

## **SAR Executive Summary for the Internal Quality Assessment at Program Level Department of Metallurgy and Materials Engineering, University of Indonesia**

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Department of Metallurgy was established as a study program under Faculty of Engineering, University of Indonesia in 1965. Since November 5<sup>th</sup> 2002 the name officially changed to Department of Metallurgy and Materials Engineering. During its development stage, the Department of Metallurgy and Materials Engineering has achieved several milestones, such as:

- ❑ Grade A in Accreditation for Undergraduate Program from National Accreditation Board, Ministry of National Education (Year 1997 and 2007).
- ❑ Establishment of master (1995) and doctoral (2008) programs.
- ❑ Establishment of "Dual-degree" International Program with Monash University (2003), University of Queensland and Loughborough University, UK (2010).
- ❑ Grants awarded by the Government of Republic Indonesia for:
  - Internal improvement for non-metallic field competence - PHK-A4 (2004)
  - Improvement for external and regional competence – PHK-A2 (2004-2006)
  - Internationalization of academic and research activities in information technology, energy and nanomaterials – PHKI (2010-2013)
- ❑ Establishment of Center for Materials Processings and Failure Analysis (CMPFA), a venture unit to support the materials engineering industry and community (2001).
- ❑ Intensive academic and research collaborations with international institutions, such as Monash University (Australia), University of Queensland (Australia), Loughborough University (UK), Kagoshima University (Japan), Nanyang Technological University (Singapore), Yeungnam University and KITECH (Korea) (since 2006).
- ❑ ISO 17025 accreditation process for Materials Testing Laboratory (2010)

Within these excellent progress and achievements, however, Department of Metallurgy and Materials Engineering still needs to do even more. The journey towards a world-class of metallurgy and materials research and education center is a long and arduous one that the department needs to push even harder to make a large step-change enhancements on a broad base of continual incremental improvements. This Self Assessment Report is one of our big leaps in beginning the journey, and thus Department of Metallurgy and Materials Engineering is very grateful has been chosen by University of Indonesia as one of the departments to be assessed by ASEAN University Network Quality Assurance (AUN-QA).

Considering the high demand to produce qualified graduates and following current trends toward the global competition, and as a part of national education system, which has the objective to develop the intellectual life of the nation by conducting three main activities known as tridharma, the department is also committed to carry out higher level educations, to conduct scientific research, and to provide community services. To achieve the three duties endowed by the national education system, the department put its vision and mission in line with that vision and mission of Faculty of Engineering and University of Indonesia, i.e. to

become a metallurgy and materials engineering center of excellence in education, research, and community service with the vision to produce high quality graduates with strong academic basis and a comprehensive ability in metallurgy and materials engineering and technological processes and are capable of playing an active and dynamic roles in national, regional, and international community.

To achieve such a vision and mission, Department of Metallurgy and Materials Engineering needs to have goals and objectives/expected learning outcomes (ELO), i.e. to produce practicing metallurgy and materials engineers who:

1. are technically proficient and capable of applying basic science and knowledge in metallurgy and materials engineering activities.
2. are able to work in multidisciplinary teams and conducting research, analysis, and data interpretation in metallurgy and materials engineering field.
3. are able to communicate their ideas effectively within technical community and to the general public.
4. will take their places in society as responsible citizens and are aware of technical, professional, and ethical challenges.
5. have the ability and appreciation for lifelong scientific inquiry, learning and creativity.

These ELO, which would be expected to develop during the students' schooling period, would be facilitated by generic and specific knowledge obtained through curriculum specifically designed to accommodate the wide spectrum of metallurgy and materials engineering knowledge and typical industrial needs.

The curriculum in Metallurgy and Materials Engineering Study Program is structured to address problems and knowledge associated with the metallurgy and design of materials and materials processing to meet the specific needs for a variety of industries. Emphasis is on the basic sciences and principles of engineering with applications of these principles to metallurgy and materials behaviors. Basically, the curriculum in the department of Metallurgy and Materials Engineering consists of minimum 144 credit points distributed into 8 semesters. These 144 credit points are divided into 12 credits of general courses, 31 credits of basic engineering courses, 52 credits of basic skills (basic metallurgy and materials engineering courses), 32 credits of skills (in-depth metallurgy and materials engineering courses), and 10 credits of elective courses. In addition to these courses, there would be also an internship, seminar and thesis that bear a total of 7 credits.

As of August 2010, the department has graduated totally 1,700 graduates with a degree in bachelor of engineering, 50 graduates with a degree in master of engineering, and 8 graduates with a doctoral degree. At the beginning of first semester of 2010/2011, the department has actively 392 undergraduate students, 49 master students, and 16 doctoral students. At the same time, Department of Metallurgy and Materials Engineering has 27 permanent lecturers, comprise of 16 with doctoral degrees and 11 masters. This gives the ratio of about 3:2 for doctoral and master degree. Most of the lecturers have been serving for more than 15 years. From 11 of lecturers with master degree, 9 lecturers are pursuing doctoral degree both at domestic and foreign universities. There are 4 lecturers who are recruited with the status of university employee.

There are 16 supporting staff in which 5 are focused in the academic administration. Most of the administrative staffs hold bachelor degree in respective field. In addition to this administrative supporting staffs, there are also supporting staffs for library, technician, and networking staffs. The number of engineering library staff is 27; 3 staff hold bachelor degree in Library Science. At the university level, the library is run by 8 staff comprising 1 librarian, and 7 administrative staff, whereas at the department level there are 3 librarians. The number of library staffs is considered adequate. There are 5 technicians working at eight laboratories. Three people are high school graduates and the other two are university/diploma graduates. To maintain the computer networking, the department has assigned one skilled staff as information and technology staffs, whilst the Faculty of Engineering network is managed by a Computer Center (UPKD) with 10 staffs.

Every academic staff in Department of Metallurgy and Materials Engineering belongs to a scientific peer group. A peer group is formed among lecturers according to their academic competency, interest and research records. The three peer groups within the department are: (1) Materials Manufacturing Processes, (2) Advanced Materials, and (3) Chemical Materials and Corrosions. In the event that an academic staff is needed, the recruitment would be initiated by a proposal from Peer Group based on the need. Having known the needs of expertise of new academic staff, the department then put a job vacancy in newspapers or other information networks to recruit qualified staffs. General qualifications for academic staffs usually include academic degree, scientific interests, experience, capability to conduct research works and also teaching competency. All those criteria will be assessed through written test as well as interviews. Career, retirement, workload, time allocation and remuneration of the lecturers are regulated according to the university and Department of National Education policy.

In Faculty of Engineering, teaching rooms are managed and shared among 7 departments. Teaching rooms are located within 3 buildings, i.e. Main Lecture Building (K), Computer Building (GK), and Library Building (A). The size of a classroom varies from small rooms of 29 m<sup>2</sup> with the capacity of 17 students and large rooms of 395 m<sup>2</sup> with the capacity of 150 students. The Building K is fully dedicated for classrooms. The Building GK, which has 3-storey, is partly used for teaching; the first floor is used for Faculty Administration Center, the second floor is used for Computer Center, whereas the third floor, which has 7 classrooms, is dedicated for classrooms. Building A is a 6-storey building in which the 4<sup>th</sup> and 5<sup>th</sup> floors are used for library while the rest are used for classrooms. In total, there are 46 classrooms with total space of 3.409 m<sup>2</sup>. Standard equipments in each classroom are LCD projector, overhead, black board/white board, computer and all are furnished with air conditions. In addition to these classrooms, there are 4 seminar rooms; room K301 with the capacity of 150 people, Chevron Room for 100 people, BRI Room for 150 people, and AHM room for 150 people. For the academic year of 2007/2008, the rate of utilization of the classrooms in the morning session is approximately 95% and the ratio of classroom area to the student body is about 0.67 m<sup>2</sup>/student. For the term 1 in academic year of 2007/2008, totally 2292 engineering students were enrolled. For the next year to come, another 5-storey building will be built fully dedicated for classrooms, studios, and seminar room.

For laboratories, currently there are 8 groups present in Metallurgy and Materials Engineering Department. These laboratories are utilized not only for academic purposes as teaching

laboratories, but also to support research and some other activities, especially for the industrial cooperation purposes. In this case, the Department of Metallurgy and Materials Engineering offers some mutually beneficial cooperation with the industry to utilize and to make optimum use of some department facilities such as laboratory services in the area of education and development and other services.

1. Destructive Test Laboratory
2. Processing Metallurgy Laboratory:
  - a. Metal forming
  - b. Metal casting/foundry
  - c. Welding
3. Chemical Metallurgy Laboratory
4. Advanced Materials Laboratory
5. Corrosion and Metal Protection Laboratory
6. Metallography and Heat Surface Treatment Laboratory
7. Non-destructive Test Laboratory
8. Mechanical Workshop and Sample Preparation Room

Center for Materials Processing and Failure Analysis (CMPFA), established in 2001, is designed as an academic venture unit as well as a gate for public services, serving materials engineering industries and institutions. CMPFA provide various services including materials testing, research analysis, consultancy and training course, supported by laboratories and qualified staffs of the department.

By the end of 2009, several key achievements have been made, such as:

- More than 1500 contracts work orders have been made yearly, involving with more than 150 small and big institutions in Indonesia.
- Generate horizontal funding of more than Rp. 2 billions/year allocated to support the departmental activities, facilities, research equipment and maintenance.
- More than 75% of total contract is for material testing; 10-15% for failure analysis projects and the rest for training and knowledge upgrading activities.

CMPFA is also contributing in academic activities, providing a platform for lecturers and students especially in obtaining topics for final projects (skripsi/thesis), which come directly from industrial needs. For final year students and fresh graduates, CMPFA is also providing a place for job training before entering the job market. Currently, CMPFA is in accreditation process for the improvement in Materials Testing Laboratory, i.e. ISO 17025 (2010).

The Department of Metallurgy and Materials Engineering always tries to assure the quality of teaching and learning process since its establishment especially in order to achieve the department's vision and missions. This is also stressed by the awareness of the importance of quality assurance to the outcomes, which are the goals of the department. Quality assurance in academic processes involves the quality of curriculum design, human resources management, monitoring of teaching and learning process, and evaluation system of the students. In addition to the assurance unit, the quality assurance mechanism at the Department of Metallurgy and

Materials Engineering is also implemented both internally and externally. Internal evaluation is carried out by the department itself whereas external evaluation is conducted by recognized national and international accreditation bodies.

In an effort for the internationalization process, a number of mutual collaborations with international institutions have been setup by Department of Metallurgy and Materials Engineering, such as:

- Dual-degree international undergraduate programs with Queensland University of Technology, Monash University, University of Queensland and Loughborough University.
- Academic exchange and joint research programs with Yeungnam University (Korea), Nanyang Technological University (Singapore) and Kagoshima University (Japan).
- Adjunct professorship for Prof. Kim Kyoo-Ho (Solar Cells - Yeungnam), Prof. Freddy Boey (Biomaterials - Nanyang) and Prof. Kozo Obara (Nanomaterials - Kagoshima) to strengthen the collaboration and focusing advanced research area.
- Applied research program with Korea Institute of Industrial Technology (*KITECH*), followed by establishment of Korea-Indonesia Casting Center at University of Indonesia.
- Joint Research in collaboration with Consortium for Clean Coal Utilization (USA).

In terms of graduates, the main performance indicators are Grade Point Average (GPA), length of study, and waiting time to get the first job. The satisfactory level for GPA is 3.00, which is the common requirement by the industry for their qualification in the recruitment of new staff. The department also makes an effort to increase the number of students with GPA more than 3.00. This level has been achieved since academic year 2005/2006. The average GPA of last academic year (2008/2009) was 3.13, increased from 2.90 for the year 2002/2003 and 3.04 in 2005/2006. The department also makes an effort to increase and maintain the number of students with GPA more than 3.00 through continuous improvement of curriculum, competency of academic staffs, improvement of teaching processes and supporting facilities. Pass rate average during the last five years is about 93.9% with the grade performance average of students is around 2.75. This rate means that in general approximately 6% students failed in certain subjects.

The average time to graduate for the last five years is between 9 to 10 semesters. It is expected that 9 semesters would be the closest target to be achieved. The shortest period is 8.69 semesters which occurred in 2004-2005. However, there is a trend of decreasing study period close to the target of 9 semesters. Graduation time to degree in the past 3 years (2005-2007) is 9.3 semesters, compared to that of 3 previous years (2002-2004) and (1998-2001) with an average time to degree of 9.51 semesters and 10.58 semesters. One of the factors is the change of allowable study period shorten from 7.5 years to 6 years.

As part of continuous development and improvement process in the academic quality, the Department of Metallurgy and Materials Engineering has carried out some efforts to increase stakeholder's satisfaction through some activities as part of both University's policies and Department's policies.

The main challenge faced by Department of Metallurgy and Materials Engineering is to maintain continuous improvement of quality in the situations where the governments' financial supports are being decreased. Therefore, the management of funding would be based on the optimum utilization of all academic and non-academic resources. Considering the high competency and well reputation of the academic staff, the current activities are emphasized on the improvement of competitive advantage to support the sustainable growth through completion of management and organization transformation and improvement of the effectiveness and efficiency of soft resources and facilities utilization. Based on those focuses, then the development of education is carried out with the orientation of optimizing the opportunities and domestic market through improvement of partnerships and internationalization of Metallurgy and Materials Engineering.