Source Language
Paragraph 12 There are also close connections between the workings of engineers and artists; they are direct in some fields, for example, architecture and industrial design, and indirect in others. Artistic and engineering creativity may be fundamentally connected.
Target Language
Paragraf 12 Juga terdapat kaitan yang dekat antara pekerjaan insinyur dan seniman. Dalam beberapa bidang, misalnya arsitektur dan desain industri, kaitan mereka adalah langsung, dan tidak langsung dalam bidang yang lain. Kreativitas artistik dan perekayasaan secara mendasar mungkin berhubungan.

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