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# Bullet-in



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## Master Development Plan



# GOVERNMENT ARSENAL DEFENSE INDUSTRIAL ESTATE

CAMP GENERAL ANTONIO LUNA

## EDITORIAL

### Something great at forty-eight....

With the Government Arsenal (GA) going on forty-eight (48) years in existence this year, it is soon realizing the transformation into a Government Arsenal Defense Industrial Estate (GADIE) with the recent approval of its Master Development Plan (MDP) by the Secretary of National Defense.

Said MDP is necessary for the proper zoning of the 340-hectare defense industrial estate in order to identify appropriate locations for the various defense industries that shall be established there, with different modes of investment like Public-Private Partnership, BOT, JV, etc. In line with this project is the conversion of said estate into an Economic Processing Zone in order to avail of tax and other business incentives. These initiatives will keep the ball rolling and by 2016, defense industries may start sprawling up in the area.

All these efforts are geared towards a genuine support to revive the Self-Reliant Defense Posture (SRDP) program of the government.

## Director's Corner



After the painstaking efforts of GA's abled staff and executives and collaborative linkages with concerned government institutions, the GA Master Development Plan (MDP) was finally approved by the Secretary of National Defense. This has a major effect on our future, to ensure that we will have direction on where we want to go and ensure also that our legal mandate under RA 1884 and the AFP Modernization Act will be achieved. The MDP is the last step before GA becomes an Economic Processing Zone. Complementing this is the recent approval also of the Environmental Compliance Certificate (ECC) as supporting document for said economic zone to be worked out with the PEZA.

This year, GA's thrust is also geared towards construction of more needed facilities such as raw materials and finished products warehouses, and enhancement of ballistics and laboratory facilities to be able to cope with the increasing production and capabilities upgrade.

When I came to the Arsenal, the way I see it, it is not really an Arsenal then, but only an ammunition plant. It should also be engaged in manufacture of weapons. Besides higher small arms ammunition production, our goal is eventual in-house manufacture of weapons, which presently, we are sustaining the capability to produce the parts through the Small Arms Repair and Upgrade Unit (SARUU).

Defense Self-reliance and capability upgrade should be the agenda of the day.

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# ESTABLISHMENT OF GOVERNMENT ARSENAL DEFENSE INDUSTRIAL ESTATE

The Master Development Plan (MDP) for the Government Arsenal Defense Industrial Estate (GADIE) was finally approved by Secretary Voltaire T Gazmin of the Department of National Defense (DND), while the Environmental Compliance Certificate (ECC) for the MDP was already granted and issued on April 24, 2015.

The MDP is needed to establish the proper zoning of infrastructures to be located in the GA estate, while the ECC is a requirement of the GADIE application for issuance of presidential proclamation as Special Economic Zone. Said ECC shall cover the development of the GADIE Project (Group II-E.15) covering a total land area of 340 hectares.

The GADIE will be developed to serve as the center for the manufacture of various products to support the country's defense and security requirements. Any excess in the local requirements will be sold in the global market. This project shall include appropriate locations, road network and various infrastructures that would be constructed, relative to the manufacture of defense materials to include company housing area and attendant facilities.

As recommended by the private Consultant and in consideration of the existing GA facilities and the continuous operation thereof, the MDP was prepared to satisfy the identified demands. The strategy includes the delineation of the development into phase separating the new development areas from the improvement and expansion areas to avoid the mix-up in projects and management. The new development which will be referred to as Phase 1, will be a prospect for a Public-Private Partnership (PPP) undertaking, while the improvement and expansion of the existing GA referred to as Phase 2, will definitely be dependent on the programs and budget passed by the government, the GA being a line bureau under the DND.

There will be two major zoning classifications to be applied at both phases – the Non-Explosive Zone and the Explosive Zone, where the first classification refers to the location for defense related industries that are not in the manufacture of hazardous products, including the Administration and Housing Zones; and the second one refers to defense-related industries which are hazardous in nature, as well as munitions storage facilities and the like which require adequate spaces and buffers.

Following are the proposed defense industries:

## Phase 1. Development of Defense Industrial Estate

**Administration Zone.** New GA Administration Building, Engineering Office, COA Office, Multi-purpose Hall, DIE Administration Building, Entry Processing and Security Area, Hotel and Service Apartment, Convenience Store, Commercial Spaces, New Emergency Hospital and Sports Complex

**Housing Zone.** Executive Housing, and the Staff Housing of 30 hectares total area as per Presidential Proclamation No. 371. (The latter is excluded from the MDP)

**Non-Explosive Zone.** Rifle Manufacturing Plant, Brass Rolling Mill, KIA Motor Plant, etc.

**Explosive Zone.** Manufacture of Medium and High Caliber Ammunition, Melt Loading Facility of PAF, and other projects.

## Phase 2. Improvement and Expansion of Existing GA Facilities –

The existing GA will be retained as a purely Government-operated and managed facility, with its improvement and expansion of facilities dependent on the needs and priorities of the AFP/PNP and as per programs and budget allocation by the National Government.

**Non-Explosive Zone.** Leadwire Manufacturing Plant, Case & Bullet Division Raw Material Warehouse and Planning & Logistics Division Warehouse.

**Explosive Zone.** Primer Loading Plant, TNR Manufacturing Plant, additional cartridge magazines, 40mm and other medium caliber ammo manufacturing plant, ball powder manufacturing plant, NC and NG manufacturing plants, melt loading facility of PAF, and others.

The other areas that are part of Phase 1 are the existing staff housing, Elitool Plant areas, Hospital, Assembly (Social) Hall and school buildings.

The improvement and expansion of the existing GA facilities (Phase 2) will be set at a time when the Phase 1 developments have been substantially completed, but GA may also opt to do this simultaneously.

# SMALL ARMS REPAIR AND UPGRADE UNIT

## *Towards continued capability building*

It's been three and a half years since the creation of the Small Arms Repair and Upgrade Unit (SARUU) on January 24, 2012, and it has gained remarkable progress in the production of small arms. Part of the initiatives of the GA's modernization program is the support to the Self-Reliant Defense Posture (SRDP) program of the government, in addition to the full realization of the agency's mission and mandate.

SARUU's mission is to repair, refurbish, upgrade and enhance (RRUE) small arms firearms of the Armed Forces of the Philippines (AFP) and other law enforcement agencies. At present, 24 personnel composed of 22 civilians and 2 active military personnel are manning the unit.

The strength of SARUU lies in the clarity of its vision and its willingness to adapt to the needs of the AFP. The sense of satisfaction felt by SARUU personnel with every accomplishment is balanced by the realization that without the support of the Director Arsenal MGen Jonathan C Martir AFP (Ret) and hard work of SARUU personnel, this unit would be nothing.

## **HOW SARUU STARTED**

The unit started with a manning of thirteen (13) personnel composed of two (2) engineers, one (1) active military officer, three (3) regular personnel and seven (7) contract of service (COS) personnel. SARUU table of organization (TO) has a proposed manning of 43 personnel, and is still being filled up.



Collective efforts, skills, knowledge, training, vast experience, research and studies and challenging day-to-day activities served as the guiding path in accomplishing SARUU's goals and mandates. Aside from the compilations of Technical Manuals (TM), Field Manuals (FM), Part Manuals (PM), the unit is equipped with three (3) Armorer's Tool Kits, six (6) table vise equipment and one (1) grinding machine. The unit also has the Technical Data Package (TDP) from COLT Industries, Inc., which serves as its bible in the repair, refurbishment, upgrade and enhancement of small arms firearms. GA's existing Ballistics and quality assurance laboratories, machine shop and heat treatment facilities are utilized for test and evaluation (TE). Initial out-sourcing of parts and services such as anodizing, from different local defense industries is also being done to address the current

limitations.

Part of SARUU's success rests on strengthening the bonds between GA's mission / vision to every military and law enforcement's needs. SARUU was borne to navigate through the challenges of the past three (3) years of its existence and such will continue to be a guide in its current activities and in the years ahead.

## **ACCOMPLISHMENTS**

SARUU's continuous venture into weapons technologies, especially in small arms RRUE, paved the way for the following accomplishments:

- Refurbishment of 1,740 units M16A1 for the AFP;
- Repair and upgrade of 21 units M16A1 and 32 units M1911A1 Cal.45 for the DISG; 170 units M16A1 for the Philippine Marine Corps and 70 units M1911A1 for the Philippine Navy;
- Repair of 50 units of Squad Automatic Weapon (SAW) and Light Machine Gun (LMG) for the different units of the AFP.

SARUU's stories of accomplishment continues in the succeeding words and images. Though these will never fully capture SARUU's sense of pride in effectively responding to the needs of the AFP, perhaps through this write up, it will



somehow describe the sense of gratification the personnel of SARUU feel whenever they reach milestone of achievements.

SARUU, in its continuous research to upgrade

weapons, Mil-Specs Type III Hard Coat Anodize, Manganese Phosphate and Cerakote Finish are now being undertaken. These surface finishing processes provide superior wear resistance, chemical resistance and excellent corrosion protection from wide variety of adverse



environmental conditions. In addition, they enhance a number of physical performance properties including abrasion resistance, impact scratch resistance and maximum hardness.

It is worthy to note that SARUU utilizes fabricated parts in the RRUE of small arms firearms. M16A1 upper and lower receivers, muzzle brake, gas block, tactical latches, enhanced trigger guard, cycle reducers,



self-locking screws for butt stocks, sling adapter, Novak sights, Cal .45M1911 slide and frame, are but a few of the parts fabricated in the GA-SARUU machine shop to continuously best address the needs in the assembly of these firearms for the AFP.

Boresight, hardness tester, thickness tester, universal weapon fixture, laser marking, engraver, metal analyzer, eddy flow current, etc., are but a few of the instruments and equipment to support the GA capabilities. Eventually, capability for barrel manufacture will soon be realized, with the continuous equipment acquisition and training of personnel.



Another milestone of SARUU is the turn-over of 100 units of Pistol, Cal.45, M1911A1 of the Philippine Navy, Philippine Marine Corps and Defense Intelligence and Security Group (DISG) that have undergone refurbishment and enhancement. Also, sixteen (16) units Carbine 5.56mm M4 equipped with EoTech Holographic Weapon Sights were turned-over to DISG.



With continuous Research and Development (R & D) on weapons, the following were developed:

- 10" Musang (7.62 x 37mm) Personal Defense Weapon (PDW) based on M4/M16 platform and cycles full auto with 7.62 x 37mm Musang subsonic and supersonic rounds. Its design objectives include increased lethality over 9mm and 5.56mm, improved controllability, reduced size and weight and a maximum effective range of 300 meters.



- Special Purpose Rifle (SPR) with a 5.56mm variant rifle, an 18-inch free-floated Bull barrel; 1:7 Right-Hand twist; air gauge match barrel; standard A2 flash suppressor; flat top upper receiver; Picatinny rail; adjustable buttstock with cheek piece; and with semi-automatic fire selector. The firearm meets the requirement of a 5.56mm rifle to engage targets up to 800m with optics.

It depicts the continuing development in the AFP's weapon system



emanating from the 5.56mm Marine Scout Sniper Rifle (MSSR) which was introduced in 1996 and continuously serves as the primary range sniper rifle of the Philippine Marine Corps.

- M14 Designated Marksman Rifle (DMR) / Enhanced Battle Rifle (EBR) are the weapon used by soldiers in the Designated Marksman (DM) role. It fills the gap between a regular infantry man and a sniper (typically being deployed at ranges of 250-500 meters or 270-550 yards). DMRs may have an attached telescopic sight, quickly deployed stabilizing bipod to allow optimized accuracy and low-recoil in temporarily fixed situations or an adjustable stock. EBR's are made with the intention of carrying out both designated marksman and Close Quarters Battle (CQB) roles in combat with chassis system stock made up entirely of lightweight aircraft alloy.



In line with its mandated functions as provided for under Republic Act 1884 Series of 1957, the GA has expanded its capabilities in the manufacture of selected small arms (SA) as well as the conduct of depot-level (Echelon IV) RRUE of these weapons. Associated with these capabilities are GA's continuing R & D and the corresponding Test and Evaluation (TE) of SA to ensure that weapons delivered to the AFP are not only accurate and reliable but are likewise highly specialized to suit the demands and operating environment of the end-users who will actually employ them. In this regard, the production of 400 units GA Carbine 16 inch Mid-length and 40 units Squad Designated Marksman Rifle is intended for issuance to selected AFP Special Operations Forces (SOF) and Scout Rangers, respectively for conduct of field TE.

Furthermore, 1,600 units of combat M16 and M14 rifles of the PNP Special Action Force (SAF) will be for refurbishment of SARUU, as approved by the Secretary of National Defense (SND).

These successes of SARUU are not only a harvest of painstaking accomplishments, but an epitome of how genuine teamwork makes a difference. And more than making for compelling narratives are the successes behind these vividly captured photos, which truly represent GA's "An Accurate Shot to the Future". (by: SARUU & SMO Team)



# GA GOES FOREIGN WEAPONS TRAINING

Republic Act 1884

Long Mountain Outfitters, Henderson, Nevada, USA

(An Act to Establish a Government Arsenal, provide for its Operation and for Other Purposes) and Executive Order Number 292 (Administrative Code of 1987) mandate the creation of the Government Arsenal (GA). Both declare a policy of achieving self-sufficiency in small arms, weapons, ammunitions and other munitions for use of the Armed Forces of the Philippines (AFP).



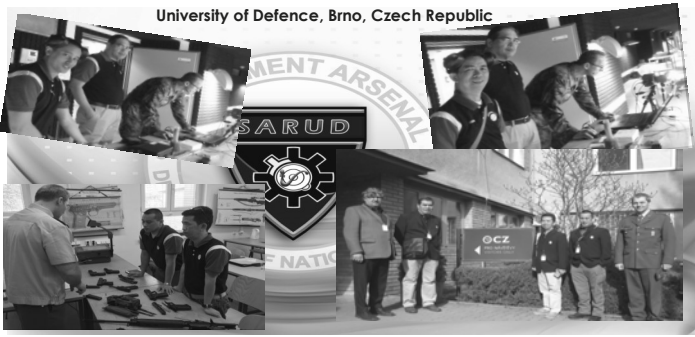
Significantly, the integration and advancement of Presidential Proclamation 371 of 2003 revising the purpose of Camp General Antonio Luna from military to defense industrial, RA 10349 of 2012 (Revised AFP Modernization Act), and EO 303 of 2004 (Sourcing of AFP-PNP Munitions Primarily from the GA) highlight the necessity of a self-reliant defense posture for a modernized armed force within a constantly evolving local, regional and global security scenario. This integration and advancement encompass current GA modernization initiatives and other activities and eventually allows the elevation of the agency's mission and mandate into an expanded role as a diverse defense industry hub.

As provided in the above mandates, the enhancement of self-sufficiency in Philippine defense requirements and advancement of a self-reliant defense posture (SRDP) necessitate the expansion of GA's roles along the spectrum of its various functions. Along this line, the GA is bound to expand its roles beyond that of producing ammunition if it aims to achieve self-sufficiency and self-reliance in defense. It becomes vital at this point of the AFP modernization that the GA directs its capability enhancement and modernization efforts along a path

that is parallel with the AFP.

Consequently, the GA, particularly its Small Arms Repair and Upgrade Unit (SARUU) has already ventured into weapons technologies, especially in small arms repair, refurbishment, upgrade and enhancement (RRUE), weapons training and assembly. The thrust of GA in expanding its operational capability to support the Philippine SRDP program is deemed necessary in such a way that its operational capability enhancement corresponds with its manpower capability building. As a result, it has become a purview in GA management that machineries no matter how technologically advanced shall remain inefficient or underutilized without the hands of well-trained, technically-skilled and highly motivated workforce.

In this regard, the GA has embarked on comprehensive training program based on a precept that high-tech machineries require hands that are technologically proficient and updated. Thus, GA sends-off three (3) batches of deserving SARUU personnel who successfully attended Armorer Courses / Silencer Technology Course and M1911 Gunsmithing Course at the Long Mountain Outfitters (LMO) training facility in Henderson, Nevada, USA. These allowed GA engineers and



operators to repair and upgrade not only rifles and pistols but crew-served and other high-caliber weapons employed by the AFP/PNP/Other Law Enforcement Agencies as well.



1<sup>st</sup> Batch: October 2 – 14, 2014



2<sup>nd</sup> Batch: April 6 – 17, 2015



3<sup>rd</sup> Batch April 27 – May 8, 2015

Another training program attended by SARUU personnel was the Tube/Barrel Weapons Foreign Course at University of Defence in Brno, Czech Republic. As a

background, University of Defence in Brno, Czech Republic is the only military institution of higher education in Czech Republic responsible in forming military officials for the Army of Czech Republic and civilian experts for its national security systems, defense and security industry. It is an accredited military institution under the direct control of the Deputy Minister of Defense for Personnel.

The Tube/Barrel Weapons Course has three main parts: Ammunition and Ballistics, Barrel Weapons Design and Optical Devices and Fire Control Systems. Exposure to this course is indeed an infusing learning experience for SARUU personnel of which they underwent discussions / practical exercises using computer laboratories, simulator, ballistics laboratories, firing range and packaged visit to prominent defense industries like Sellier and Bellot (SB) Ammunition Plant, Ceska Zbrojovka A.S. (CZ) Firearms Manufacturer, Meopta (optics) and Prototypa (ballistic equipment) Company.



Together with the Faculty of Military Technology in University of Defence, Brno, Czech Republic

These are continuous efforts and collaboration of GA with other foreign countries in exchanging ideas and information, techniques and procedures in the small arms repair and upgrade. These technical training will apparently empower the GA-SARUU to flexibly conform to the changing requirements of the operating environment defined by the primary customer, the Armed Forces of the Philippines (AFP) to perform well in accomplishing its mission. (by: SARUU & SMO Team)

# MODERNIZED GA QC TESTING FACILITIES FOR PRECISION AND RELIABILITY

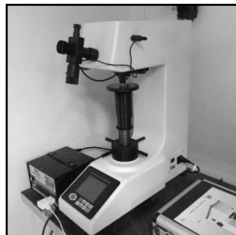
The GA being an ISO 9001:2008 - certified for its Quality Management System (QMS) in the manufacture of GA 556100 ammunition is ardent to propel higher and achieve the stature of an ultra-modernized Arsenal. This pursuit includes not only facilities and equipment for ammunition manufacture but also encompasses upgrading of its testing capabilities. In adherence to the Quality Assurance Division's (QAD) Quality Policy of providing reliable and effective quality inspection services, the GA is continuously finding ways and means of acquiring state-of-the-art precision test equipment and instruments.

Testing at the Metrology Laboratory includes acceptance inspection of tools and dies as well as calibration of in-process and acceptance gages. These functions are carried out with the use of not only reliable dimensional measuring devices but also a tandem of seasoned but still dependable instruments and upgraded models. The Metrology Laboratory acquired new units of hardness testers and toolmaker's microscope. **Mitutoyo Toolmaker's Microscope** is used for the determination of profile and dimensions of finished tools and dies. Old units of Vickers and Rockwell hardness testers are capable of hardness testing of metals / alloys only at a maximum of 20 kg and 40 kg loads, respectively. In comparison, the new **HSV-20 Shimadzu Vickers Hardness Tester** and **FR-3e Rockwell Hardness Tester** have a 50 kg and 150 kg load capacity. Indentation hardness measures the resistance of a sample to material deformation due to a constant compression load from a sharp object. Hardness specification is very important for metallic raw materials for ammunition manufacture and toolings because these items are subjected to pressure and mechanical forces during operation and processing. Decreased tool life due to difficulty in metal processing is a consequence of using materials above the maximum hardness requirement while having below minimum hardness can lead to material failure such as rupture, splitting and other firing defects during actual product usage.

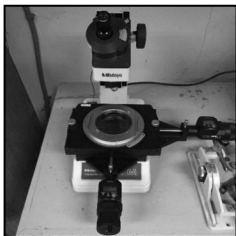
Additionally, **AES MX-9204 Salt Spray Chamber** was procured for the conduct of the Accelerated Corrosion Test for metallic links. This unit has the same function as the old one but with upgraded features such as a larger working volume and salt solution capacity; longer operating hours capability; and equipped with salt fog collectors and



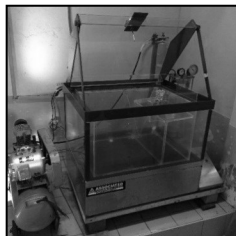
Rockwell Hardness Tester



Vicker Hardness Tester



Toolmaker's Microscope



Salt Spray Chamber

a water demineralizer system. Accelerated Corrosion Test employs a simulated environmental condition that speeds up the occurrence of rust-formation or oxidation when the metallic links are not properly coated according to standards.

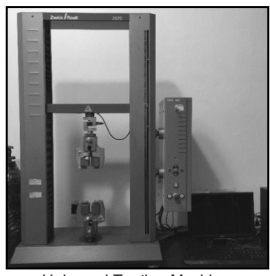
Raw material testing requires a wide range of test instruments and equipment. Although there are other factors such as machine and method for manufacture, the quality of raw materials greatly dictates the quality of the product. Therefore, it is of utmost importance to obtain accurate and reliable test results for the incoming materials with the use of modern test equipment. The Materials Testing Laboratory can take pride in the use of different modern equipment for testing of metallic raw materials.

Old units of OES-5500 Shimadzu Emission Spectrometer and Nikon Inverted Microscope Model M are now backed up with the newly acquired **Spectro MAXx-F Arc Spark Optical Spectrometer LMX06** and **Nikon Eclipse MA100 Inverted Microscope**. The new OES has a compact design and pre-calibrated for elemental analysis of Iron-based, Copper-based and Lead-based alloys, while the new **Inverted Microscope** for the grain size determination of Copper-based alloys is equipped with color digital camera and computer control system with software plus a polisher/grinder with varying grits for sample preparation. A hand-held **Olympus Innov-X Delta X-ray Fluorescence (XRF) Spectrometer** is also available for fast and non-destructive elemental analysis of metal and alloy samples at specified detection limits. Chemical Analysis is conducted on brass strip (C26000), commercial bronze (C22000), carbon steel and leadwire in order to determine their chemical composition. The type of metallic raw material is confirmed by presence of specified elements and their quantities (%). Chemical composition significantly affects the mechanical properties of the metal alloy, hence, it is a must to comply with the specifications. Metallographic examination of polished section of metal samples is conducted to determine the grain size which is the average size of the particles in a metal. When viewed under a microscope, the grain size boundaries between crystals can be counted, allowing the grain size to be calculated or can be done by comparison using a standard reticle or chart. Grain size is inversely proportional to hardness. Metals with very small particles are hard while those with larger grains are softer. Therefore, grain size requirement must be met to attain the desired hardness of the material.

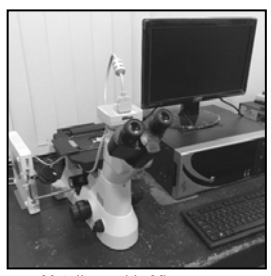
Another state-of-the-art equipment is the **Zwick/Roelle Z20 Universal Testing Machine (UTM)** which is a state-of-the-art table top UTM with a maximum test load of 20kN and equipped with testXpert II computer software for reliable data acquisition and analysis for the conduct of Tensile and Elongation Test on brass, commercial bronze and carbon steel strip samples. It can also be expanded to compression test of metals/alloys within the load requirement and mechanical testing of rigid and semi-rigid plastics with available grips, fixtures and other accessories. Tensile and Elongation Test is used to determine the behavior of



materials under axial tensile loading and the amount of permanent extension of a specimen that has been fractured in a tensile test. Brass for case / primer cups, commercial bronze and carbon steel for metallic link have tensile



Universal Testing Machine



Metallographic Microscope



Arc Spark Optical Spectrometer

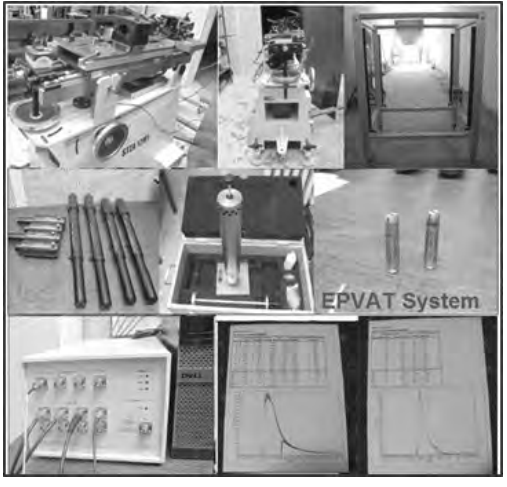


X-Ray Fluorescence Spectrometer

and % elongation requirements since these metal alloys undergo mechanical processing such as blanking and cupping operation, drawing operation; cutting and forming.

QAD has been catering to the testing needs of the Armed Forces of the Philippines (AFP), Philippine National Police (PNP) and other government agencies in the acceptance inspection of their procured ammunition. The GA now offers both the traditional Copper Crush method and modern EPVAT system to clients, depending on their requirements. Ballistics testing for procured and manufactured components and ammunition has levelled up with the procurement of a **Ballistics Measuring System** called **EPVAT** that conforms to NATO standards. With this **Electronic** system, data and plots for **Velocity**, **Pressure** and **Action Time** can be generated in just one shot which makes it more effective and efficient for ballistics testing. The EPVAT system consists of the following components: (a) *Test System* (mobile firing rest), (b) *Proving Device* (Universal Ballistic Breech, Test Barrels for various calibers), (c) *Barrel Gauges*, (d) *Pressure Transducers* (Kistler 6215 Pressure Transducer and K6215A Muzzle Pressure Transducer) and *Accessories*, (e) *Transient and Time Recording System* (Transient Recorder and Ballistics Work Frame software), (f) *Dynamic Verification System* (Pressure Impulse Generator) and (g) *Precision Light Screen System*.

The construction of a modernized firing range solely designed for the use of this EPVAT system had been recently finished.



To finally complete the calibration requirement of the EPVAT System, a **Continuous Calibration System** consisting of *Pressure Generator*, *Reference Pressure Sensor*

(6963A8000), *Calibrator* (signal conditioning, data acquisition, evaluation) and *Calibration software* was procured. Along with this system, three (3) other ballistics equipment have also been acquired such as the **POTSS-2011 Optical Target Scoring System** which is a mobile equipment that measures the X-Y coordinate for the Accuracy Test, rate of fire and even the velocity for a calibre range of 4.5 mm to 40 mm; **FDO1M Muzzle Flash Detector** for muzzle flash determination using PIN photoiodide sensor at 750-1000 nm wavelength; and **Barrel Gauge System** that is capable for precise measurement of barrel land and groove dimensions as well as barrel life for various calibers.



Furthermore, other ballistics equipment obtained in the past couple of years include the **Olympus IPLEX MXII Industrial Videoscope System** and **Oehler Digital Chronograph (Model 35BNC) with Lumiline Photoelectric Screen (Model M27)**. The videoscope is intended for viewing and recording of test and weapon barrels in order to determine the bore conditions due to wear and tear. It has state-of-the-art features such as 3-5 mm Ø and 1-1.5 m long tough tapered flex insertion tube, illumination using multiple ultra-high intensity LEDs, 90°-120° and up/down/left/right view direction and equipped with an LCD color monitor (8-step brightness control, image observation and freeze function, electronic zoom). On the other hand, the new chronograph is an upgraded version of the existing Oehler Proof Chronograph Model 35P which is used with two (2) M27 screens that allows measurement of velocity. The unit can compute and print a summary of high, low, range, mean and standard deviation at the end of a test group.

The realization of the efforts towards GA's Modernization Program is steadily manifested by the new and modern look of various QAD testing laboratories as well as the upturn of technical knowledge and skills of its seasoned and junior personnel in handling and operating a wide range of instruments and equipment. GA's testing capabilities can now be comparable with what the chemical testing laboratories at the Department of Science and Technology (DOST) and Philippine Institute of Pure and Applied Chemistry (PIPAC); and even with what the metrology laboratories at Metals Industry Research and Development Center (MIRDC) can offer. Through the years, the GA had been known to be the only reputable ballistics testing center in the Philippines with testing capabilities at par with foreign ammunition manufacturers that are compliant to international standards and will continue to strive to be even better. GA's testing capabilities have indeed significantly improved and continuous upgrading will be seen in the coming years, with GA QAD's commitment for quality and reliable testing services. (by: Engr Czarina C Daclan)

# REMANUFACTURING ENGINEERING

*Restoring usefulness of end-of-life equipment*

Remanufacturing Engineering could be an old concept reinvented, enhanced or given a new name, but some progressive countries who have been adopting it for quite some time are reaping the benefits, more so that it embraces the environment-friendly principles of reduce-reuse-recycle.

Here are some notes taken by the author in her attendance last March 19, 2015 at the ADIC Program in conjunction with LIMA'15 in Langkawi, Malaysia, wherein MFDM made a presentation on Remanufacturing Engineering.

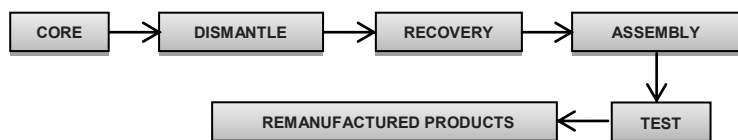
MTU Services (Malaysia) Sdn Bhd. is a subsidiary of MFDM Group of Companies (MFDM) which specializes on maintenance, repair and overhaul, asset management, remanufacturing and strategic sourcing. MFDM is in collaboration with the Ministry of Defense of Malaysia as an MRO provider for its Navy and a leading member of the Remanufacturing Focus Group under the Ministry of International Trade and Industry.

**Definition.** Equipment remanufacturing engineering is the industrialization of high technical maintenance of mobilizing end-of-life equipment. (China)

A remanufactured part fulfills a similar function as the original part, maintain/retain the original value of the part. It is restored from an existing part (core) using standardized industrial processes in line with specific technical specifications. (US)

A manufactured part is given the same warranty as a new part and it clearly identifies the part as a remanufactured part and the manufacturer.

## Typical Manufacturing Process



## Typical Remanufacturing Sectors

US : helicopters, fighter jets, tanks  
China : trucks / vehicles, Navy / Marines equipment

## Benefits and Significance of Remanufacturing

- Reduce military expenditures (alternative to procuring new)
- Extend useful life and enforce equipment maintenance capability
- Upgrade the military technology
- Improve defense capability
- Environment friendly – a RM product can save 50% of cost, 60% of the energy and 70% of the materials

- Need not re-invent the wheel, as it takes shorter period from design to production

## Selecting Qualified RM Suppliers

- Original Equipment Manufacturers (OEM)** – They produce and remanufacture also. They have the original technology advantage, strong control of its product resources where its business is established. (example: Caterpillar)
- Authorized Dealer Remanufacturer (ADR)** – Others do for them, easy to negotiate with, better adaptability to the local customers
- Independent Remanufacturer** – They do not produce but remanufacture products for others. They have the suitability of diversified technologies of various OEM products and are better adaptable to customer requirements

## Factors to Consider when Choosing a Remanufacturer

- Technical capability
- Adaptability of diversified products
- Good to negotiate and control (especially for confidential issues)
- Thoroughly understand the local and regional market
- Well control of the local resources and users

## Remanufacturing Business Cooperation Model

**The Specialization Model.** Each member country to develop its own agreed area of specialization which will be complementary and fulfill the needs for a complete system. This will attain economies of scale as a group, as for example for the manufacture of complete vehicles, country A will produce the diesel engines, country B will produce the chassis and body, and country C, the transmissions.

As prerequisite, there should be free movement of cores and remanufactured products between member ASEAN countries.

The benefits are: economies of scale, and this will strengthen the ASEAN economic, security and socio cultural ties.

**An ASEAN-wide Steering Committee.** Though it appears to be a very promising concept in the ASEAN region, and already being practiced by the US, Japan, China and Europe, the issue of Intellectual Property Rights (IPR) and commonality of equipment between ASEAN member countries were raised. An ASEAN-wide Steering Committee has yet to be established to explore the potential of developing an ASEAN cooperation in the remanufacturing of defense assets and work on the policies and address the issues raised. (by: TLV)

# MUSEO NG ARSENAL (Gusaling Ruperto K Kangleon)

*Preserving a great past while taking pride of the present...*

The Arsenal Museum was already in existence since 1979 and was housed at the *Kasinagan* or the Training Center Building inside the Government Arsenal (GA) camp, but it is during the incumbent director, Jonathan C Martir's management, that the Museum was given a new look and housed separately in the refurbished building previously occupied by the Arsenal Savings & Loan Association (ASLAI) office. It is a strategic location, overlooking the statue of General Antonio Luna on the left side of the Administration



Building (Gusaling Jacinto L Papa Jr)

A Museum Committee was created by virtue of Office Order No. 01 dated January 7, 2014, which tasks involve the planning for the lay-out and contents of the Museum, conduct of research and documentation of historical materials to be housed thereat, and initiating procurement of supplies, materials and equipment for the museum. The Committee is chaired by Mr. Arthur R. Meram, with members – Ms Hiyasmin O Karunungan, Ms Ma. Susana N Narciso, Mr Godofredo Z Baluyot, Ms Floriefe V Legaspi, Engr Georgette G Aranas, Engr Ryan Ray M Santos, Mr. Danilo G Acebo, Ms Kathrina C Lacay, together with the Management Information Office personnel headed by Mr. Murbie C Narciso.

It was out of gratitude and profound admiration to the late Senator Ruperto K Kangleon that Director Martir considered naming the Museo ng Arsenal after him, in grateful recognition of his zeal and determination in sponsoring Senate Bill No. 352 seeking the establishment of a government arsenal as an immediate need, with the purpose of providing self-reliance in terms of weapons and ammunition for the Armed Forces of the Philippines (AFP), thus improving the defense capability of the Philippines. This was finally ratified and was passed into law in 1957 and is now known as Republic Act 1884. Senator Kangleon was a religious catholic, distinguished patriot, guerilla commander, athlete and statesman.

On October 8, 2014, the Museo ng Arsenal was inaugurated in time for the 47<sup>th</sup> Araw ng Arsenal celebration, with Ms Aida Kangleon-Roska, Senator Kangleon's daughter as the Guest of Honor, who went home to the Philippines all the way from the US for the special occasion.

Upon entering the Museum, visitors will see right away, Senator

Kangleon's bust made of GA's scrap brass, and mounted on a graphite base, alongside two (2) Lantaka (ancient warfare weapon) replicas, also made of scrap brass. Among the items that can be viewed and

appreciated inside the museum are the charcoal paintings of the past and present directors of the GA, with their significant contributions to the growth of the bureau. The museum also houses a life size brass statue of General Antonio Luna, to whom the GA camp was named after. It also showcases AFP's unserviceable firearms turned-over to GA and which were repaired, refurbished and upgraded by the GA's Small Arms Repair and Upgrade Unit (SARUU) to be fully functional again.

Another impressive display in the museum is the mural painting that spreads on the right upper wall, which depicts GA's history that dates back in the late 60's and early 70's when the Arsenal was still in the construction stage and the groundbreaking ceremony graced by the late President Ferdinand E. Marcos. Said mural painting was jointly painted by skilled artists- personnel of GA headed by Mr. Alberto E. Medina.

The museum will not be complete without showcasing the products of the GA, so visitors can have a glimpse of what it manufactures, as well as the evolution of the ammunition packaging materials. Some equipment used when GA started production operations are also on display.

The Museo ng Arsenal is open to the viewing public every Wednesdays, from 8:00 am to 5:00 pm, and on Saturdays, from 8:00 am to 12 noon.

A tour of the museum would truly leave impressions on visitors of the remarkable commitment and passion of the GA personnel, as they translate to the proudly Philippine-made products. *(by: Kathrina C Lacay)*



Batch 1 of SARUU trainees, Long Mountain Outfitters, Henderson, Nevada, USA



Batch 2 of SARUU trainees, Long Mountain Outfitters, Henderson, Nevada, USA



Batch 2 of SARUU trainees, inside the University of Defence, Brno, Czech Republic



Batch 2 of SARUU trainees, Live Fire Training at Pro Gun Club Firing Range, Henderson, Nevada, USA



Batch 3 of SARUU trainees, Gun Smith Course, Long Mountain Outfitters, Henderson, Nevada, USA