

Ethiopia2050- Grand Challenges and Opportunities

Advanced Manufacturing Challenges in Ethiopia
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Overview

- Background
- Green Manufacturing
- Gig Economy
- MSEs, Clusters and Industrial Parks
- Advanced Manufacturing
- Machine Building Experience

Background

- The dissolution of Corporations following EPRDF takeover, resulted in loss of specialist knowledge in the corporations. TGoE agreed the same should not happen to the Metal Corporation. (4/1993)
- Officials of TGoE sponsored a study for BME chaired by NMWC which resulted in new strategy for basic metals and engineering fields. (9/1993)
- A bureau was established at the PM office to start putting the strategy to practice. (~1/1994)
- However, following the Ethio-Er war (5/1998 - 6/2000), major changes occurred in EPRDF gov't.
- Meantime, the BME Strategy document never left the PM office to Mo Industry.
- New Industrial policy was issued in 8/2002 which focused on light manufacturing. Metal & Engineering was regarded too expensive.
- However, it later (6/2010) resurfaced with METEC, who announced the “plan” to produce, among others, several sugar industries. However, METEC manufactured little; it bought things, mainly machines...
- A lot has happened in Industry since 1993, but little machine building; the Eth-2050 challenge is to seriously re-start it, initially by building machines with multiplier effect, e.g. machine tools, prime movers, etc.

Green Manufacturing

- Eth power is mainly renewable. Little has been tapped of the potentials.
- However, there is little or no local manufacture in any of EEU projects in wind, solar or geo-thermal.
- Ethiopia's power for industries is GREEN. But is not sustainable; last year's power rationing has proven it.
- EEU management is not reliable. Cant even raise bill to charge the customer. Some field staff is corrupt.
- For power sector to be reliable:
 - All proposed projects need to have value addition component.
 - Distribution (weak at EEU!) has to be done by Ethiopian companies.
 - We need to develop natural gas systems for household use,
 - Management to be competent,
 - etc.
- We need to think out of the box.
- Perhaps we need to consider nuclear power more seriously, at least as a back-up system. Cf: Our satellite to be launched today.

Eth Power Reserve & Usage

Resource	Unit	Reserve	Exploited Percent
Hydropower	MW	45,000	<5%
Solar/Day	Kwh/m ²	Avg. 5.5	<1%
Wind: Power Speed	GW m/s	1,350 >6.5	<1%
Geothermal	MW	7,000	<1%
Wood	Million Ton	1,120	50%
Agricult. waste	Million Ton	15-20	30%
Natural Gas	Billion m ³	113	0%
Coal	Million Ton	300	0%
Oil Shale	Million Ton	253	0%

Gig Economy

- “Gig” is basically *short term contract* or *freelance work*.
- As per the old Labor Law, an employer of permanent workers has little direct right on his/her investment. For example an investor cannot take action on workers who under-perform although he/she knows they are on a slow down.
- Action needs long and written data collection, warnings, etc., that are almost “scientific” to be acceptable to the courts. Probably the only time action be taken is if a culprit is caught red-handed stealing or doing mischief on machinery.
- If one fires a worker who is past his/her probation period without proper procedure, the penalty is a very hefty fine. *A new investor friendly law has since been approved. (1156/2019)*
- However, gigs and short term contracts can be made if end dates and parting terms are defined. “Gigs” are hence quite common – outside of normal manufacturing works. *Its one reason the Service Sector is growing so fast.*
- The Labor law should be pro-youth and allow investors to have younger, more energetic and receptive labor.
- In fact both Labor leaders and employers’ representatives also need to go as they have reportedly been there since 1993!

MSEs and Clusters

- Natural clusters (grow out spontaneously due to market forces; easy and more widespread in Eth.
- Induced clusters are created due to government policy when growth in a new sector is planned; it needs **strong policy follow-up** and implementation.
- UNIDO assists FeMSEDA in tech and finance; Cluster Dev't agents (CDAs) are core of its operations. CDAs, among others:
 - create discussions between MSEs to create trust and avoid misunderstanding between members.
 - advise MSEs to work with the private sector; they learn from it and be prepared for end of Gov't project they are working with.
- The **shoes cluster** in Mercato (grew 500 to 1500 in 12 yrs) is one of the best in Africa as it overcame the competition from Chinese suppliers. (Excellent CDA and MSE cooperation)
- Shiro Meda **traditional ware cluster** is large (over 6,000 members) but is not innovative; no trust between member ሸማኔዎች. (Unsuccessful CDA activity; traditional culture of weavers.)

Industrial Parks

- Many IPs are being built, mostly in textiles and similar light manufacture; most are Chinese built. Hawassa cluster is a state of the art facility.
- Of the Chinese built and funded IPs, the EIP Zone in Dukem appears to be the best run. It includes >30 IPs in 6 general fields: textile, metal work, building materials, leather, agri-processing and mechanical and electrical equipment manufacture.
- None are owned by Ethiopian entrepreneurs; shop floor staff are mostly Ethiopian.
- Of Ethiopian regional owned IPs, the one in Tigray region is metal focused and re-trains its clusters as and when necessary; it is successful.
- Ethiopians need to invest in IPs. They need to work with Chinese IPs so they learn what “efficient” is, however difficult the Chinese partners could be. Foreign IPs can leave any time and nothing is learned.
- In syncing with the ET-2050 Challenges, the idea of establishing towns from IPs is a welcome tool for **Urbanization** in Ethiopia.

Now we go to Advanced Manufacturing

Manufacturing Background

- Industry 4.0, currently is the most advanced industrial system where machine to machine communication without human involvement is the norm.
- We in Ethiopia are struggling for internet supply for business and personal use. I 4.0 is too far away for us to care!
- We have other burning issues:
 - Many factories are idling for lack of raw materials
 - Duties and taxes are paid on raw materials, components, etc., while finished goods are imported duty free. This is the new norm in Engineering Industries. Unfair.
 - **Re-bars** are still being imported while local rolling mills are virtually idle.
 - Locally **Galvanized steel coils** which are taxed @ similar rate as imported coils, despite appeals by local galvanizers for better tax system over the last two years, etc.
 - Manufacturing's role is shrinking to less than 5% of GDP.
- Policies are now being contradicted by the same organs who put them there in the first place.
- The following pages show results of times when machine building by government plants was being practiced. The idea was to continue on machine building as soon as practicable.

Machine Building in pre-EPRDF Ethiopia

- Many private workshops used to make their own machines.
- The experience below is however a conscious effort by NMWC to build its own machinery. It happened some 40 years ago at Kaliti Steel Industry (KASI), after it was nationalized.
- The supervising Metal Corporation recognized the talent and entrusted the plant to build the machines KASI & other plants needed.
- The core person of machine design and building was Ato Tadesse Dadi, a person who had little formal education, but he had the gift to imagine the internal workings of machines and memorize shapes and sizes. He did not reverse engineer or use any drawings, to the best of his technicians. His approach was hence relatively faster.
- He had the requisite management group and a dedicated team of technicians and lived to expectations of NMWC.

Shown below are some of the machines, most still in working order.

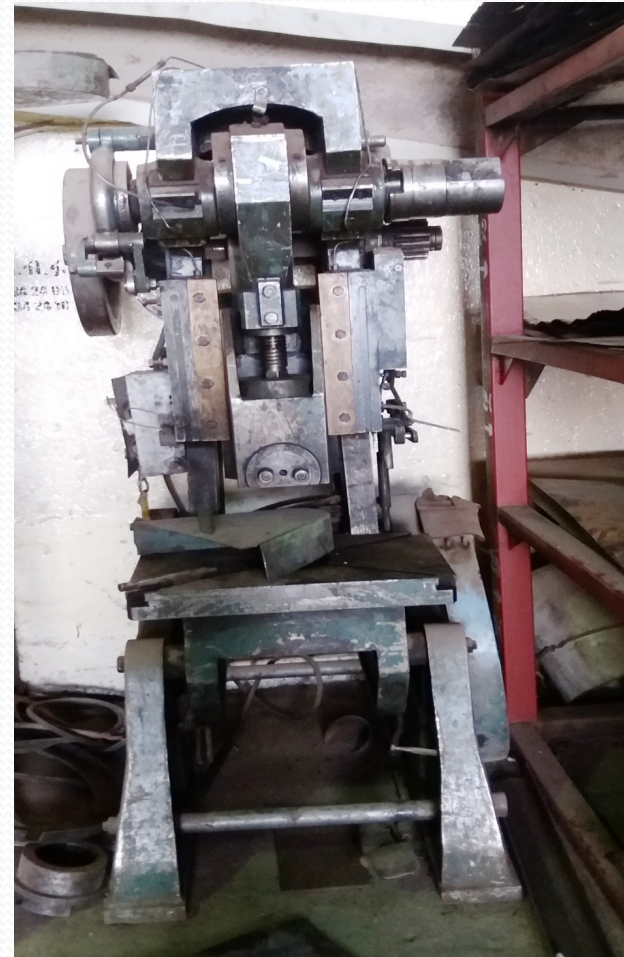
Profile Cutter

- Such cutters were used alone as below or adapted to work on other machines.
- Design has since been adopted ~countrywide.



Eccentric Mechanical Press

- A clean and simple design
- Is being used extensively



Uncoiler stand – About 10MT capacity



Sheet Metal Rolling Machine to make Trapezoidal (Ega) Sheets.

- Length of Machine ~10m with Uncoiler
- Note speed control adapted from truck gearbox
- This is the main machine made by KASI



Hydraulic Shearing machine: this was later imported as it was more accurate.



U-Channel Rolling Machine

- Machine length ~8m with uncoiler; now unused due to wear and tear.
- The machine couldn't have had a long service life.



Adapted profile cutter



Recognition

Combination Press Brake – Guillotine shear; ~2.5m wide

- NMWC allowed the team leader to build and take this machine on his retirement
- A neat construction
- Electro Mechanical operation;
- Quiet operation on test running
- Press parts reportedly made from steel sourced from Ethio-Sider
- The machine was in Press Brake mode when visited, with Cutting die set disassembled



Combination

Press Brake –

Guillotine shear:

Side view

- Again a neat construction
- Note the relatively deep throat to facilitate bending of larger work-pieces
- The body is fabricated from flame cut steel plates



Recognition- Land (~2000m²)

Ato Tadesse built his workshop on Land given free by gov't.



KASI Workshop Logo

“ብረትን ያንቀጠቀጠ ትውልድ!!”

Names and pictures of participants in the machine building experience are shown on a poster in the machine shop.

The poster has been in the shop for quite a while.



Epilogue

- **Machine building** is something which will bring the engineering industries to life. We have the machines, the people, the prototypes and the software. There should be no fear to start it...
- It was done so effectively some 40 years ago – with little forex, with poor machines, but with determined actors and leadership.
- It can now be replicated so much better, if only there is the will from decision makers.
- **Machine Building** could ignite Manufacturing at Engineering Industries!!

END