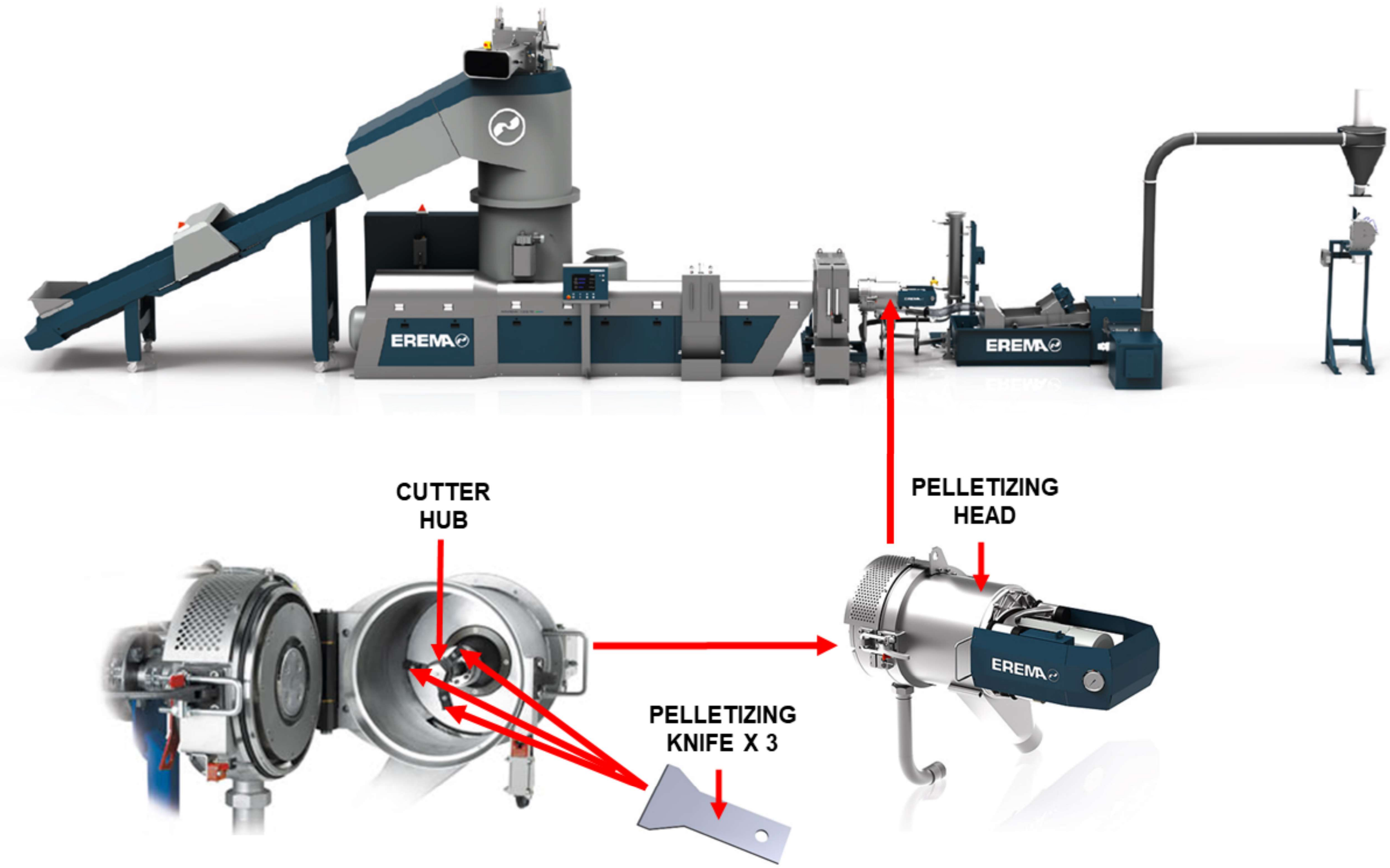
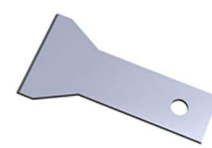
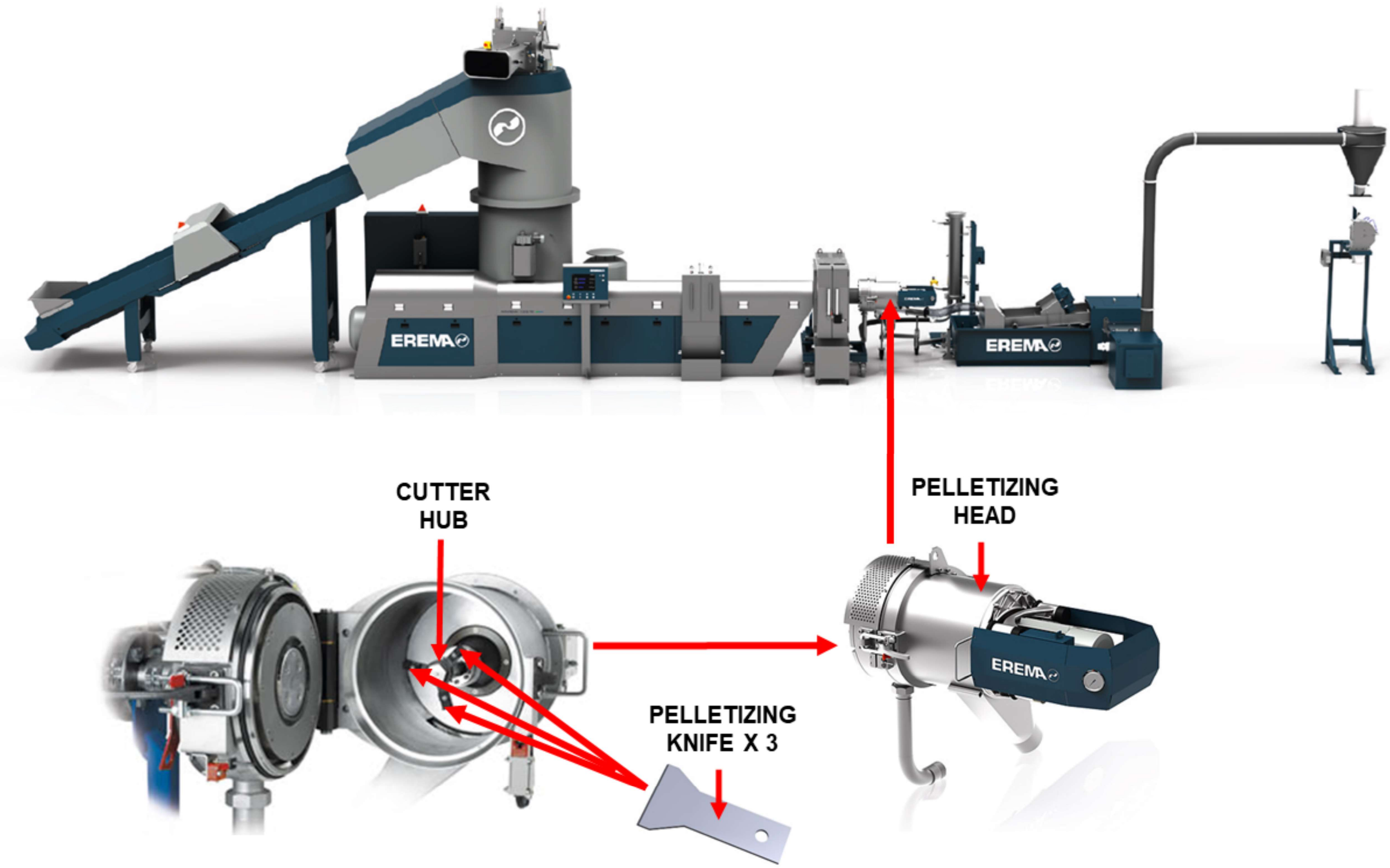


I was asked by my boss from a former employer to investigate 'why' we were replacing so many pelletizing knives on our two material reclaim re-pelletizing machines. He owned the operational replacement and replenishment budget account and was alarmed that we were spending $56,000.00 a year on pelletizing knives replacement. This is what the pelletizing knives look like:-



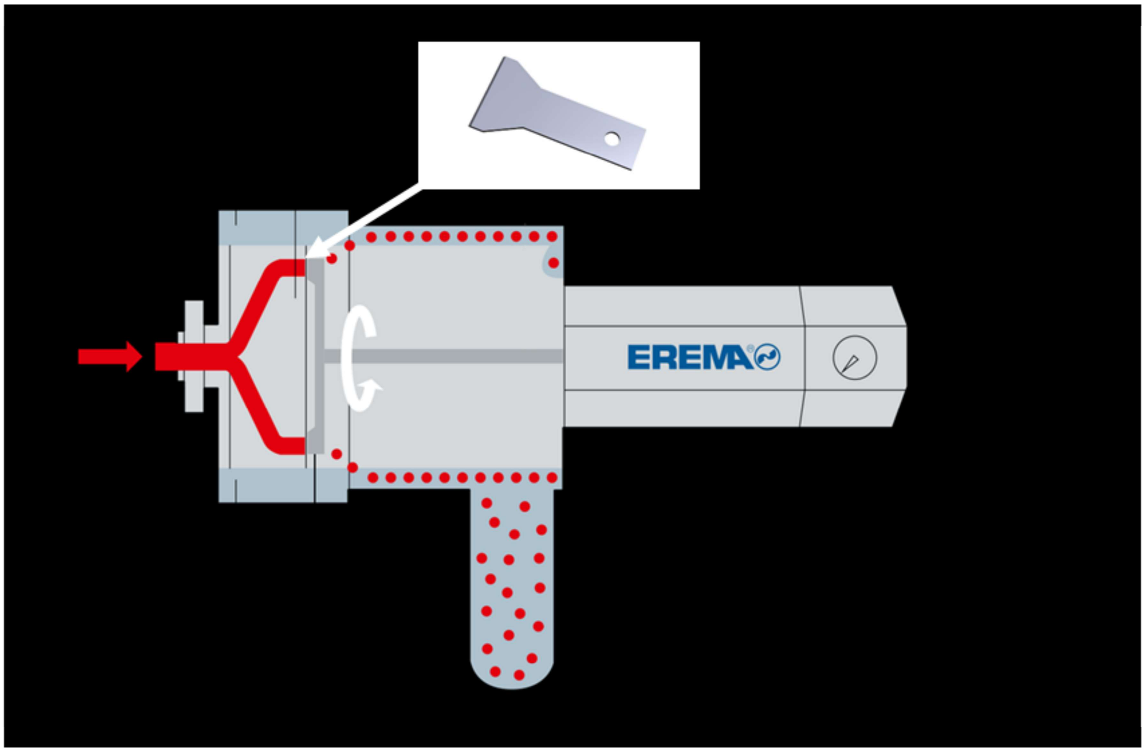
They are made of high carbon M2 59-61 Rc steel progressive hardened at the cutting edge while the tang of the knife is spring like. For the sake of demonstrating my analytical skills I will not go into the details of how the palletizing work or the principles of operation and just stay with how I went about this problem. In maintenance reliability engineering speak doing something like this is what is known as conducting a **FRACAS** (**F**ailure **R**eporting **A**nalysis **C**orrective **A**ction **S**ystem). Why are we using so many X parts per year and why is X part failing so often. The knives of course are expendable tooling.

This is a simple illustration of how I made used of **Categorical Data** to analyze this problem. I'll use the STAR method to demonstrate the **S**ituation, the **T**ask, the **A**ction and the **R**esults.



Situation

Inordinately high rate of changing out and replacing pelletizing knives on both material reclaim re-pelletizing machines which was resulting in an annual cost in replacing pelletizing knives for the material reclaim machines of **$56,000.00**

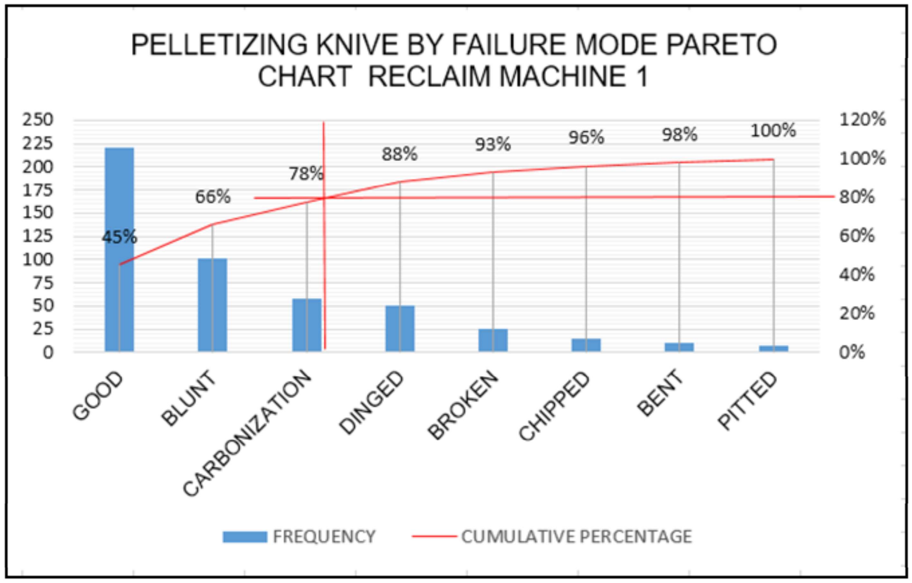


Task

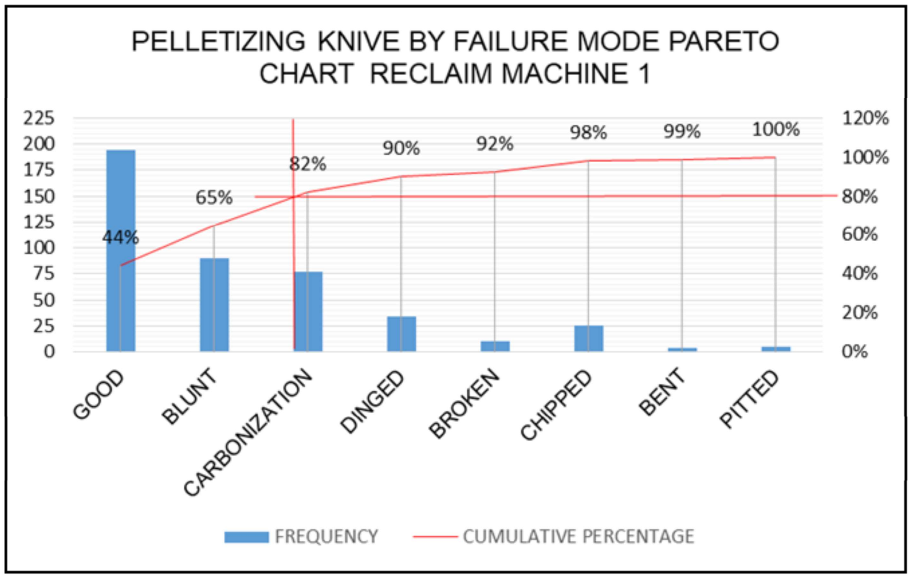
Although I knew the basic principles of operation of these reclaim machines I did not have in-depth knowledge the pelleting knives what they were made, their expected life cycle and proper operational installation. So, you studied up, read the equipment manuals, ask the original equipment manufacturer questions, interview the machine operators etc.

- Gain a thorough understanding of the principles of operation of the actual pelletizing part of the process
- Develop a current state
- Conduct a failure analysis of the knives
- Make and take corrective actions
- Follow up long term effectiveness tracking

FAILURE MODE CATEGORICAL SURVEY	
	MACHINE 1
DINGED	50
CHIPPED	15
BROKEN	25
BENT	10
CARBONIZATION	58
BLUNT	101
PITTED	8
GOOD	220



FAILURE MODE CATEGORICAL SURVEY	
	MACHINE 2
DINGED	34
CHIPPED	25
BROKEN	10
BENT	4
CARBONIZATION	77
BLUNT	90
PITTED	5
GOOD	194



Action

One of first things to do is interview the machine operators on all four shifts to enquire what do they know about the knife situation. Were they aware of how much money was being spent on knives each year. They didn't and were surprised when I told them.

Interview machine operators to ascertain what are the precipitating events on the process which gives them cause to change the knives out.

- Collect all used knives from both machine and determine failure modes
- Count the knives into the **Categorical** data 'failure modes'
- Pareto the failure modes
- Develop a troubleshooting guide for the machine operators to guide on cause and effects remedies for the knives failure modes
- Explore possible cut down on piece part price on the original equipment manufacturer knife for after market manufacturer.

One thing that was immediately clear with this Count data was that the operators were changing the knives out unnecessarily **45%** of the time – type 2 error. The knives that I determined and categorized as **GOOD** I could find nothing wrong with them. **BLUNT** meant the knives exhibited normal wear of the cutting edge.

fitesa

OPERATOR TROUBLE SHOOTING GUIDE FOR RECLAIM MACHINE

Form: 031-320XXX
Effective: 00/00/0000
Supersedes: None

PROBLEM	POSSIBLE CAUSE/S	WHAT TO CHECK	PHOTOGRAPHIC DESCRIPTION
PELLETIZING			
Pellets sticking together with strings or trails	Fines and tails on pellets are typically caused by die and/or blade wear.	If the die-plate cutting face becomes grooved it is not possible for even a new and sharp blade to cut the polymer cleanly.	

Results

Clearly I had to develop some operator training on good judgement of when is the condition of the knives necessary and sufficient to warrant their replacement. Which I did and trained all the machine operators in its use.

- Annual replenishment of pelletizing knives **8,300**. (that's a lot of knives).
- Cost of replenishment of pelletizing knives **$56,000.00**.
- Developed troubleshooting guide on resin pellet shape and condition to corrective action which resulted in a **35%** increase in knife life cycle.
- Cost down on original equipment manufacturer's knives against an after market knives
- I decided to see if I could find an after market knife for this equipment and I was successful in doing so. As it turns out there are many after market companies making these knives for this re-pelletizing machine. I wanted to make sure that the knives of the after market manufacturer were of same quality of steel dimensional accuracy of the original equipment manufacturer's knives, so I had a full metallurgical T Test of the two knives before switching over.
- Original equipment manufacturer's knife piece part price **$6.85**.
- After market manufacturer's knife piece part price **$3.65 = 47%** cost reduction or an annual savings of **$28,000.00**.