

Application of MATLAB Software in The Study of Performance Efficiency of Simulated Solar-Powered Pelletizing Animal Feed Machine

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Abstract—The rising global demand for sustainable agricultural practices has necessitated the development of energy-efficient and environmentally friendly technologies, particularly in the processing of livestock feed. This research anchors on analysis of performance efficiency of a conceptualized simulated solar-powered animal feed pelletizing machine using MATLAB software, aimed at addressing the twin challenges of energy scarcity and feed inefficiency in rural and off-grid farming communities. Experimental trials evaluate machine performance, with variables such as pellet output rate (kg/h), and moisture content within the acceptable range of (10-12%) The energy consumption is significantly lower compared to grid-powered systems, highlighting the economic and environmental benefits of solar integration; adaptable to rural use, with low maintenance requirements and the potential for modular scalability.

Keywords—MATLAB, Software, Simulated Solar, Powered, Pelletizing, Animal, Feed, Machine)

I. INTRODUCTION

The study and evaluation of solar-powered pelletizing machines is a promising area for sustainable development. It aligns with the global agenda on renewable energy, climate change mitigation, and circular economy (Sameer Kanabargi, 2014). Current work on pelletized animal feed will focus on increasing system efficiency, affordability, and adaptability to different materials and environments

Pelletizing animal feed enhances nutritional utilization, reduces feed wastage, improves storage efficiency, and simplifies transportation (Fei Peng,2020). The integration of solar photovoltaic (PV) technology into feed processing equipment provides a sustainable alternative, leveraging renewable energy to power mechanical components such as mixers, conditioners, and pellet mills (Abdollahi), economic analysis of solar-powered pelletizing machines.

These efforts aim to improve efficiency, reduce costs, and enhance accessibility for small-scale farmers and communities. Innovations include semi-automatic portable pellet machines, integration of shredders and mixers, and the use of durable materials like mild steel for critical components to ensure longevity and performance (M,R,2021). This

research study and project focus on MATLAB analysis of SIMULATED solar-powered pelletizing machines. These efforts aim to improve efficiency, reduce costs, and enhance accessibility for small-scale farmers and communities.

II. PROBLEM STATEMENT/JUSTIFICATION

The production of pelletized animal feed is a significant contributor to the animal feed industry, but it is often energy-intensive and reliant on non-renewable energy sources. The use of solar-powered machines in this process has the potential to reduce energy costs, increase sustainability, and improve production efficiency. However, this research is geared towards sustainable efforts to evaluate the impact of SIMULATED solar-powered machines on production output, and determine their effectiveness and feasibility.

JUSTIFICATION:

The justification of this research is based on fundamental reasons that;

1. ***Energy Efficiency*:** Solar-powered machines can reduce energy costs and dependence on non-renewable energy sources, making production more sustainable.

2. ***Increased Productivity***: Evaluating the impact of simulated solar-powered machines on production output can help identify opportunities to optimize production processes.

efficiency.

3. ***Environmental Benefits***: Solar power reduce greenhouse gas emissions and global warming. contribute to a cleaner environment, aligning with growing demands for sustainable production practices.

4. ***Competitive Advantage***: Producers who adopt solar-powered machines can gain a competitive edge in the market, appealing to environmentally conscious consumers.

Knowledge Gap: There is a need for research and evaluation to determine the effectiveness and feasibility of solar-powered machines in pelletized animal feed production, providing valuable insights for industry stakeholders. By evaluating the impact of solar-powered machines on production output, this study can provide valuable insights into the benefits and challenges of adopting this technology, informing decision-making and driving innovation in the animal feed industry (James Edward Brereton, 2022).

III. OBJECTIVE(S) OF THE STUDY

The objectives of this research include:

1. ***Assessing production output***: Determine the quantity and quality of pelletized animal feed produced using simulated solar-powered machines.
2. ***Evaluating energy efficiency***: Measure the energy efficiency of simulated solar-powered machines compared to traditional energy sources.
3. ***Analyzing cost-effectiveness***: Examine the cost savings and economic benefits of using solar-powered machines.
4. ***Investigating reliability and consistency***: Assess the reliability and consistency of solar-powered machines in maintaining production output.
5. ***Identifying environmental benefits***: Quantify the reduction in greenhouse gas emissions and other environmental benefits associated with using solar power.

6. ***Determining scalability and feasibility***: Evaluate the potential for scaling up solar-powered machine adoption in pelletized animal feed production.

By achieving these objectives, the evaluation can provide valuable insights into the benefits and challenges of using solar-powered machines in pelletized animal feed production`

LITERATURE REVIEW

The continuous need for superior pellet quality in animal feed has propelled advancements in pelleting technology. Critical phases in pellet production, particularly conditioning and pelleting, significantly influence the physical quality of pellets. This article traces the evolution of pelleting technology from historical milestones to more recent innovations, highlighting significant advancements and their impact on pellet quality control. Future trends and desired innovations in pelleting technology are also discussed.: Pelletizing biomass into fuel pellets or animal feed pellets improves resource utilization and agricultural productivity (Abdollahi M,R ,2021),. For example, in livestock farming, pelletized feed enhances nutritional value, reduces waste, and improves animal performance. In many developing countries, there is a significant gap in the supply of compound feeds, making affordable pellet production crucial for farmers.

The production of high-quality animal feed pellets is vital for efficient animal nutrition and health. Over the past century, equipment manufacturers have strived to develop technologies that ensure consistent pellet quality. The conditioning and pelleting phases are central to achieving the desired pellet durability and hardness. This article reviews the historical developments and recent innovations in pelleting technology using solar powered device, and outlines future directions for improved pellet quality control. Pelletized animal feed production is a complex process of converting raw materials into a compact uniform pellet form that provides a nutritious diet for animals (James Edward Brereton,2022). The production process requires careful attention to detail to ensure the production of high quality feed that meets the nutritional needs of the target animal species. A solar-powered

pelletizing machine is a sustainable engineering solution aimed at converting biomass or other raw materials into pellets using solar energy (Sudhir Puloria,2025). Pelletizing is widely used in agriculture, bioenergy, and waste management to transform fine or loose materials into a more manageable, dense, and transportable form. The study of solar-powered pelletizing machines bridges renewable energy technology, mechanical engineering, and environmental science (Shingley et al, 2001). Pelletizing is a process where material is compressed into small, dense cylindrical units (pellets) (Peter, L. Tea Jr, 2002). It is commonly used for:

- **Biomass pellets** (wood, sawdust, agricultural waste): used as biofuel.
- **Animal feed pellets:** for livestock nutrition.
- **Plastic or industrial pellets:** for further manufacturing processes.

The traditional pelletizing process is energy-intensive and often relies on fossil fuels or electricity from non-renewable sources. Environmental Concerns on Greenhouse gas emissions from fossil-fuel-based pelletizing processes contribute to climate change and there's a global shift towards decarbonization and renewable energy sources . Energy Access in Remote Areas had hampered interest in livestock production hence agricultural communities lack access to reliable grid power. Solar-powered systems offer a decentralized, clean, and sustainable energy source,

TYPES OF PELLETS

Pellets are compacted cylindrical or spherical agglomerates typically made from fine, powdered, or ground raw materials. The pelletizing process involves compressing or molding a material into a solid form that is easier to handle, transport, store, and use. Depending on the raw material and end-use, pellets can serve in energy production, agriculture, manufacturing, pharmaceuticals, and environmental management (Fei Peng,2020). Pellets are broadly categorized based on their **application domains** and **material composition**. The most common types include:

1. Biomass Pellets

1) **a. Wood Pellets; Raw Material:** Sawdust, wood chips, forestry residues, bark

Applications:

- Renewable fuel for heating in residential and industrial boilers
- Power generation in biomass power plant

Characteristics:

- High calorific value (~16–18 MJ/kg)
- Low moisture (typically <10%)
- Uniform size and density
- Low ash content when derived from clean wood

2) **b. Agricultural Residue Pellets**

Raw Material: Crop residues (rice husk, wheat straw, corn stalks, sugarcane bagasse, etc.)

Applications:

- Biofuel for cooking and heating
- Raw material for co-firing in thermal power stations

Characteristics:

- Moderate calorific value (~14–17 MJ/kg)
- Higher ash content than wood pellets
- Often requires pretreatment (e.g., drying, grinding)

3) **c. Energy Crops Pellets**

Raw Material: Grasses (e.g., switchgrass, miscanthus), fast-growing trees

Applications:

- Bioenergy generation
- Used in blended fuels with coal

Characteristics:

- Sustainable and rapidly renewable

- Calorific value varies by species

B. 2. Animal Feed Pellets

1) a. Livestock Feed Pellets

Raw Material: Grains (corn, wheat, barley), soybean meal, vitamins, minerals

Applications:

- Feeding cattle, poultry, pigs, fish

Characteristics:

- Balanced nutrient composition
- Enhanced digestibility
- Uniformity ensures equal feed distribution
- Reduces feed wastage

2) b. Aqua Feed Pellets

Raw Material: Fishmeal, shrimp meal, algae, plant-based proteins

Applications:

- Feeding farmed fish and shrimp

Characteristics:

- Must be water-stable
- Floatable or sinking depending on fish species
- Smaller diameter (1–4 mm)

C. 3. Plastic Pellets (Nurdles)

Raw Material: Virgin or recycled plastics (e.g., polyethylene, polypropylene, polystyrene)

Applications:

- Raw material for injection molding, extrusion, and other plastic manufacturing processes

Characteristics:

- High consistency in shape and size
- Melts uniformly for molding

- Typically produced via extrusion followed by pelletizing

D. 4. Metal Ore Pellets

1) a. Iron Ore Pellets

Raw Material: Iron ore fines, bentonite (binder)

Applications:

- Blast furnaces and direct reduced iron (DRI) plants

Characteristics:

- High iron content (typically >64%)
- High thermal and mechanical strength
- Uniform porosity and size

2) b. Other Metal Pellets

Can include copper, nickel, or manganese ore pellets in specialized smelting operations.

E. 5. Waste-Derived Pellets (RDF/SRF)

1) Refuse-Derived Fuel (RDF) Pellets

Raw Material: Processed municipal solid waste (MSW), plastic, paper waste

Applications:

- Alternative fuel in cement kilns, industrial boilers

Characteristics:

- Lower and inconsistent calorific value
- Requires advanced sorting and pretreatment

2) Solid Recovered Fuel (SRF) Pellets

- Higher quality than RDF due to stricter processing and moisture control

- Standardized under EU norms (EN 15359)

F. 6. Pharmaceutical Pellets

Raw Material: Active pharmaceutical ingredients (APIs), excipients

Applications:

- Used in controlled drug delivery systems (capsules or tablets)

Characteristics:

- Small (0.5–1.5 mm)
- High sphericity for uniform coating
- Enables extended-release or multi-drug formulations

G. 7. Chemical and Fertilizer Pellets

1) a. Fertilizer Pellets

Raw Material: Urea, ammonium nitrate, phosphates, organic compost

Applications:

- Soil nutrient supplementation

Characteristics:

- Uniform size for even application
- Slow-release variants available. **Catalyst or Additive Pellets**

Comparison Table

Type of Pellet	Primary Use	Raw Materials	Key Characteristics
Wood Pellets	Heating, power	Sawdust, wood waste	High energy, low ash
Agricultural Pellets	Energy, waste mgmt.	Crop residues	Low cost, variable quality
Animal Feed Pellets	Livestock nutrition	Grains, minerals	Nutritionally balanced, durable
Plastic Pellets	Manufacturing	Polymers	Uniform, meltable

Type of Pellet	Primary Use	Raw Materials	Key Characteristics
Iron Ore Pellets	Steel industry	Iron ore fines	High Fe content, strong
RDF/SRF Pellets	Industrial fuel	Processed waste	Variable energy, sustainable
Pharmaceutical Pellets	Drug delivery	APIs + excipients	Controlled release, highly engineered
Fertilizer Pellets	Agriculture	Organic or chemical	Nutrient-rich, slow/fast release options

Development in Pelletizing Technology;

The inception of modern pelleting technology can be traced back to the early 20th century with the development of the flat die pellet mill by California Pellet Mill (CPM). This innovation marked the beginning of mechanized pellet production, enabling more efficient and consistent feed processing.

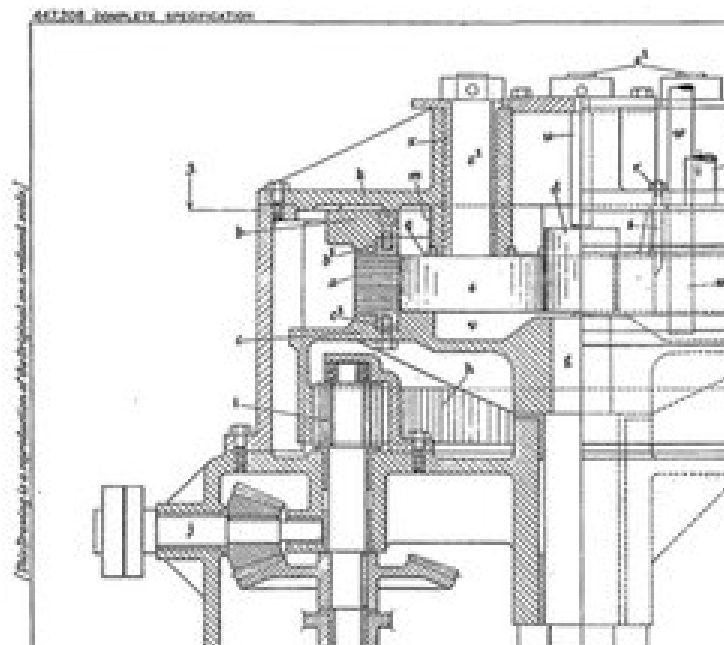


Illustration: Flat die and ring die patents by Mr. Edgar Thomas Meakin, engineer at California Pellet Mill in the 1930s

Ring Die Pellet Mill Innovation

Following the flat die, California Pellet Mill introduced the ring die pellet mill which significantly improved the uniformity and durability of pellets. This advancement was a crucial step forward in enhancing the overall quality of feed pellets.

Integrating Steam Conditioning with the CPM Master Pellet Mill

The integration of steam conditioning with the CPM Master Pellet Mill was another significant development. The addition of steam made the feed mixture more pliable, enhancing pellet formation and durability. This technique also improved nutrient preservation and digestibility in the final product.

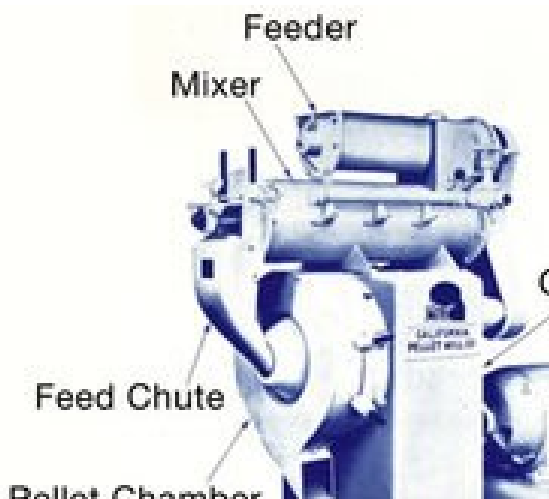


Illustration: Master Pellet Mill in the 1950s

New Technology Conditioning Innovation

Increased Steam and Liquid Addition

New conditioning technologies incorporate double retention times and advanced blending techniques to increase steam and liquid addition. This improves pellet quality by ensuring thorough mixing and optimal moisture content.



Illustration: New conditioning technology

Smart Sensor Installation for Data Acquisition

The integration of smart sensors in pelleting technology represents a significant advancement in optimizing pellet quality and production efficiency. Smart sensors enable real-time data acquisition, monitoring, and control, ensuring consistent quality and operational efficiency (Avallone et al, 2017).

AUTOMATIC ROLLER ADJUST INNOVATION

Pre-Compression in the Pellet Mill Die

Automatic roller adjust systems optimize pre-compression in the pellet mill die, ensuring consistent pressure application. This results in uniform pellet quality and reduced wear on the equipment.



Illustration: Remote roller adjustment type lineator

ROLL SPEED MEASUREMENT INNOVATION

Anti-Blocking System

Innovations in roll speed measurement include anti-blocking systems that prevent feed mixture buildup while optimizing steam conditioning and pre-compression. This results in smoother operation and higher quality pellet.



Illustration: Roll speed measurement for anti-blocking system

Modern Pelletizing Equipment;



Pelletizing Unit



Brereton,2022). The production process requires careful attention to detail to ensure the production of high quality feed that meets the nutritional needs of the target animal species. A solar-powered pelletizing machine is a sustainable engineering solution aimed at converting biomass or other raw materials into pellets using solar energy (Sudhir Puloria,2025). Pelletizing is widely used in agriculture, bioenergy, and waste management to transform fine or loose materials into a more manageable, dense, and transportable form. The study of solar-powered pelletizing machines bridges renewable energy technology, mechanical engineering, and environmental science (Shingley et al, 2001). Pelletizing is a process where material is compressed into small, dense cylindrical units (pellets) (Peter, L. Tea Jr, 2002). It is commonly used for:

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Pharmaceutical Pellets	Drug delivery	APIs	+ Controlled

Type of Pellet	Primary Use	Raw Materials	Key Characteristics	Integrating with the CPM Master Pellet Mill	Steam Conditioning	Pellet Mill
Fertilizer Pellets	Agriculture	Organic or chemical	excipients release, highly engineered Nutrient-rich, slow/fast release options	The integration of steam conditioning with the CPM Master Pellet Mill was another significant development. The addition of steam made the feed mixture more pliable, enhancing pellet formation and durability. This technique also improved nutrient preservation and digestibility in the final product.		

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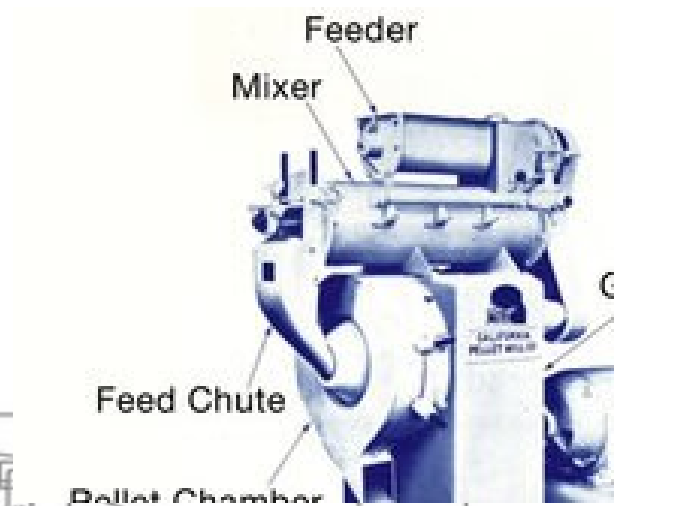


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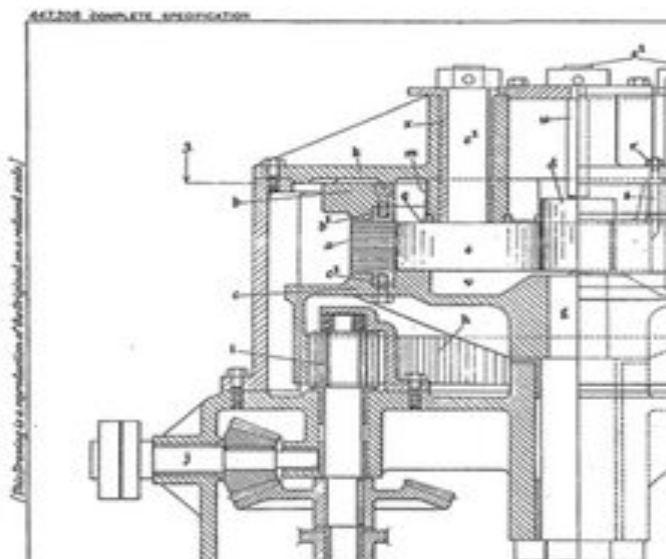


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Pelletizing Unit



CHAPTER TWO METHODOLOGY

The methodology of this research follows these approaches (Abdollahi M,R ,2021);

1. Objective

O. To convert loose, powdered or mixed animal feed ingredients into compact, uniform pellets that are easier to store, handle, and feed, while improving digestibility and reducing waste using conceptualized simulated solar powered pelletizing machine (Khurmi, et al,2020)

(SEE APPENDIX 1 = **SIMULATED 1 5KW solar powered Machine**)

P. 2. Materials and Equipment Required

1) Materials:

- Feed ingredients (e.g., maize, wheat bran, soybean meal, fish meal, vitamins, minerals)
- Binding agents (optional; e.g., molasses, bentonite)
- Water or steam (for conditioning)

2) Equipment (simulation of 1 5KW solar powered pelletizer) (Halowenko,2021)

- Grinder/hammer mill

3. Step-by-Step Process

3) Step 1: Formulation and Weighing of Ingredients

- Develop a feed formulation based on the target animal (poultry, cattle, pig, fish).
- Weighing of raw materials according to nutritional requirements (energy, protein, vitamins, etc.).

4) Step 2: Grinding

- Grind ingredients using a hammer mill to reduce particle size (typically 1–4 mm).
- Uniform particle size improves mixing efficiency and pellet integrity.
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5) Step 3: Mixing

- Transfer ground materials into a feed mixer.
- Mix thoroughly for 3–10 minutes to ensure homogeneity.
- Add micro-nutrients, binders, or medications if required.

6) Step 4: Conditioning (Optional but Recommended)

- Introduce steam or hot water into the mix using a conditioner.

- Conditioning temperature: 60–90°C
- Duration: 15–30 seconds
- Objectives:
 - Increase moisture (target: 15–17%)
 - Soften ingredients for better pellet formation
 - Begin gelatinization of starch for improved digestibility

7) *Step 5: Pelletizing*

- Feed the conditioned mash into the pellet mill.
- The mixture is forced through die holes using rollers, forming cylindrical pellets.

8) *Step 8: Packaging and Storage*

- Pack into moisture-resistant bags (e.g., 25 kg or 50 kg sacks).
- Store in cool, dry, and pest-free conditions.

Q. 4. *Quality Control Parameters*

- **Pellet Durability Index (PDI):** Measure of resistance to breakage during handling.
- **Moisture Content:** Ideal range is 10–12%.
- **Pellet Size:** Must match species' feeding behavior (e.g., 2 mm for poultry, 4–6 mm for cattle).
- **Nutrient Retention:** No loss of critical nutrients due to excessive heat or mechanical stress.
- **Microbial Safety:** Ensure absence of Salmonella, molds, or mycotoxins.

R. 5. *Data Collection (for Research Applications)*

- **Input-output ratio:** Measure mass of raw mash vs. final pellets.

- **Energy consumption:** Track power usage of each unit (mixer, pelletizer, cooler).
- **Pellet quality:** Test PDI, hardness, and nutrient content.
- **Temperature and humidity:** Record during conditioning, extrusion, and cooling.

S. 6. *Safety and Operational Considerations*

- Always monitor for overheating in motors and belts.
- Ensure steam lines are insulated and valves are functioning properly.
- Dust control measures should be in place to prevent respiratory hazards and explosions.
- Operators should wear PPE: gloves, masks, safety goggles.

T. 7. *Environmental Considerations*

- Reuse fines and waste materials.
- Ensure proper management of wastewater or cleaning residue.
- Use renewable energy sources (e.g., solar) to power operations.
- Simulation of the **design of a 1.5Kva Solar Powered pelletized Machine**The description of the parts are **discussed below**;(see APPENDIX 1 for the simulated Designed 5KVA solar powered pelletizing machine).
- Photovoltaic (PV) Systems
- **Solar panels** convert sunlight into electricity, which powers the pelletizing machine.
- Includes **battery storage** to ensure continuous operation during low sunlight or at night.

1) *Solar Thermal Systems (less common for pelletizing)*

- Use sunlight to generate heat, which can assist in drying raw material before pelletizing.

U. *Components of a Solar-Powered Pelletizing System*

1) a. *Solar PV Array*

- Powers motors and electronic components of the machine.
- Size depends on machine capacity and location's solar irradiance.

2) b. *Battery Bank*

- Stores excess energy for use during cloudy days or nighttime.
- Typically involves deep-cycle batteries.

3) c. *Charge Controller*

- Regulates voltage/current from the PV panels to prevent battery overcharging.

4) d. *Inverter*

- Converts DC from solar panels to AC if the pelletizing machine uses AC motors.

5) e. *Pelletizing Machine*

- Includes feed hopper, conditioner (optional), die and roller assembly, cutter, and cooling system.

2.1 DATA COLLECTION/ SITES;

The collection and experimental sites are;

A; TRADITIONAL FEED MILLS

1. Emene feed production, Enugu State Nigeria
2. Abakpa Nike Feed mill, Enugu State Nigeria
3. Uguwoaba Feedmill, Enugu State Nigeria

(see Appendix 3,4)

B; SIMULATED SOLAR POWERED MACHINE(Enugu State NIGERIA)

1. Emene feed production, Enugu State Nigeria

The simulated solar powered machine is used with Matlab Software to determine the following parameters;

Input-output ratio: Measure mass of raw mash vs. final pellets.

Energy consumption: Track power usage of each unit (mixer, pelletizer, cooler).

Pellet quality: Test PDI, hardness, and nutrient content.

Temperature and humidity: Record during conditioning, extrusion, and cooling.

(see Appendix 5, 6)

CHAPTER THREE

RESULTS (OUTPUTS/RESULTS):

3.1 The results on this research follows this pattern

1. **Correlation of Steam Addition for optimum moisture range.**

2. **Determination of Pelleting Capacity of the solar machine (kg/h) versus Energy Consumption (kw)**

3. **Efficiency of the simulated solar pelletizing machine versus the traditional pelletizing machine.**

Graphs illustrating the correlation between steam addition, pelleting capacity, die specifications, and resulting pellet quality are instrumental in optimizing the pelleting process (Shingley et al,2001).

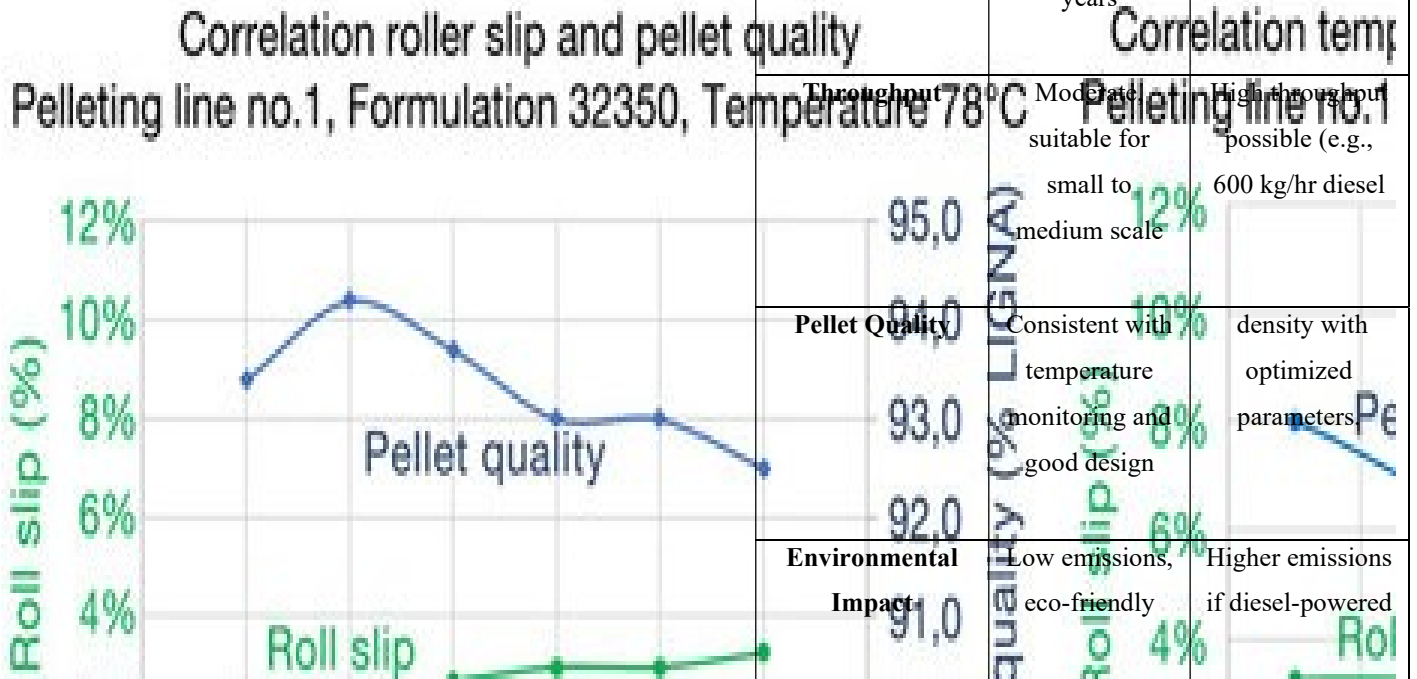


Illustration: Pellet quality studies at increasing capacities and conditioning temperatures and consistency, which is crucial for maintaining high-quality standards.

3.2 OUTPUT/OUTCOME/RESULTS;

Table 3.1 ;

Research parameters	Simulated Solar-Powered Pelletizing Machine	Traditional Pelletizing Machine
Energy Source	Solar energy with battery storage (renewable, free fuel)	Grid electricity or diesel fuel (non-renewable, costly)
Energy Efficiency	Low operational energy cost; payback ~1.8	Higher ongoing fuel/electricity costs

3.1 Work Plan/Time Frame

Work Plan for the Implementation of simulation for Pelletized Animal Feed Production is as follows (A.P.Verma,2023);

Phase 1: Planning and Assessment (Weeks 1-4)

1. Conduct feasibility study and site assessment .

2. Determine energy requirements and production capacity needs.

3. Identify suitable solar simulation options and suppliers.
 4. Develop a detailed project plan and timeline.

Phase 2: Installation and Testing (Weeks 5-12)

1. Install solar-powered simulation software..
 2. Conduct thorough testing and commissioning of the system.
 3. Ensure proper integration with existing production equipment.

Phase 3: Monitoring and Evaluation (Weeks 13-26)

1. Monitor production output, energy efficiency, and system performance.
 2. Collect and analyze data on energy savings, production costs, and environmental impact.
 3. Identify and address any technical issues or challenges.
 4. Evaluate the overall effectiveness and feasibility of solar simulation.

Phase 4: Optimization and Scaling (After Week 26)

1. Refine and optimize production processes based on lessons learned.
 2. Explore opportunities for scaling up solar-simulation.
 3. Develop strategies for maintaining and upgrading the system.
 4. Share findings and best practices with industry stakeholders.

This work plan provides a general outline for implementing simulated solar-powered machines in pelletized animal feed production

CHAPTER FOUR

4.1 BUDGET

The budget COST for the research project is as follows;

O.		
1	PERSONNEL COST/STIPEND	1 PRINCIPAL RESERCHER 2 RESEARCH ASSISTANT
2	SUPPLIES EXPENSES	RAW MATETIALS. maize, wh bran, soybean meal, fish meal, vitamins, minerals)Binding ager (optional; e.g., molasses, bentonite)
3	EQUIPMENT AND TESTS	1 Simulation of SOLAR POWERED PELLETTIZED MACHINE(1.5KVA)2 TEST (a) Data logging and monitoring equipment (b) measuring equipment like ammeter, voltmeter
4	TRANSPORTATION	COST(N) TRAVELS TO;

S/ N	ITEM	DESCRIPTION
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		ESPOLY FARM SITE,FABRICATION SITE,TESTS AND MARKET 6 PROCUREMENT OF RAW MATERIALS.						HIRING INTERNATIONAL PEER REVIEWED JOURNAL(SCOPUS)
5	DATA COLLECTION	MEASUREMENT AND INSTRUMENTATION HIRING				DISSEMINATION COST	450,000	Report writing and dissemination costs
6	PUBLICATION AND DISSEMINATION COST	INTERNATIONAL PEER REVIEWED JOURNAL(SCOPUS) Report writing and dissemination costs		-	-	EQUIPMENT MAINTENANCE,	450,000 280,000	CHARGING OF BATTERY and panel servicing,
		CHARGING OF BATTERY and panel servicing,						TOTAL
				The total budget for this research is 2,000,000 Million Naira only (N2,000,000.00)				
		TOTAL						CONCLUSION: N4,500,000,00

CHAPTER FIVE
 In conclusion, the MATLAB software application indicated that simulated solar-powered pelletizing machines offer competitive efficiency in energy use and pellet quality with

4	TRANSPORTATION	TRAVELS TO; 1.Emene site 2 Ugwuoba site 3 Simulation Enugu					50,000	the added benefits of sustainability and lower operational costs, especially advantageous in off-grid or rural settings. Traditional pelletizing machines may provide higher throughput and established performance but at the cost of higher energy consumption and adverse environmental impact. The traditional pelletizing process is energy-intensive and often relies on fossil fuels or electricity from non-renewable sources
5	DATA COLLECTION	MEASUREMENT AND INSTRUMENTATION					150,000	Environmental Concerns on Greenhouse gas

emissions from fossil-fuel-based pelletizing processes contribute to climate change and there's a global shift towards decarbonization and renewable energy sources. Energy Access in Remote Areas had hampered interest in livestock production, hence agricultural communities lack access to reliable grid power. Solar-powered systems offer a decentralized, clean, and sustainable energy source

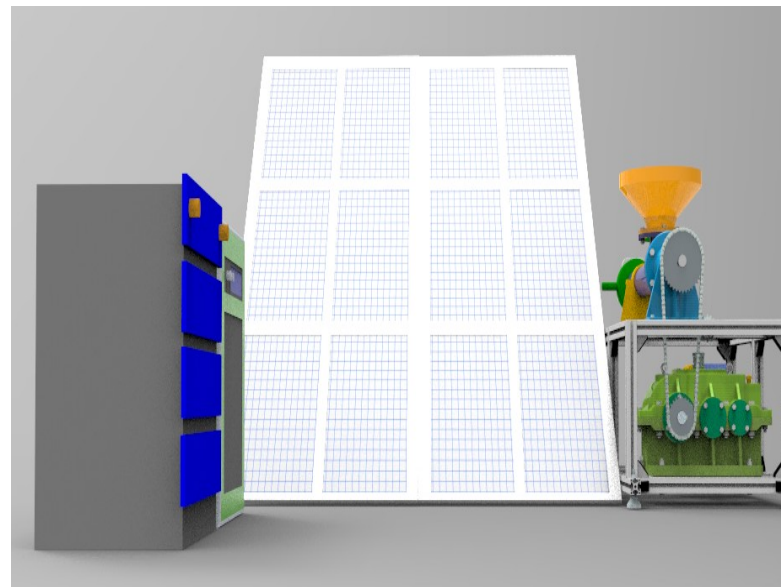
**Signature of Principal Researcher:
Signature of Chairman ICR**

**Signature of Head of Department:
Signature of Head of Institution:**

REFERENCE

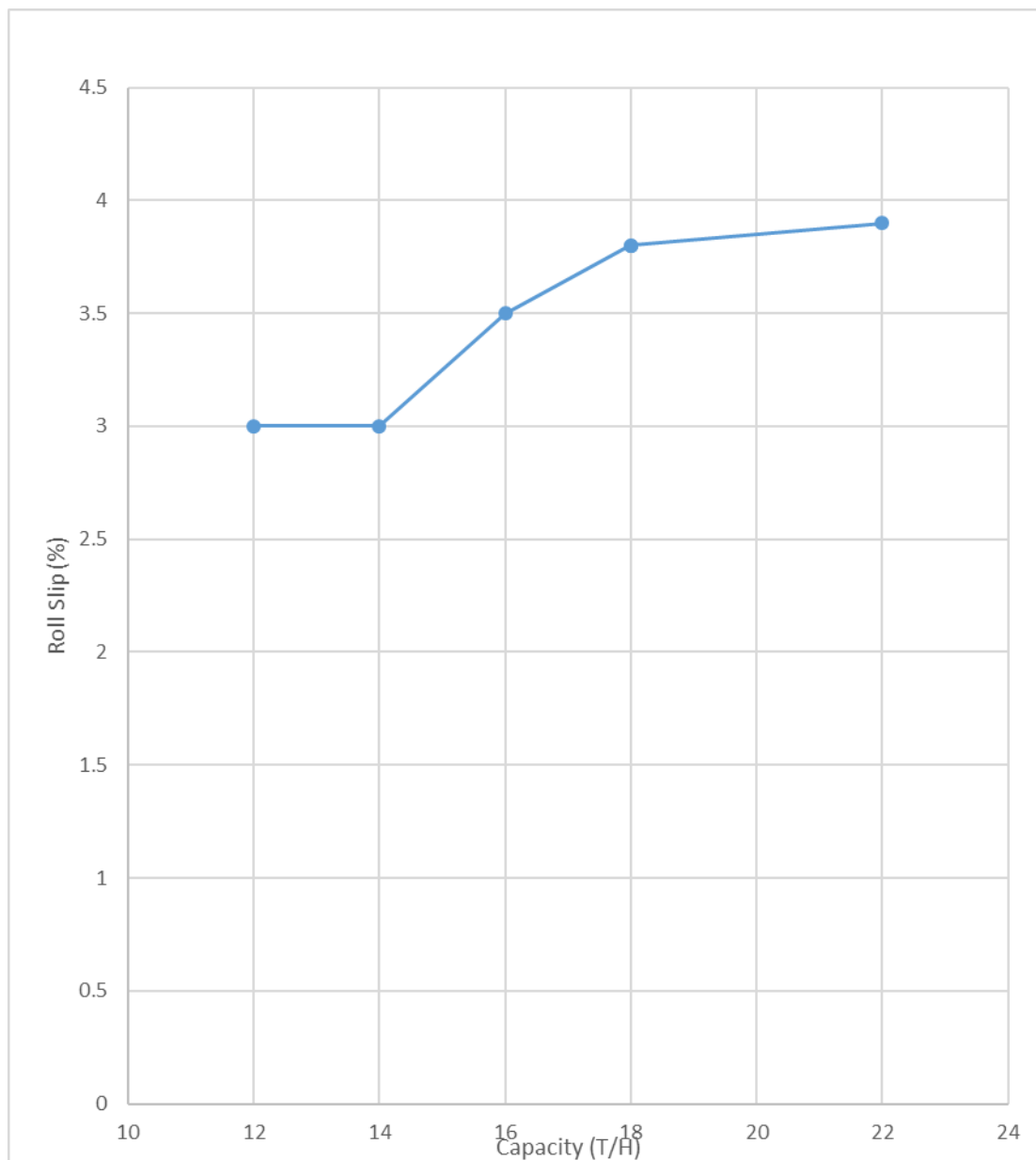
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APPENDIX 1 CONCEPTUALIZED Simulated 1. 5KVA SOLAR POWERED PELLETIZING MACHINE

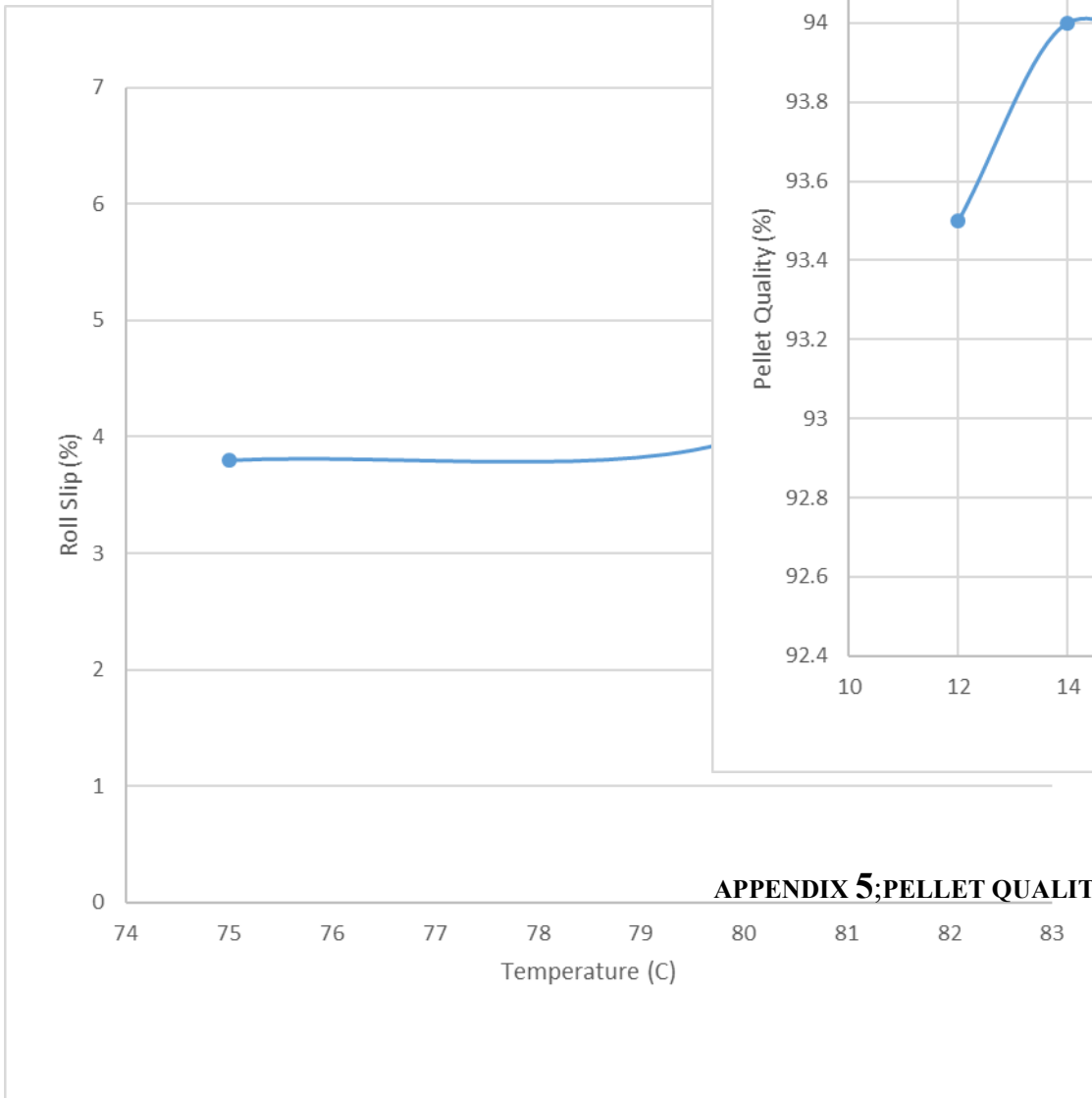


MATLAB TRADITIONAL PELLET MACHINE

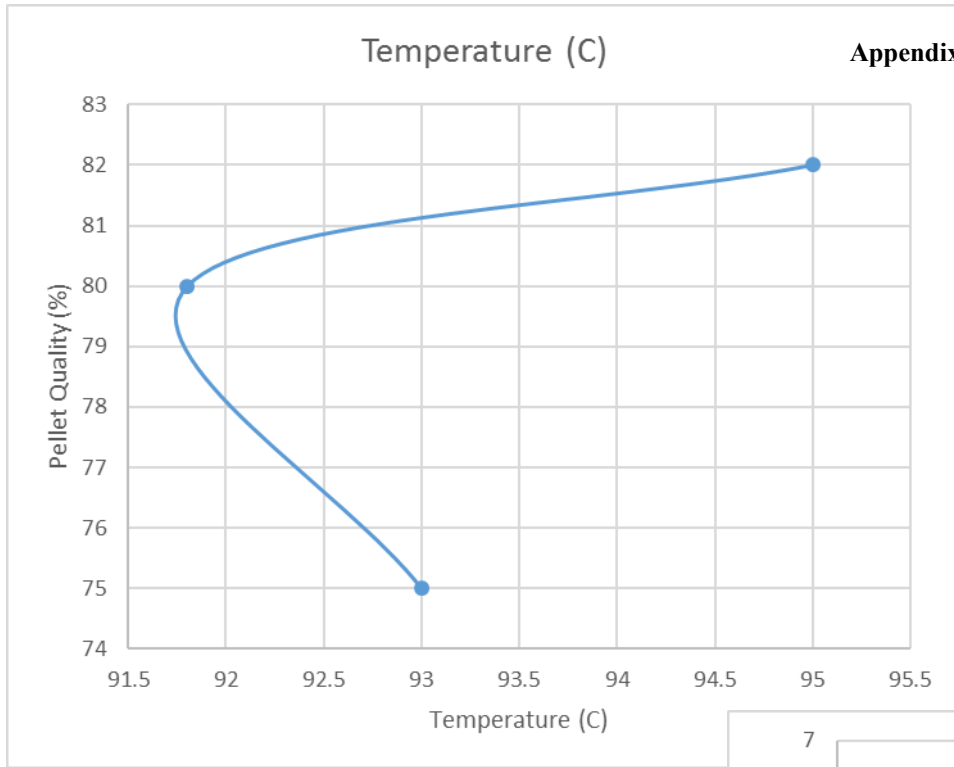
RESULT;



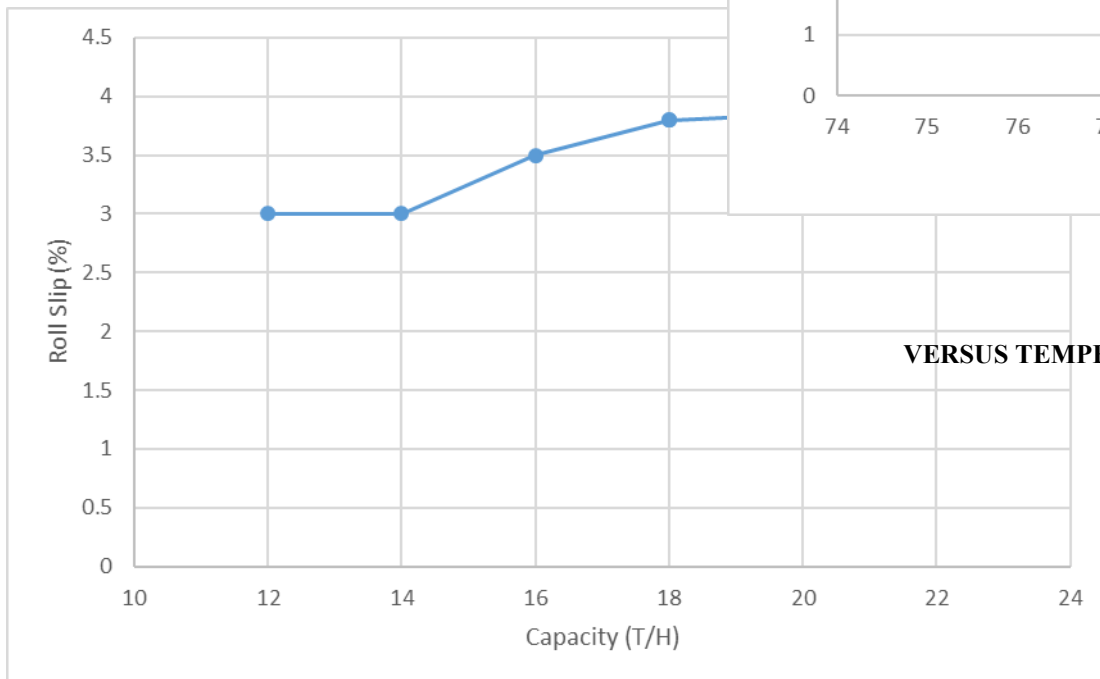
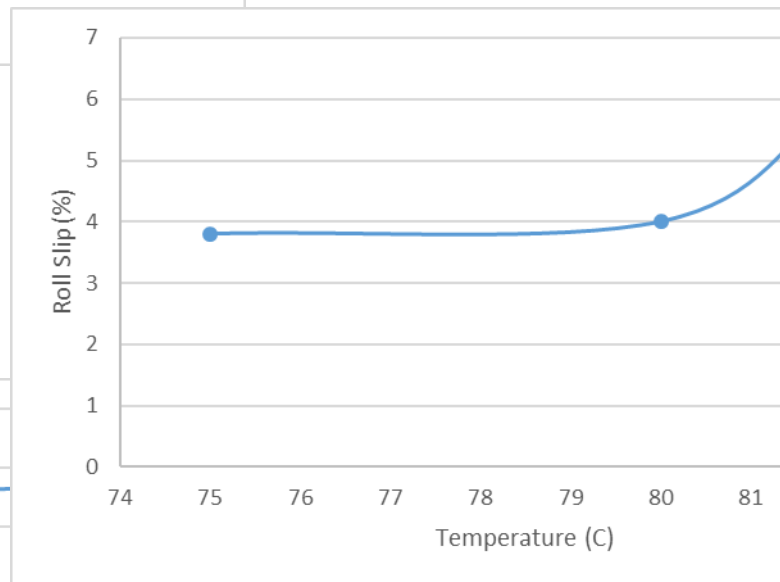
APPENDIX 3 ; ROLL SLIP VERSUS CAPACITY

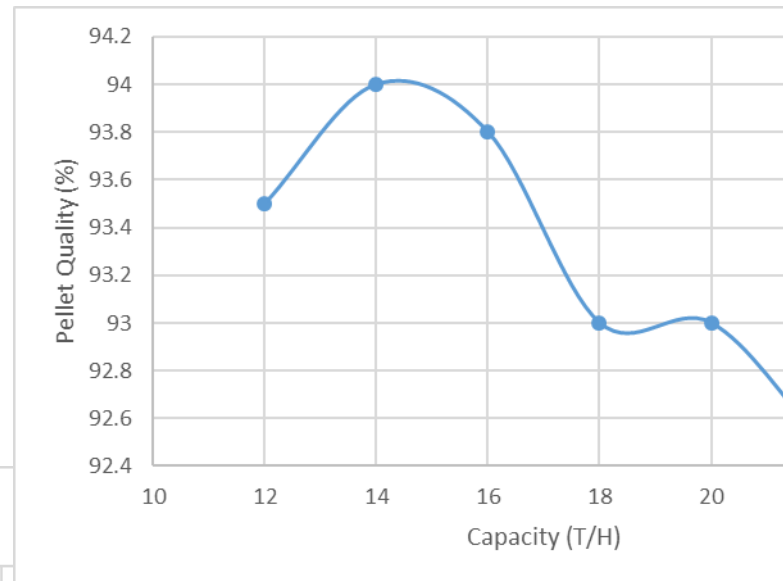
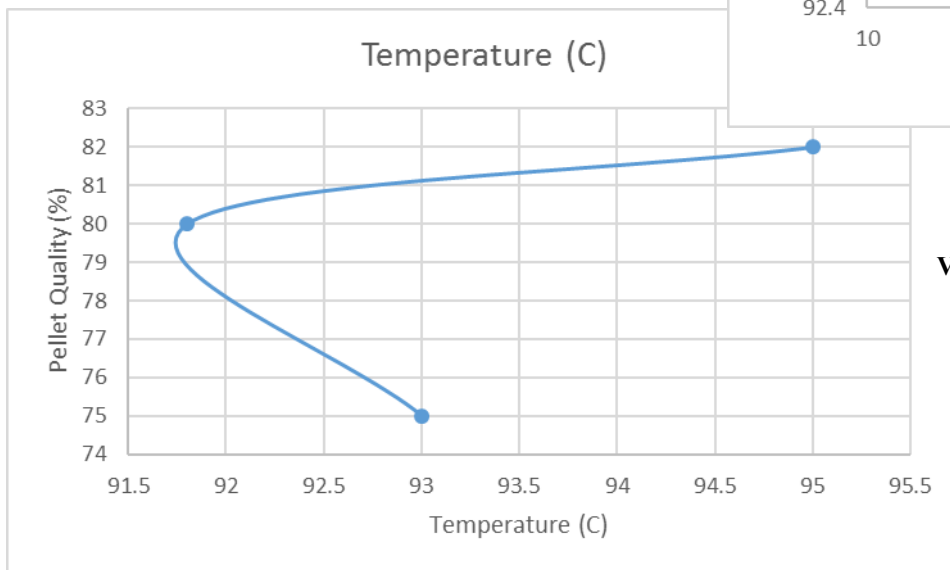


APPENDIX 4; ROLL SLIP VERSUS TEMPERATURE



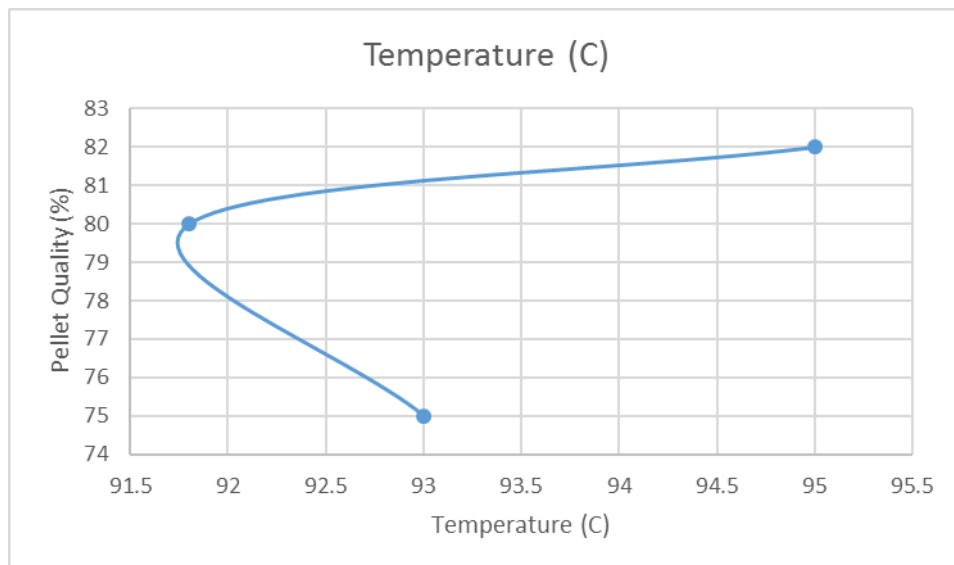
APPENDIX 6; PELLETT QUALITY VERSUS TEMPERATURE





**Appendix 10; PELLETT QUALITY
VERSUS CAPACITY**

**Appendix 9; PELLETT
QUALITY VERSUS TEMPERATURE**



Appendix 11; PELLET QUALITY VERSUS TEMPERATURE