

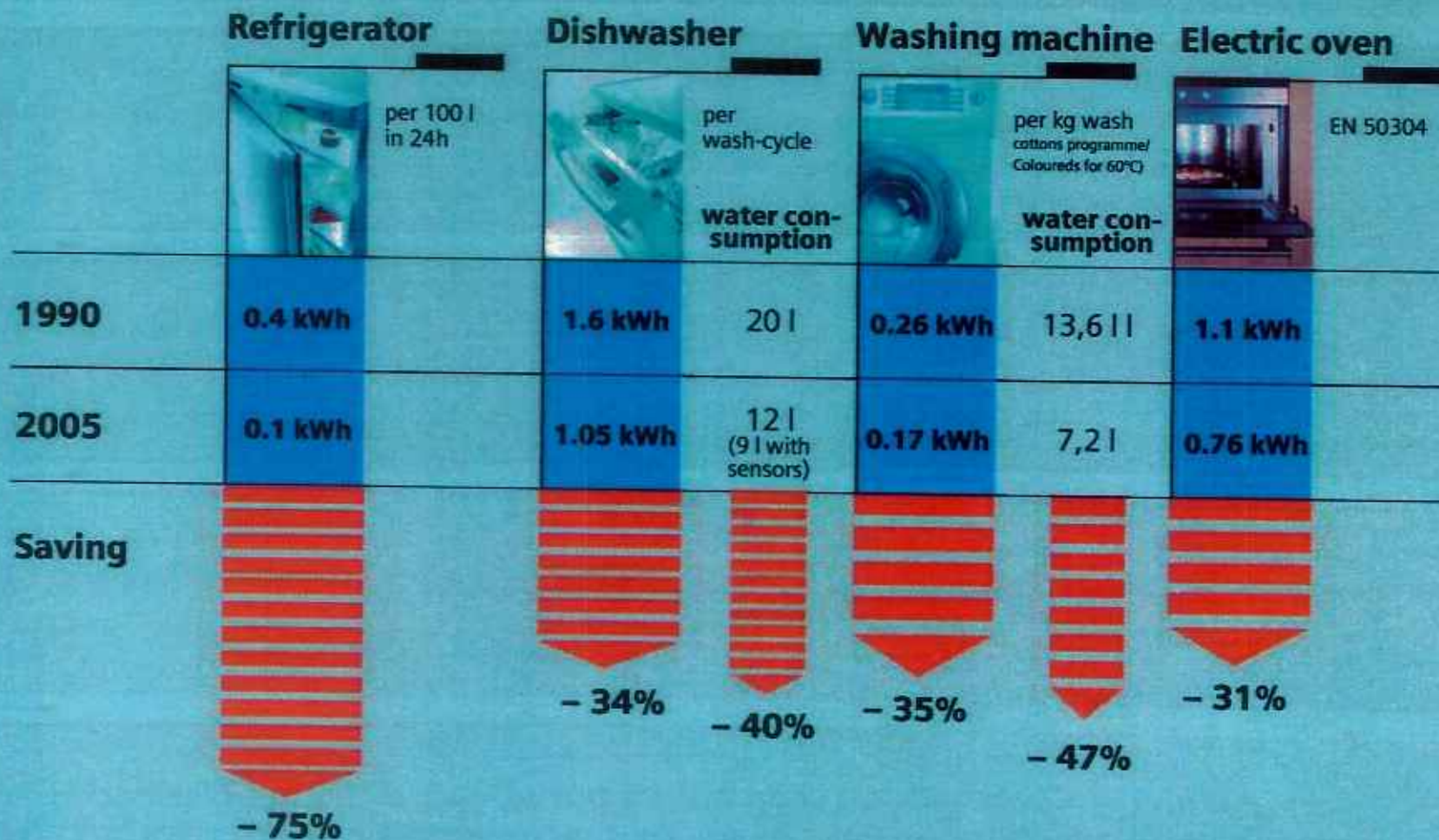
Chapter 11b

Special Transformers

- Energy Savings via Power Electronics
- Talk 2 Overview
 - Executive Summary
- Chapter 11 Review
- Induction Heating

Energy Savings via power electronic Motor Drives

Reduction of Energy and Water Consumption (1990 – 2005)

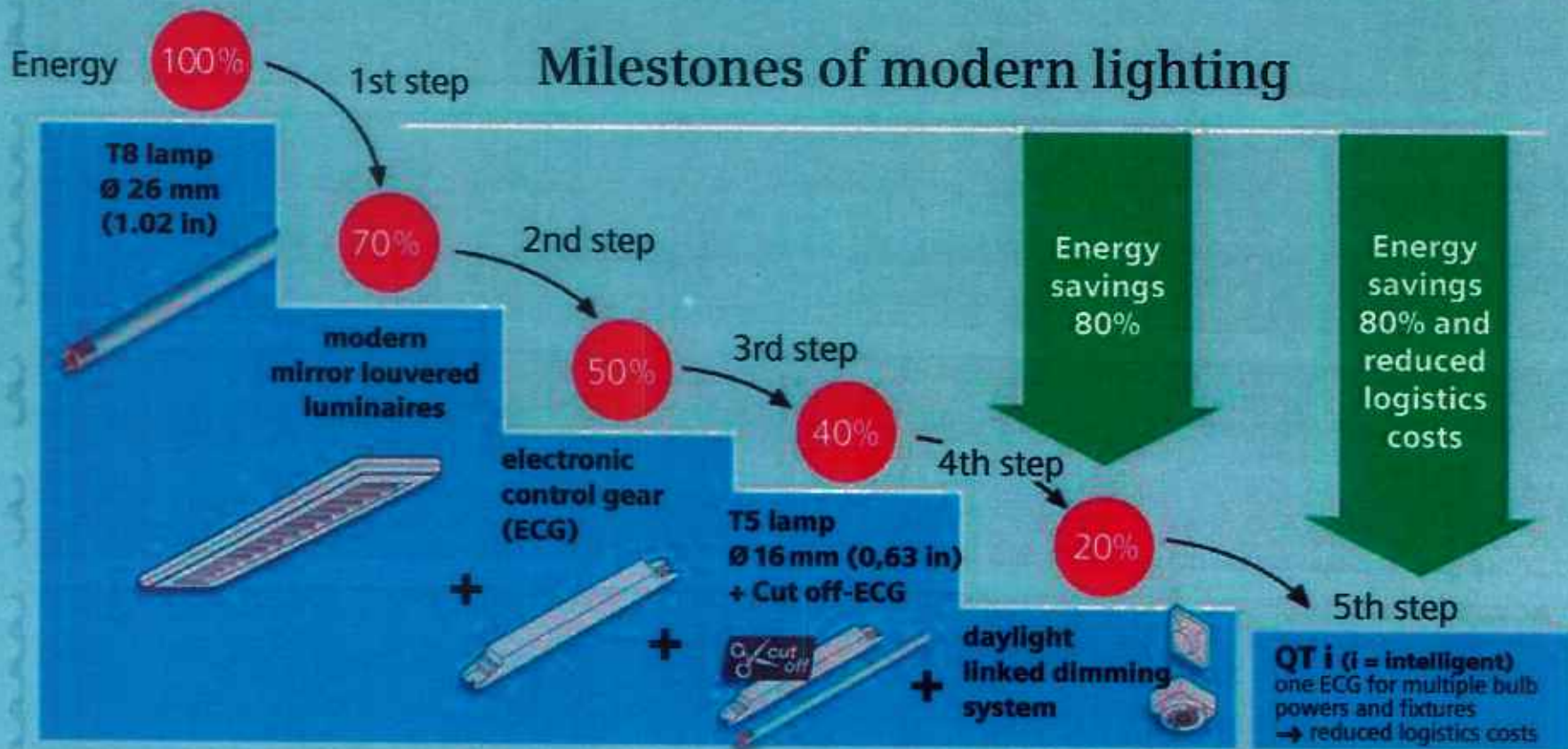


Source: BSH Bosch und Siemens Hausgeräte GmbH

Lighting

Lighting a factory hall

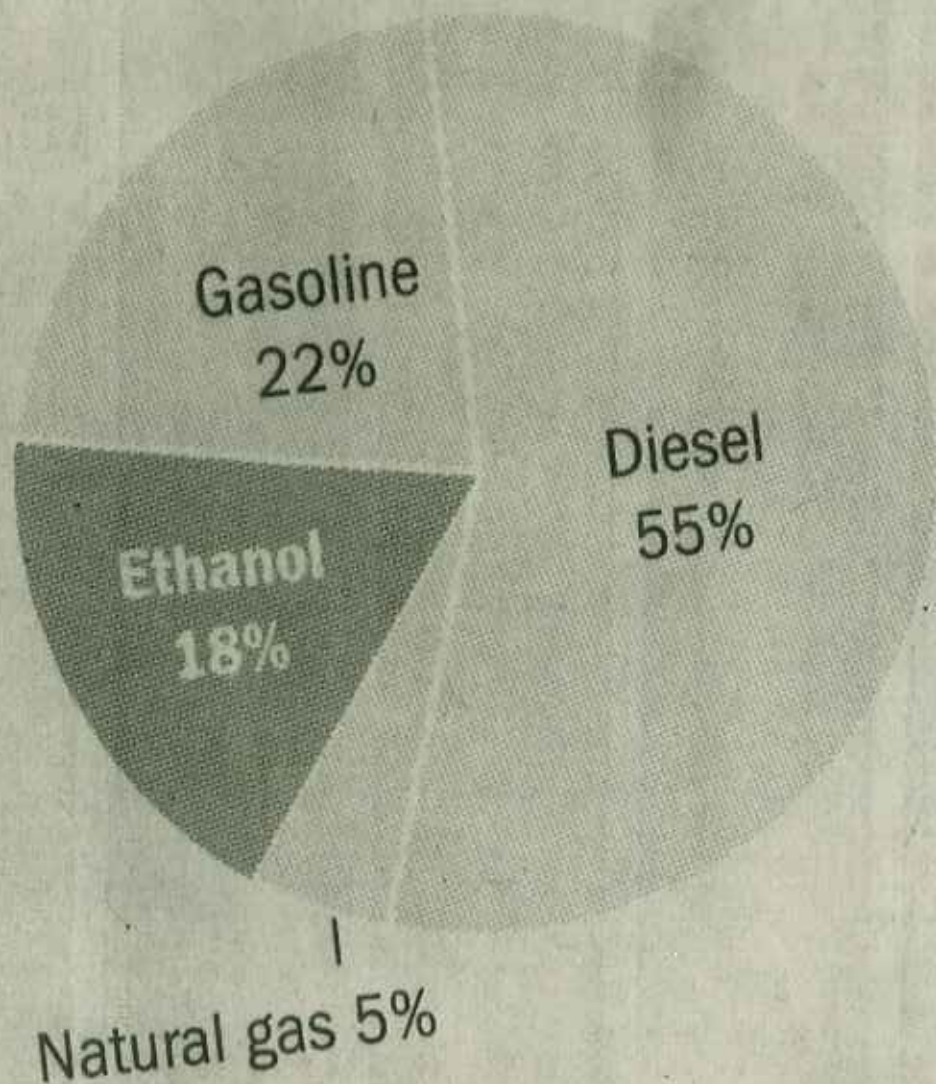
- Approximately 3,700 conventional fluorescent lamps, no reflector, conventional ballast (~1.1 million kWh of electricity used every year)
- Estimated potential savings about 42% = 460,000 kWh per year



Source: Osram

Role Model

U.S. energy-policy makers may be reluctant to take cues from Brazil, which relied on government edicts such as mandating ethanol sales at filling stations (left) to wean itself from imported oil. Share of Brazil's overall transport market by fuel:



Note: Includes trucks

Source: Brazilian gov



Talk #2 Sign up

Compare

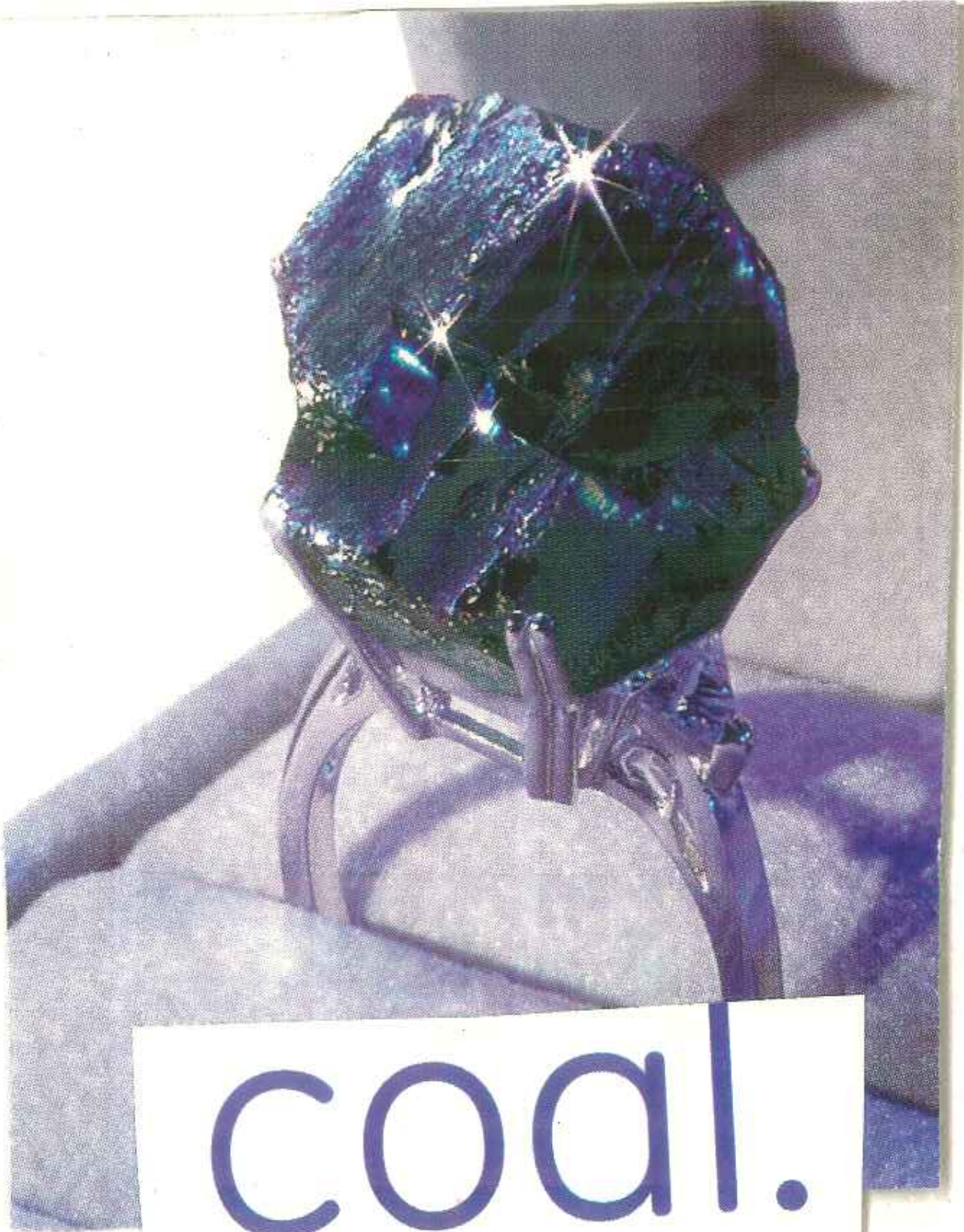
contrast

2 Sources

Coal
Nuclear
Hydro
Gas Turbine

Wind
Solar
GeoThermal
Tidal

Forever



coal.



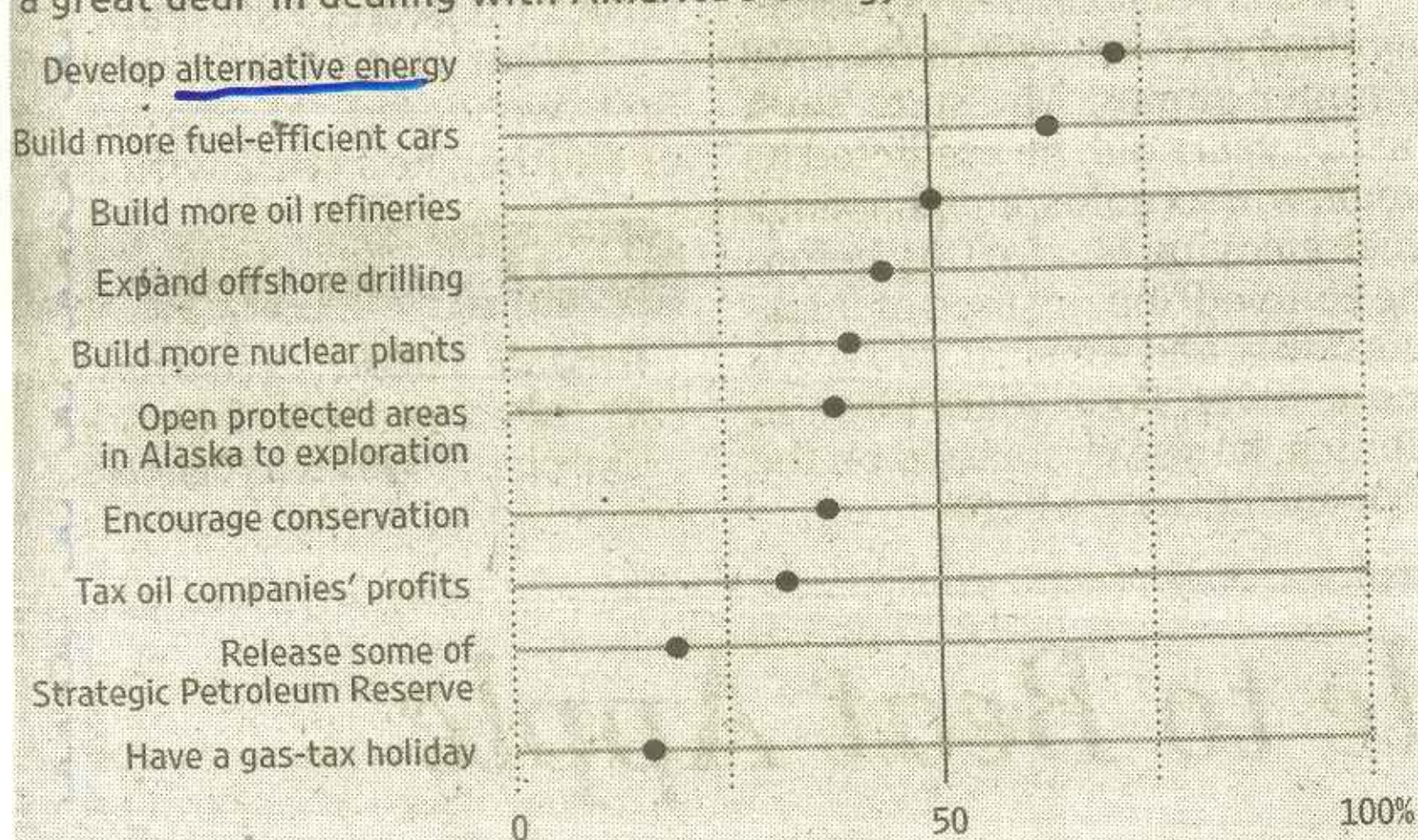
KISS

Your Ash Goodbye.

Cornfused About Ethanol,

Energy Strategies

Percentage of voters who say each of the following will accomplish 'a great deal' in dealing with America's energy needs



Source: WSJ/NBC News telephone poll of 503 registered voters conducted Aug. 15-18; margin of error: +/- 4.4 percentage points

Denmark
70% of nations power
from

Choose two power gen
and
Compare



*"That's my favorite story. But tonight
I'd like to hear both sides."*

Talk # 2

You give both sides of your
(2) energy sources

What is an Executive Summary?

An executive summary (required in .621 Version III) is just what it says it is: a summary of the entire document directed at the executive ---an intelligent, decision-maker who may or may not be a technical expert. This executive may not read the rest of the document; s/he has to be able to understand the project based on this one page.

- The executive summary is usually a page or less (although summaries of very long reports are longer).
- It is on a separate page.
- It appears after the Table of Contents and the List of Tables and Figures and before the main proposal or report begins.
- It is double spaced.
- It has no reference citations.
- It's rare to have graphics in an executive summary.
- It summarizes background and significance, key concepts, schedule, budgets, and concluding recommendations and/or proposals.
- The language in an executive summary is for the general, educated reader, not for the technical expert.

Suggestion

Write the executive summary last.

- It is not an introduction. It's a entirely separate section of the document that summarizes the entire report or proposal.

summary properly will have the same effect on other nonfiction readers.

* Tips:

- Keep your main points in mind as you write the summary. You do not need to include every point in the summary, but ensure that the major ideas are covered succinctly.

Please Share Your Tips with Us

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Things You'll Need:

- [Word-processing Software](#)
- [Printer Paper](#)
- [Computers](#)
- [Printers](#)
- [Thesauri](#)
- [Report Covers](#)
- [Dictionaries](#)

Project Details:

Skill Advisory: Easy



Questions Answered and Topics Addressed:

- How to write an executive summary
- What is an executive summary
- Steps for writing an executive summary

✓ Check out Thousands of How-To Solutions in eHow's Centers

- | | | | | |
|---|---|--|--|---------------------|
| • Automotive | • Careers & Education | • Computers & Home Electronics | • Family & Relationships | • I |
| • Food & Entertaining | • Health | • Hobbies & Games | • Holidays & Traditions | • I |
| • Personal Care & Style | • Pets | • Sports & Fitness | • Travel | |

e-Business Plan: Business Description

Writing your e-business plan begins now!

Previous lessons in this tutorial have provided background information and emphasized preparation to write the e-business plan. The business description section of your e-business plan represents the first substantial section you have to write. This lesson gives you an overview of the business description section with links to additional lessons that assist you in writing your mission statement, goals, and objectives.

The lesson outline is:

What is the Business Description?

Business Concept

--Industry analysis

--Mission statement

--Business goals

--Project objectives

--Value proposition

Products and Services

What is the Business Description?

The business description describes the nature and purpose of the business and includes the firm's mission statement, goals, value proposition, and description of products and services. The business description delivers this content in a straightforward and informative manner, but with an upbeat and inspiration tone. The purpose of the business description is to objectively explain and justify your business idea in a positive and enthusiastic manner.

The business description includes two sections with both required and optional content. The business concept section includes an industry analysis, the mission statement, business goals, value proposition, and, optionally, the objectives and business model. The products and services section is a concise description of what the business will sell or deliver to the customer.

Business Concept

The business concept section gives the reader the big picture about what the business will do and how it will succeed.

Industry analysis: A good way to open this section is with a brief industry analysis. An industry is a group of businesses that manufacture, distribute, or sell similar products or services. An industry analysis defines the industry in which the business will operate (e.g., retail, information distribution, financial services) and uses reliable and objective data to show the future prospects of the industry and, by implication, the business.

Sources of information for the industry analysis include research companies such as Dun & Bradstreet, Standard & Poor's Investor Services, and the Risk Management Association who publish business directories and industry surveys. Trade and industry journals publish articles that include quantitative data, trend analysis, and influential environmental factors that are affecting their respective industry sectors. These resources will be available in most university libraries.

Business Case Box 2

A traditional industry analysis is less critical in a business case because, obviously, the senior management and board of directors will know as much, or more, than you about the industry in which the company operates. However, there would be no harm in highlighting some important industry-based data, especially as it applies to the proposed e-commerce venture.

For example, recently we critiqued a business plan for expansion of a grocery store chain into a nearby city. That plan included historical and projected data on the chain's performance in its current locations, an extensive description of the grocery market in the new city, location analysis data, assessment of internal and external environmental factors (e.g., the impact of on-line grocery stores), and a list of assumptions upon which all the projections were based.

Alternatively, this is an opportunity to write a "company analysis" that has the same purpose as an industry analysis, but with the focus on the company. Again, the reader will be extremely well-informed so everything has to be relatively new and applicable to the proposed venture.

Topics that would likely be of interest to business case readers in the company analysis include:

- consistency of the electronic commerce opportunity with the company's history and current initiatives
- an analysis of why the company should adopt this particular initiative instead of other opportunities
- environmental factors in the industry and the company that may positively and negatively impact on this initiative

Assignment 2: Identify the industry within which your e-business will operate and write an industry analysis. Follow the guidance provided by your instructor to submit, present, or save this analysis.

Mission statement: With the big industry picture in the reader's mind, narrow the focus to your business. After a few words of introduction, state the mission of your business and provide a brief justification and explanation about the importance of this mission, perhaps in light of the industry analysis just presented. Or, in the business case, explain how the e-business initiative will contribute to the fulfillment of the company's mission (see Business Case Box 3).

Business Case Box 3

When is a mission statement not a requirement in a business plan? When the business plan is a business case. The reason why is obvious -- the initiative being proposed is being developed in an organization that (hopefully) already has a mission statement. Instead include the company's mission statement in the business case and explain how the e-business project will support that mission.

Alternatively, the business case may present a "project purpose statement" that contains all the characteristics of a mission statement (e.g., visionary, broad, short) and is consistent with the company's mission. Being consistent with and supportive of the company's mission statement is critical for political acceptance of the e-business initiative.

A mission statement is a declaration of what a business aspires to be. This can be an intimidating exercise, especially if your business idea is still being formed in your own mind. It is also an important exercise because the mission statement appears early in the plan and is a starting part for defining the business and writing the plan.

The Mission Statement lesson provides explicit instructions to write the mission statement and illustrates the process with sample mission statements. When you are ready to write your mission statement, complete

Business Case Box 4

The major exception to the don't-include-objectives-in-a-business-plan rule is the business case. In the business case much of the uncertainty that is inherent in start-up e-business plans does not exist. Also, the mission and goals of the initiative should be no surprise to the senior management and board of directors because it is likely they authorized the development of the business case.

Instead, these business case readers are most interested in what resources will have to be reallocated or acquired to carry out the initiative, and what benefits will be received in return. Requirements such as these inevitably lead to the setting of objectives as part of the business case. Finally, this is easier to do because many of the staff who will be responsible for achieving the objectives are in place.

So, unlike most business plans, a business case is likely to include a set of specific, measurable, action-oriented, realistic, and time-bound objectives necessary to carry out the proposed e-commerce initiative.

You should seek guidance from your instructor to determine whether writing project objectives is a required or optional part of your business plan. If you do need to write some objectives, then the Project Objectives lesson will assist you. When you are ready to write your project objectives, complete that lesson and return here to complete assignment 5.

Assignment 5: Write at least three SMART objectives for each of the business goals you developed in assignment 4. The best way to present these objectives in your plan is to make them part of the goal they relate to. That is, following each goal statement, list three or more objectives that contribute to the achievement of the goal. Follow the guidance provided by your instructor to submit, present, or save these objectives.

Value proposition: So far you have told the business plan reader the answers to the what (mission statement), how (goals), and when, where, who, and by how much questions (objectives). What's missing? The answer to the why question.

The value proposition describes the benefits that a company's products or services provide to customers and/or the consumer's need that is being fulfilled. In other words, why should a customer buy your product or service?

Since the focus of the value proposition is on the customer, the proposition should be stated from the customer's perspective. Value propositions (with examples) may be based on lowest cost (buy.com), superior customer service (amazon.com), reduction in product search (autobytel.com) or price discovery (deal-time.com) costs, product customization (dell.com), or provision of niche products (anything left-handed).

This is also the "first-best" opportunity to tell the reader who are your customers. Complete information about your target markets will be covered in the market analysis section, but here you should identify your primary, secondary, and, if necessary, tertiary target markets.

Assignment 6: Formulate and write the value proposition of your e-business. This should be a paragraph or two that clearly states the benefits your business will offer to customers and justifies why this is an important proposition for customers and in the marketplace. Follow the guidance provided by your instructor to submit, present, or save this value proposition.

Finally, in your business concept, include any other important information about the business that you feel is important for an investor or other business plan reader to know. For example:

- Any unique or special features about the business that will appeal to customers or encourage the success of the business.
- The legal form of the business: sole proprietorship, partnership, or corporation (optionally, this can be included in the operations section).
- If the business is small, then the management plans (i.e., who will manage the business and their background) can be included here. If the business is a large one, then management plans are best included in the operations section (more information about this is included in the Operations lesson).
- If known and/or important, where the business will be physically located.
- If the business is an existing business, then a brief history and its current position in the marketplace can be reviewed.

Products and Services

This section of the business description offers the reader a thorough and straightforward description of the products or services the business will provide to customers. For example, include product characteristics such as functionality, design, styles, and colors.

The product/service description should be complete enough to give the reader a clear idea of your products/services, but not overly detailed or technical so the reader is confused or loses interest and attention. If the product is unusual or not easily described, include a picture or a drawing. If a range of products or services are being offered, highlight the principal one or two and list the rest of the range here and/or put the full product/service range in an appendix. As much as possible, describe the product or service from the customer's perspective.

The description should tell the reader what makes your company's product or service different or unique in the marketplace. More detail on this will be provided in the competitor analysis section, but a brief highlighting of product distinctions and key selling attributes here will help the reader understand the product or service better.

After describing the product or service, tell the reader what benefits the customer will receive from purchasing the product or service (e.g., what problem is being solved). This will most likely further explain the value proposition statement defined earlier.

Assignment 8: Write a products and services section for your e-business. Follow the guidance provided by your instructor to submit, present, or save this product/service description.

Navigation Guide for the e-Business Plan Tutorial

Introduction to the E-Business Plan Tutorial

--Top Ten Resources for Writing an e-Business Plan

Fundamentals of e-Business Planning

Writing a "Read Right" Plan

Executive Summary

Business Description

--Mission Statement

--Business Goals

--Project Objectives

EXECUTIVE SUMMARIES COMPLETE THE REPORT

In A Nutshell



"Few writers think of the messages they are trying to communicate in a report."

--Bruce Ross-Larson, *Riveting Reports*, p. 30

CONTENTS

- [Executive Summaries Provide the Essence](#)
 - [Abstracts Differ from Executive Summaries](#)
 - [Executive Summaries Are Called Different Names](#)
 - [Executive Summaries Briefly Cover Every Main Section](#)
 - [Strong Beginnings Encourage Good Reading](#)
 - [Four Major Points Emphasize Summarizing](#)
 - [How-To Involves Careful Writing](#)
 - [Executive Summaries Remain Old](#)
-

I am indebted to former students for many of the ideas suggested in this link.

Executive Summaries Provide the Essence

Executive summaries complete the report, whether an analytical report memo or whatever. Executive summaries are the parts of the reports that are read first. Readers may not even get to the detail in your report. They read the executive summaries to see if the rest of the report is worth reading.

Executive Summaries Are Called Different Names

Executive summaries go by so many different names. Sometimes the executive summary is called an Abstract. You usually find that designation in scientific papers and academic efforts. You can also call the Executive Summary simply a Summary. If you call the Executive Summary a precis, you are probably misnaming it. A precis is usually a sentence summary.

Abstracts Differ from Executive Summaries

Abstracts differ from executive summaries, because abstracts are usually written for a scientific or academic purpose. You see abstracts related to scientific lab reports. You see abstracts related to databases, where a summary or abstract of the article is given. Abstracts, according to Janis Ramey in "How to Write

Unscheduled absenteeism reported to supervisors as being caused by illness or personal problems, in some cases, caused the underlying difficulty with child care. Difficulty with child care is considered to be the third largest cause of absenteeism in the company. Tardiness provided sufficient cause for nine employees from commuting delays because child care is inconveniently located.

For this selected sample, respondents support and prefer care to be located at or near work. Child care programs can be an effective management tool that serves the goals of both the company and the program participants as well. Company centers are one of the more expensive options for employers, but these centers represent the greatest potential for solving a wide variety of child care needs if properly designed.

Setting up a daycare program on site at B. Insurance Company can be accomplished as a non-profit organization with a board of directors consisting of parent and company representatives.

Comments: The previous executive summary is well written, but it has some flaws that should be noted. In the Analysis ("For this selected sample . . .") the point should be more strongly driven home about parental involvement. That will further make the Decisions or Recommendations ("Setting up . . .") stand out. Of course, many sentences that have "is" and "are" need power verbs. For example, the sentence starting "The scope of this report is . . .," could read: "This report concerns B. Insurance Agency located in Thousand Oaks and its attempts to establish a daycare center."

Notice how the writer has cleverly mentioned over half by saying in parentheses, $n=14$. Did you note that the executive summary did not start with the question? It started with the theme and perspective to prepare the reader for the problem question. Did you read how strongly worded and clearly stated was the problem question? The problem question still remains the heart of the report, including the executive summary.

All main sections of the report were covered in the previous executive summary. Only the major percentages of significance were included in this executive summary. The reader can look at this executive summary without even reading the report.

Strong Beginnings Encourage Good Reading

Executive summaries demand special attention. The first sentence must grab and keep the reader. You cannot afford to start your executive summary with one of the following approaches:

- The purpose of the report
- The problem question
- All kinds of background to the report.

The executive summary demands your best thinking.

Four Major Points Emphasize Summarizing

When you complete your executive summary, you have one more summary to write. You start with an introductory sentence, such as:

- You underline key passages.
- You think how the report will look on paper.

Now, you have the daunting task of writing the actual executive summary. You think of your first sentence. It must be the best sentence you have ever written in your life. You must grab the reader to peruse the entire executive summary. Ask yourself these questions:

- Did I pinpoint the essence of the message?
- Did I understand the problem, the real problem?
- Did I state the idea as a symptom and as a purpose?
- Was I sure I grasped what the reader must find in the entire report?

It is not unwise to group items together in paragraphs. For example, the first paragraph of your executive summary can have the problem and the purpose. In the second paragraph you can explain the scope, limitations, and the procedures. You may want to devote a separate paragraph to the procedures.

When you write the Considerations or Findings, concentrate on the major findings. Make sure you stress just numbers and no conclusions or generalizations as you are writing. Force yourself to only think of the data. Make sure you cover every major part of the Considerations so the report has cohesion.

When you reach the Analysis or Conclusions, concentrate on the generalizations. Take apart the message. Look carefully at each bullet or number and say: Is that important? Upon reaching the Decisions or Recommendations, talk about specifics. Tell what you want the company to do, based on the data. Tell what you want individuals to do. Then, ask yourself: Have I written the report in miniature? Could someone look at this report and tell the essence of the message? Could someone read this summary and not read the report? Has the message been distilled?

Executive Summaries Remain Old

One always thinks reports and report writing are a relatively new phenomenon. History teaches us a different lesson. During the Manchu Dynasty (called by the Chinese, Qing Dynasty) in 1729-30, an incident of treasonous consequences happened. It started with a treasonous letter and built to three secret reports written by General Yue (pronounced Yu-a) in Hunan. The Emperor, Yongzheng, who ruled from Beijing, received these secret reports by special military messenger and in special boxes. These reports conformed to a certain format. Thus, begins our story.

General Yue was approached one day while riding in his sedan chair by a mysterious messenger. The messenger handed General Yue a letter; the messenger was promptly detained. General Yue became bothered as he read the contents in his office by the signature of Summer Calm, the Leaderless Wanderer of the Seven Seas. You think about e-mail signed now with emoticons and pseudonyms? You think about chat lines with made-up aliases. Who was this Summer Calm? The messenger was interrogated, first politely and then with torture. The messenger was interrogated, because the letter contained libelous comments against the Emperor and accused the Emperor of not caring about the people. General Yue began to make out his first secret report to the Emperor. In the secret report the General followed this format:

- introductory title to show the content
- main points sequentially arranged

You may want to check the [home pages](#) for further help and additional links. Don't forget to check the analytical report memo link.

(c)G. Jay Christensen, 1997

Last updated Friday, September 4, 2002



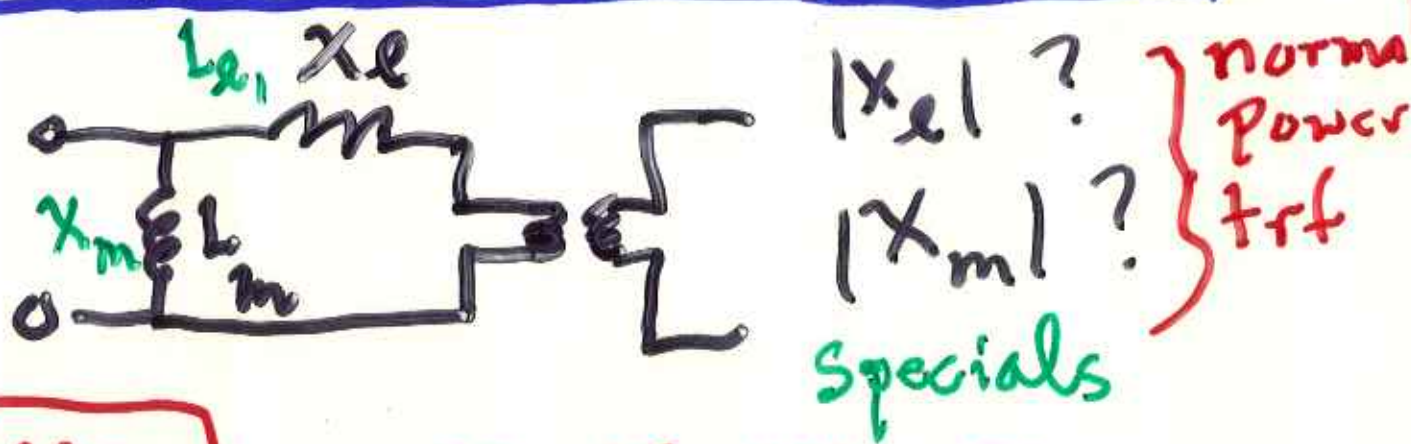
① How to Adjust $V \pm \Delta V$ as required via "taps"

② How to measure ON 500kV line?

③ all fluorescent lights employ big X_L (good)

CHAPTER 11 Special Transformers

Autotransformers, current transformers, voltage transformers and high leakage reactance transformers are discussed in this chapter to give the student an idea of the many industrial applications of transformers. The dozens of photographs and technical details provide a visual appreciation of these important devices.



Ch11 HW

12, 13, 14, 15

Outline solutions ~~next~~
~~week~~

Figure 11-2 Single-phase pole-mounted distribution transformer rated: 100 kVA, 14.4 kV/240 V/120 V, 60 Hz.

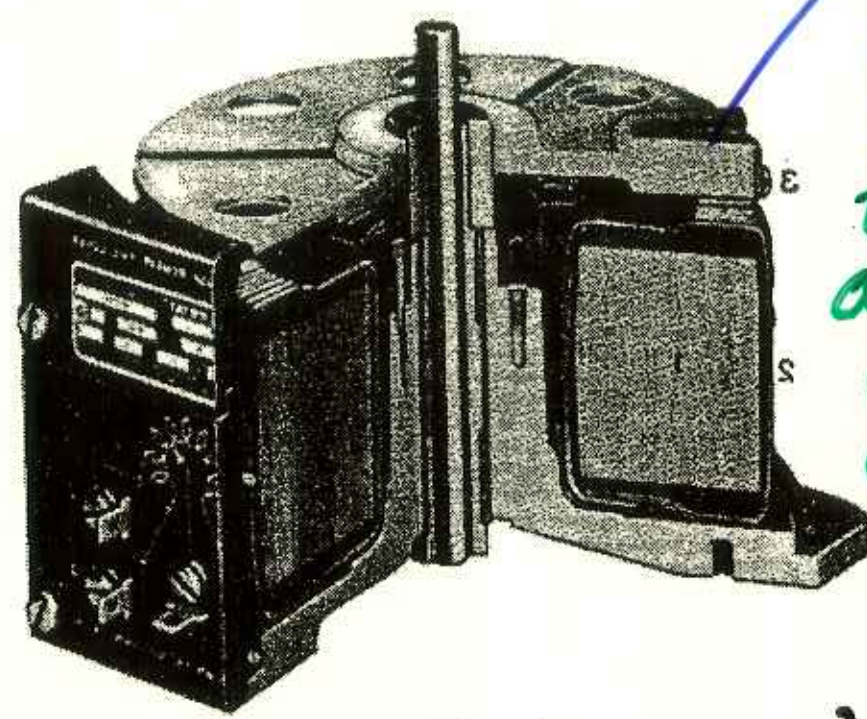
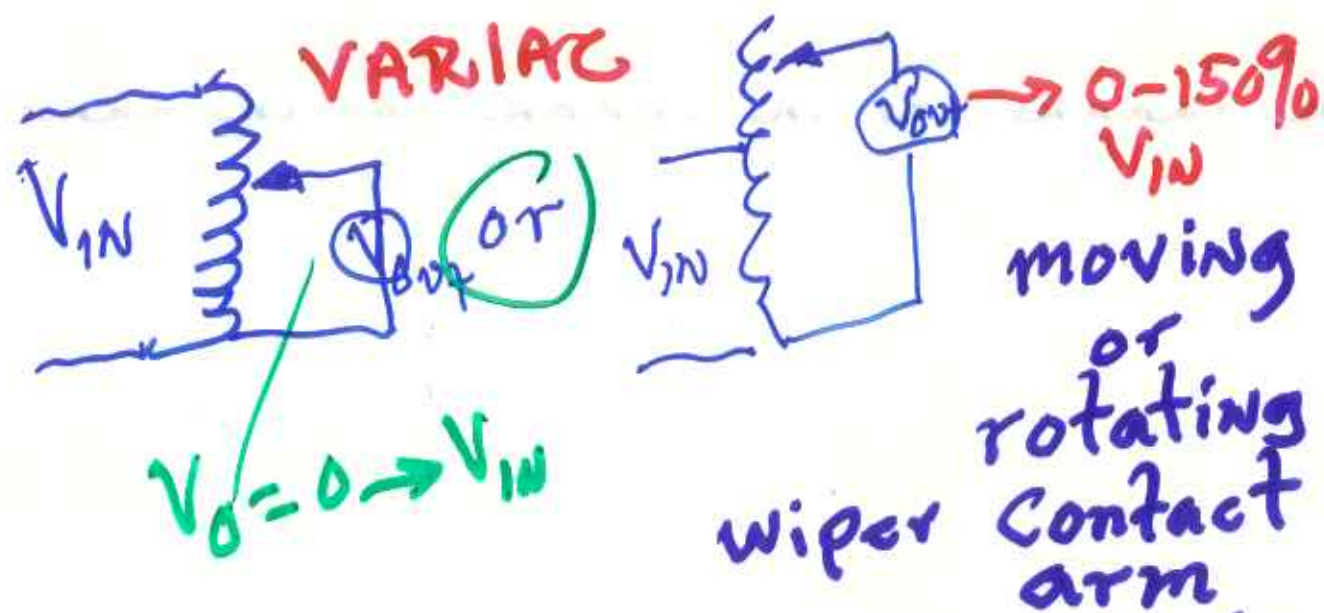


4-
3 ϕ 14KV

25A @ 120V = 3KVA
50A @ 120 = 6KVA
100A @ 240 = 24KVA

3 ϕ via 3 wire to homes?

Draw for exam #1



touching wire coil wound around the core

Use for 120 USA \rightarrow 100 Japan

240 Europe \rightarrow 120 USA

19

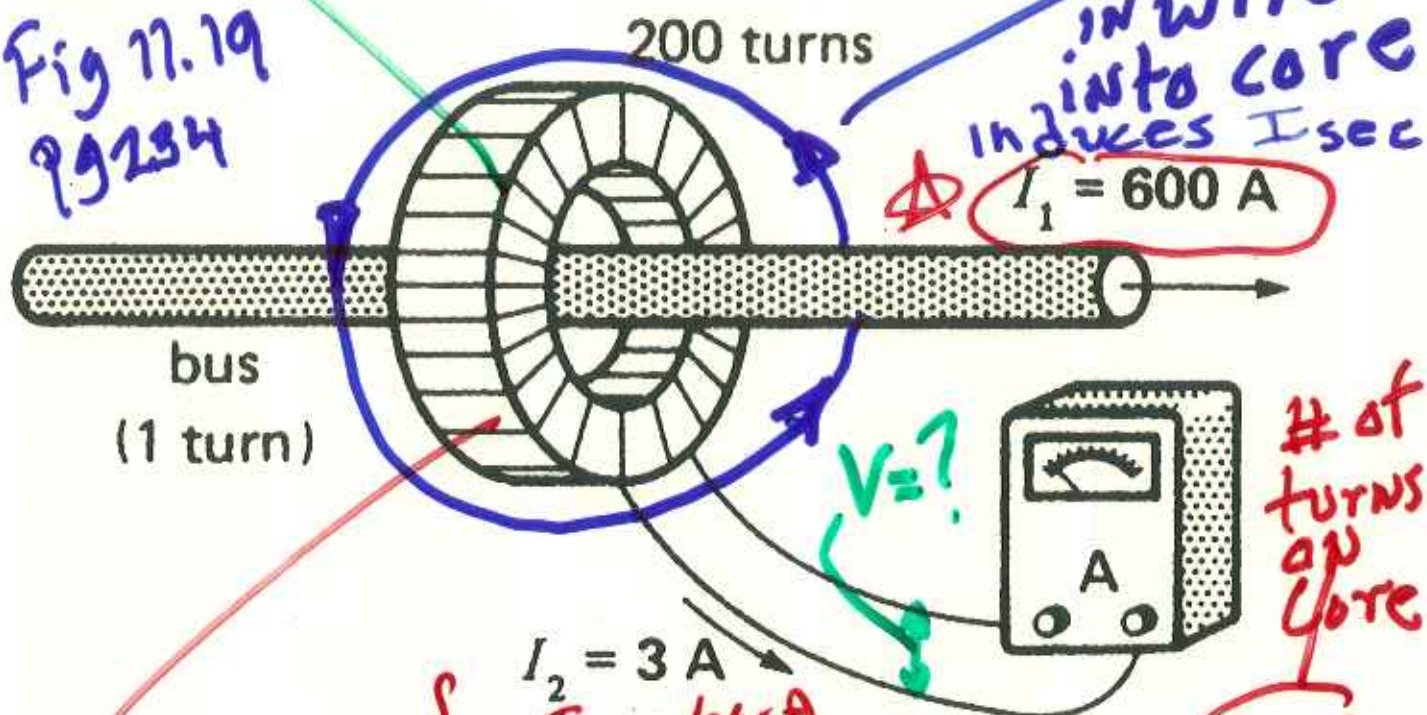
Clamp-on Ammeter Snap-on



Surround I carrying wire
by low R magnetic core

Core is best of
Torroidal shape

Fig 11.19
99234



This case $I_2 = 3 A$
for $I_1 = 600 A$
 $I_{wire} \times 1 = I_{coil} \times 200$

for 600A in wire, $I_{coil} = 3 A$

Turns ratio:
1 : 200

with
200
turns
 $V = 200 V_{wire}$

$$\frac{CT}{1000A} \\ 5A$$

11-11

Z_{meter} is 0.15 Ω

1 TURN $\rightarrow 600A$ i Trf is $\frac{1000A}{5A}$

$Z_{meter} = 0.15 \Omega$ its not 0

Secondary current = $600 \times \frac{5}{1000} = 3A = I_{coil}$

Voltage across the ammeter = voltage across the secondary winding = $3 \times 0.15 = 0.45V$

b. Primary voltage = $0.45 \times \frac{5}{1000} = 2.25 mV$

Because the primary winding is connected in series with the line, it effectively produces a voltage drop of 2.25 mV.

c. New ratio is $\frac{1000}{4} = 250A/5A$ This is obvious because the core "sees" the 4-turn coil as a 4-turn primary winding.

600A wire looped through the core 4* instead of 1*

n from 1 to 4

$$\frac{1000A}{5A}$$

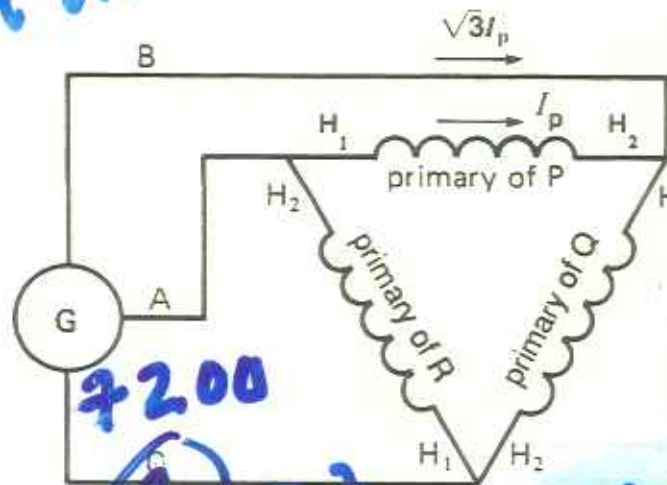
$$\frac{250A}{5A}$$

extra turns useful to more accurately measure a lower I

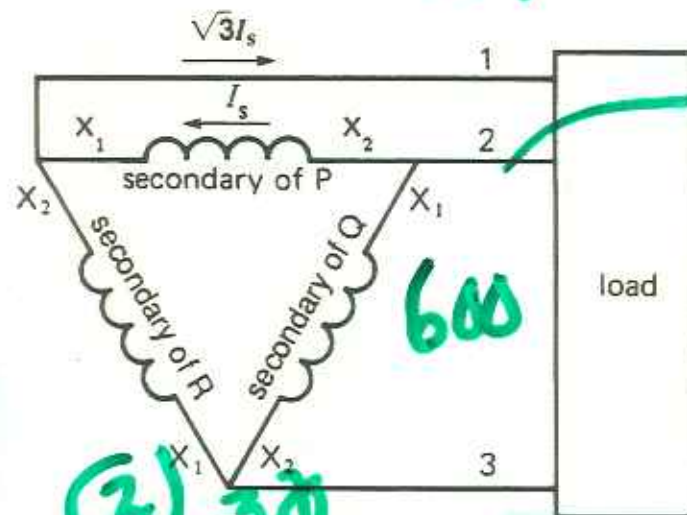
① $N_1/N_2 = ?$

Figure 12-2 Schematic diagram of a delta-delta connection and associated phasor diagram.

3 ϕ IN



3 ϕ out

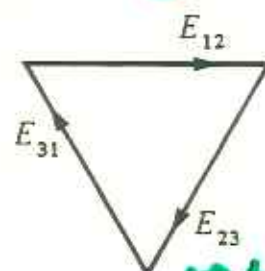
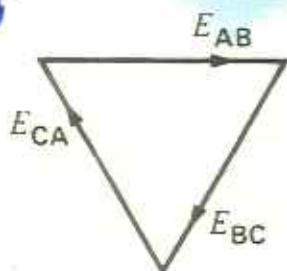


line $I_{out} = ?$

③ last time
Trf does
Not limit
S flow

② $S_p = 250 \text{ KVA}$

② $S_s = 250 \text{ KVA}$



$I_{e(max)}(\text{gen}) = ?$
 $I_p^{max}(\text{trf}) = ?$

$I_{e(max)}(\text{load}) = ?$
 $I_s^{max}(\text{trf}) = ?$

Only given $S_{3\phi}(trf) = 250 \text{ KVA}$

(load) $600 \sqrt{3} \leq 7200$ (IN) Choose

$$\frac{250}{3} \sim 83 \text{ KVA per phase}$$

$$I_{\text{max}} (\text{each } 600 \text{ V coil}) = \frac{83 \text{ KVA}}{600} \sim 140 \text{ A max}$$



Could wire line
for any I_{max}
say $(140) \sqrt{3} = 242 \text{ A}$

What if try to place a load
 $S_2 = 600 \text{ KVA}$ on Δ with $V_{\phi} = 600$
for $S_2 = \frac{600,000}{600 \sqrt{3}}$

$I(\text{line})$

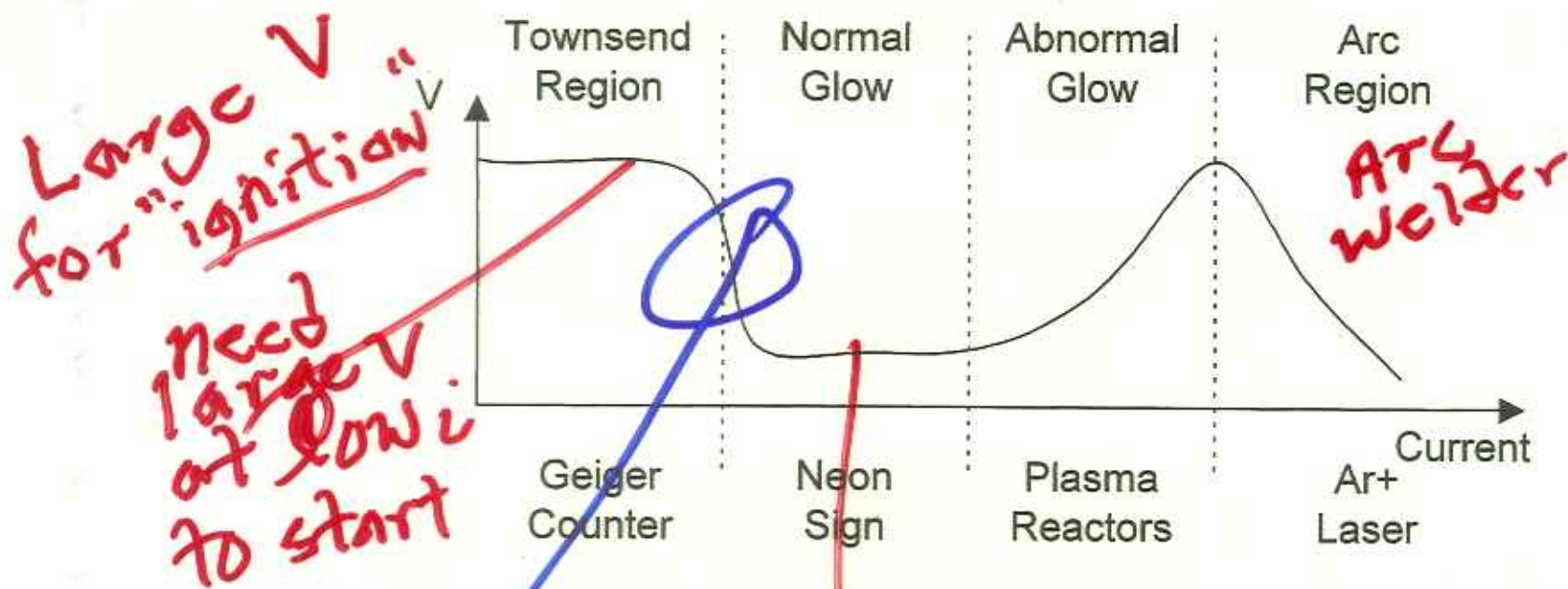
$$I(600 \text{ V coil}) = \frac{577}{\sqrt{3}} = 333 \text{ A coil OK?}$$

577 A line OK?

line and coil Both destroyed!
Wire

Required V for Starting vs Operation of Fluorescents

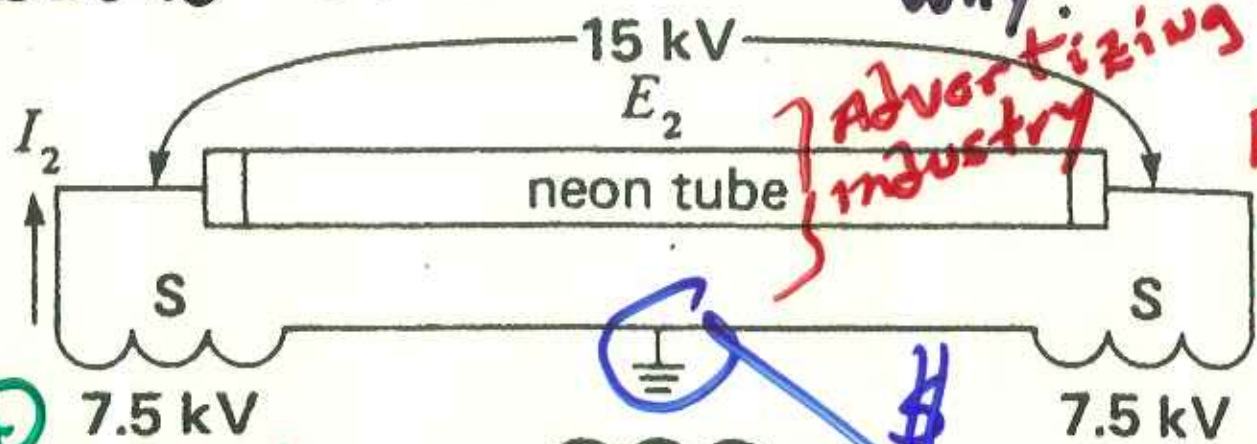
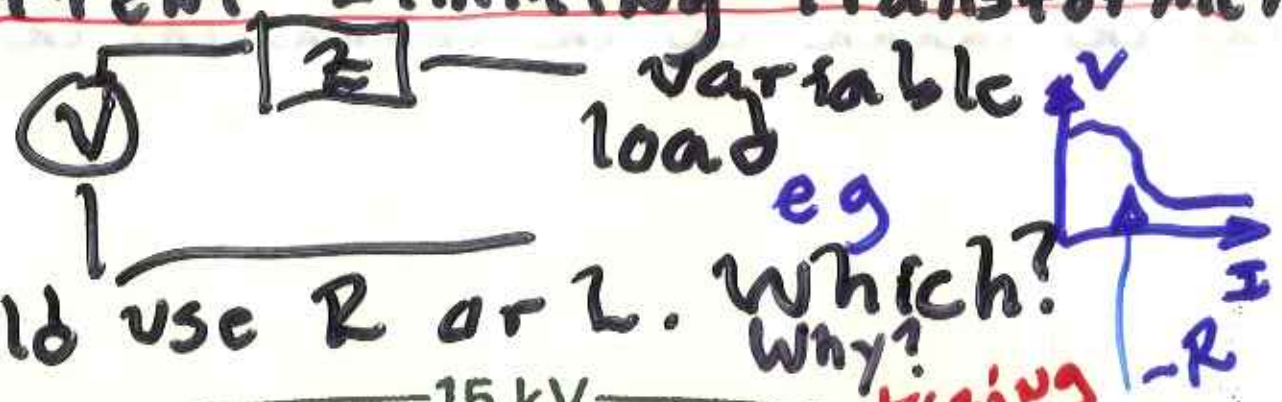
Gas discharge V-I characteristics look like nothing you will ever encounter from a semiconductor device:



Fortunately the gas discharge emits light over the entire length d between electrodes, except in the region of length w in front of the cathode.

24 Current Limiting Transformer

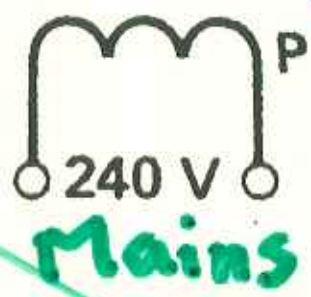
L
NO
LOSS
SKILL
I
LIMIT



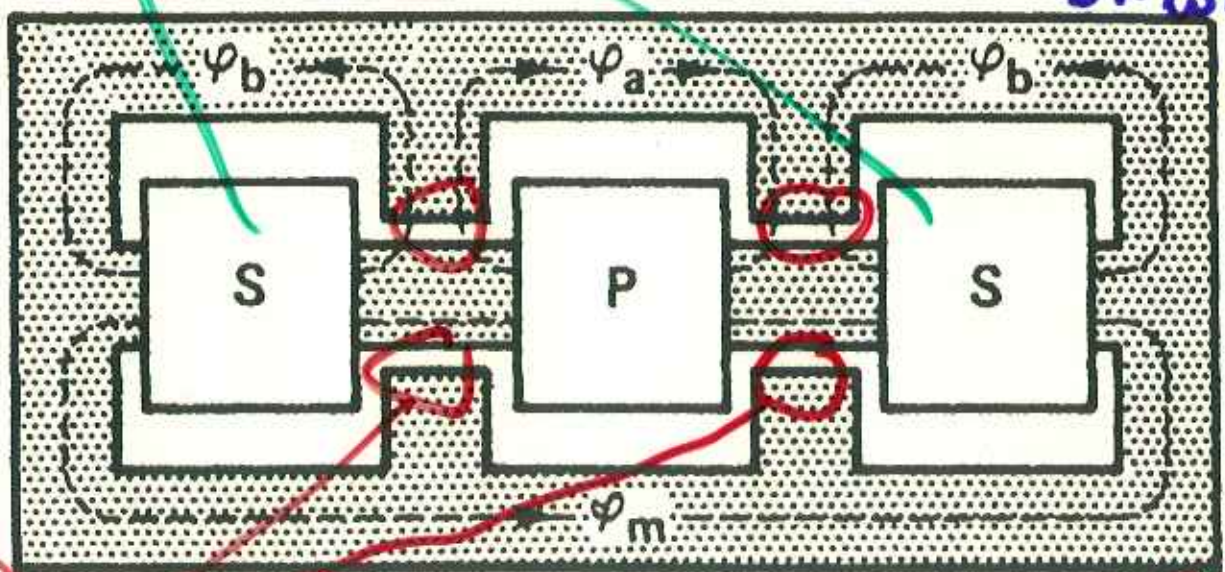
Adver
tizing
industry

Fig 11.24
Pg
236

① S not on top of P why

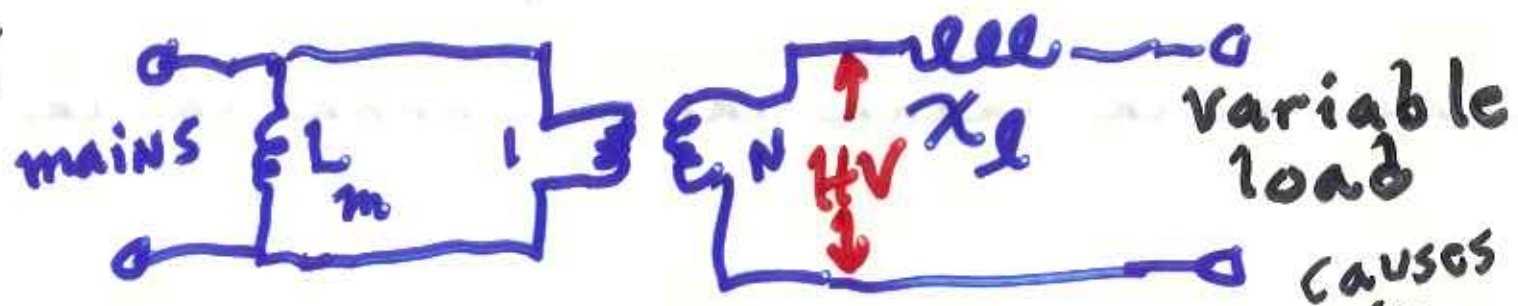


Center
tap
saves
insulation
on windings



② Air gaps increase leakage flux
increase X_L (value)
 X_L is a series inductor

25



$I_{out} = 0$, V_{out} is maximum

$V_{out} = V_{sec} - I_L X_L$

open circuit

$5KV = (15mA) X_L$

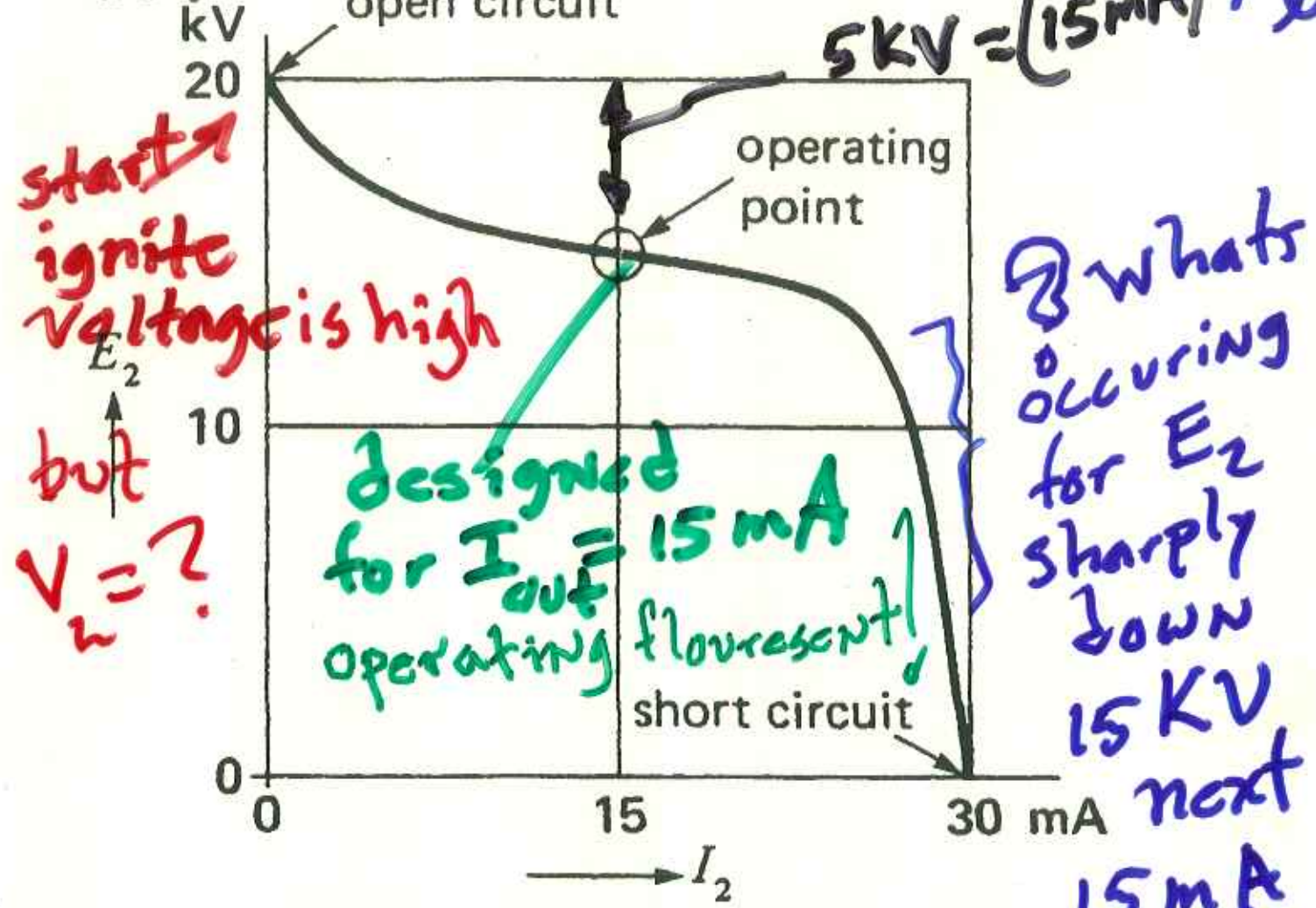
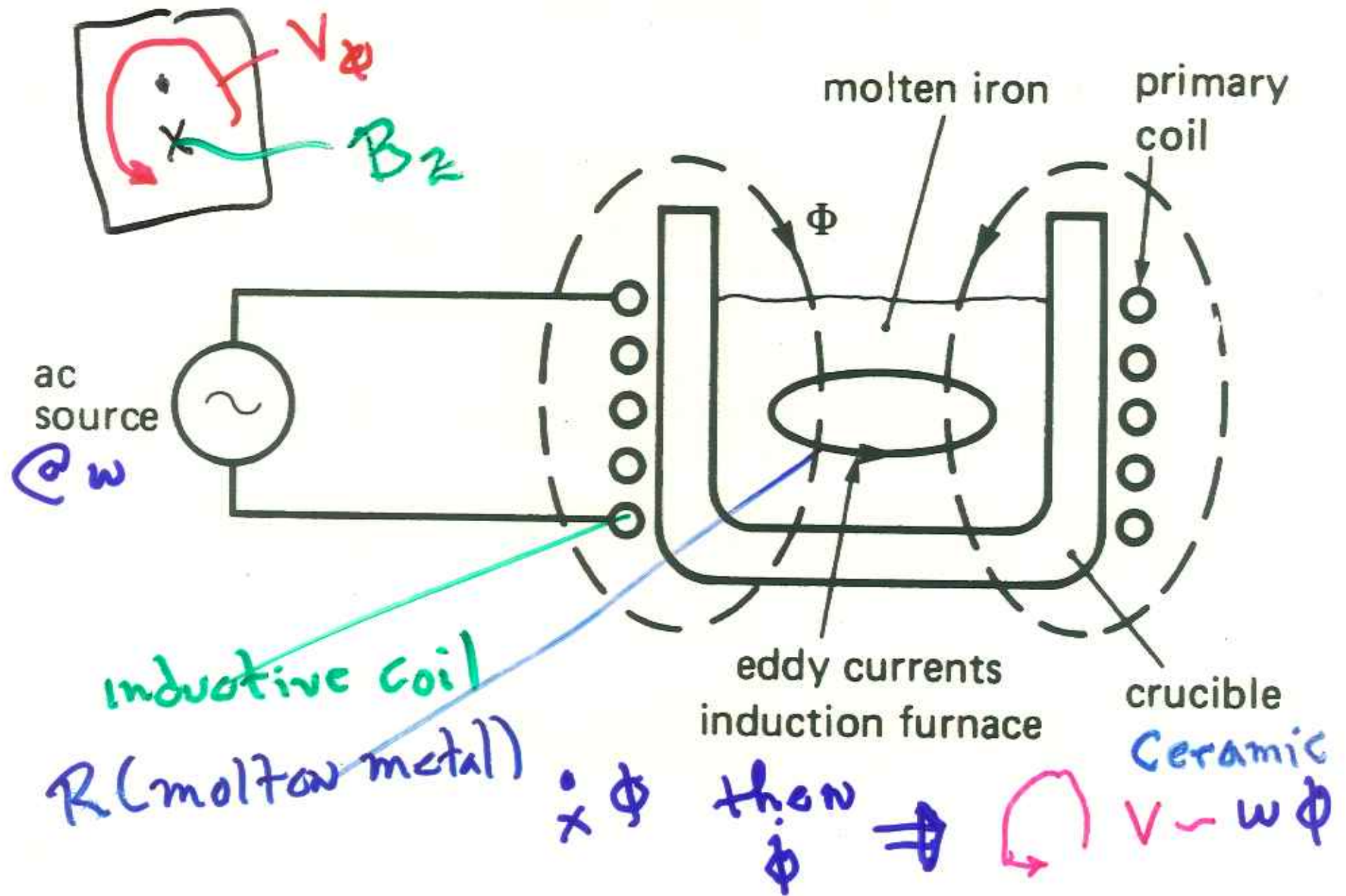


Fig 11.24c
Pg 236

Same Trf with high X_L for weld arc

Modern Metal Making



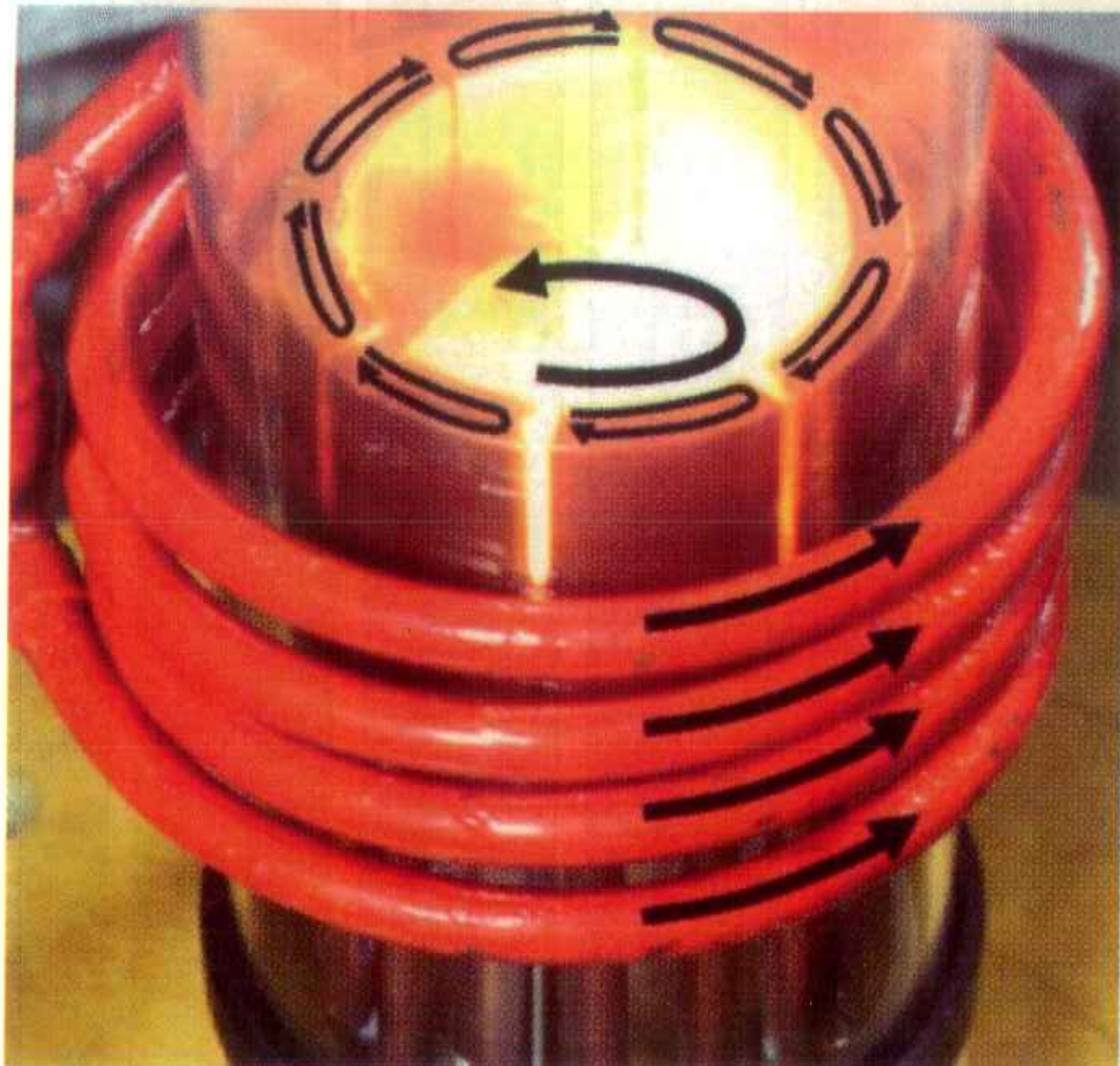



FIGURE 2: A photograph of the cold crucible with labels that indicate the direction of current in the external coil and sections.

cold  solid metal buffer
 Molten Metal

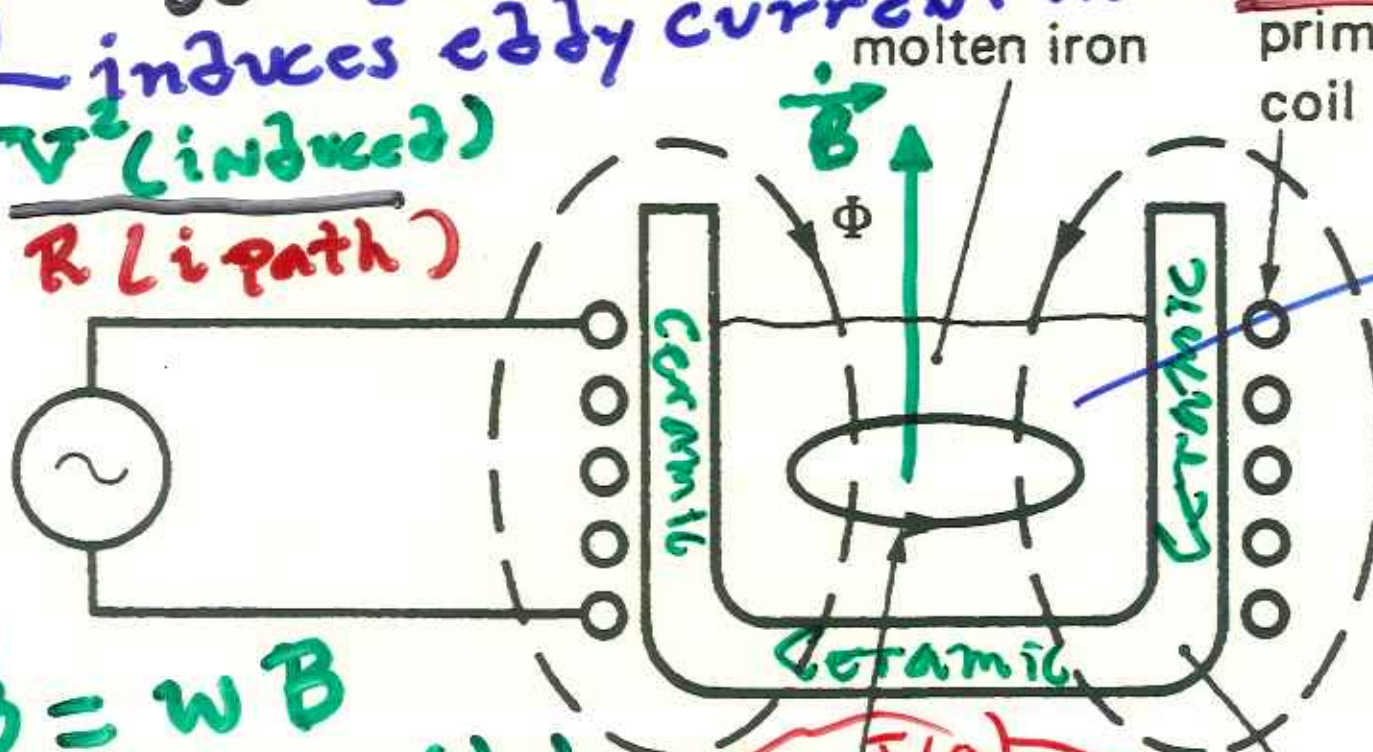
Neg C compen

Induction Heating: Low PF $\approx .2$ Why?

$\dot{B} = \frac{\partial B}{\partial t}$ B passing through a material induces eddy current in material

Power
Fig 11.2.6
PF
23%

V^2 (induced)
 R (i path)



Al, steel has low R path \Rightarrow $P_{lost} \uparrow$

$V \sim \dot{B} = \omega B$
Sinusoidal

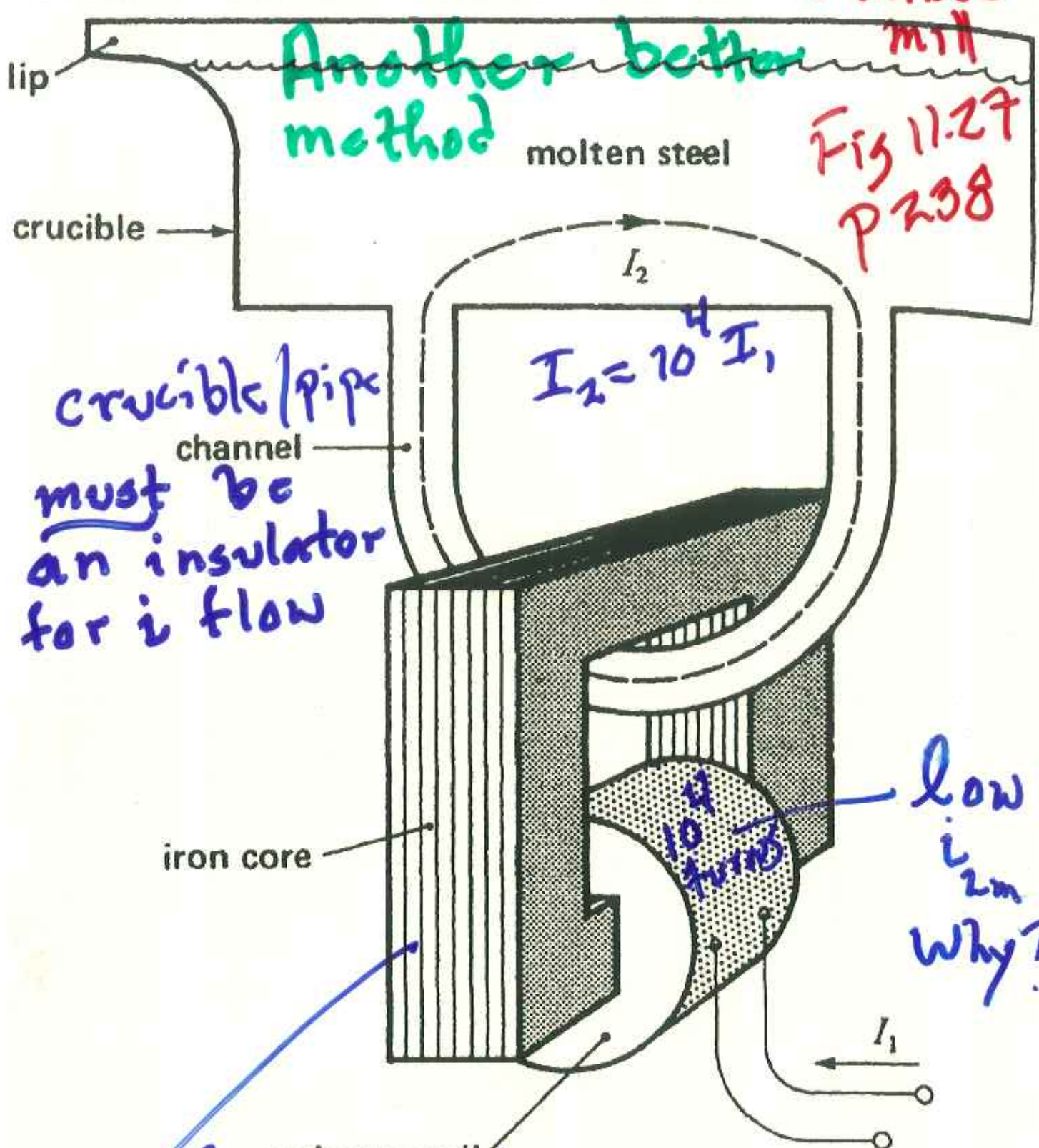
$P \sim \frac{\omega^2 B^2}{R}$

Easy to deliver P to metal

Hard to heat glass ceramic inductively why?

18

INDUCTION FURNACE : mini-mill



Another better method

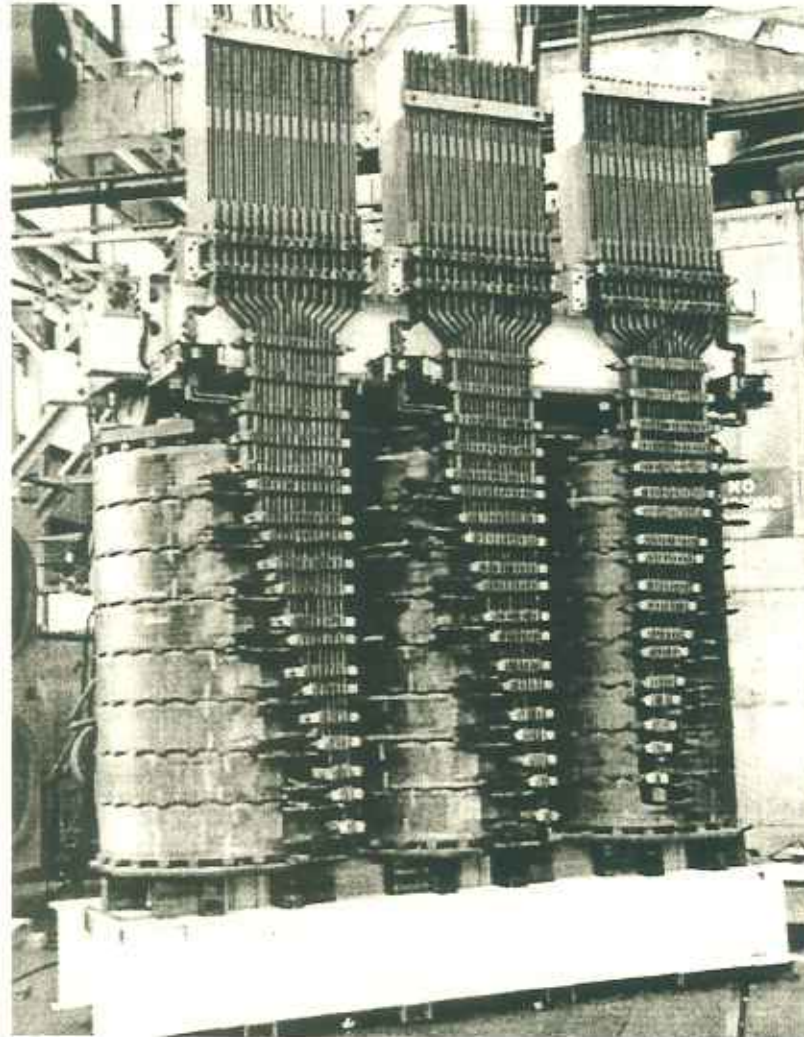
Fig 11.27
P 238

crucible / pipe
channel
must be
an insulator
for i flow

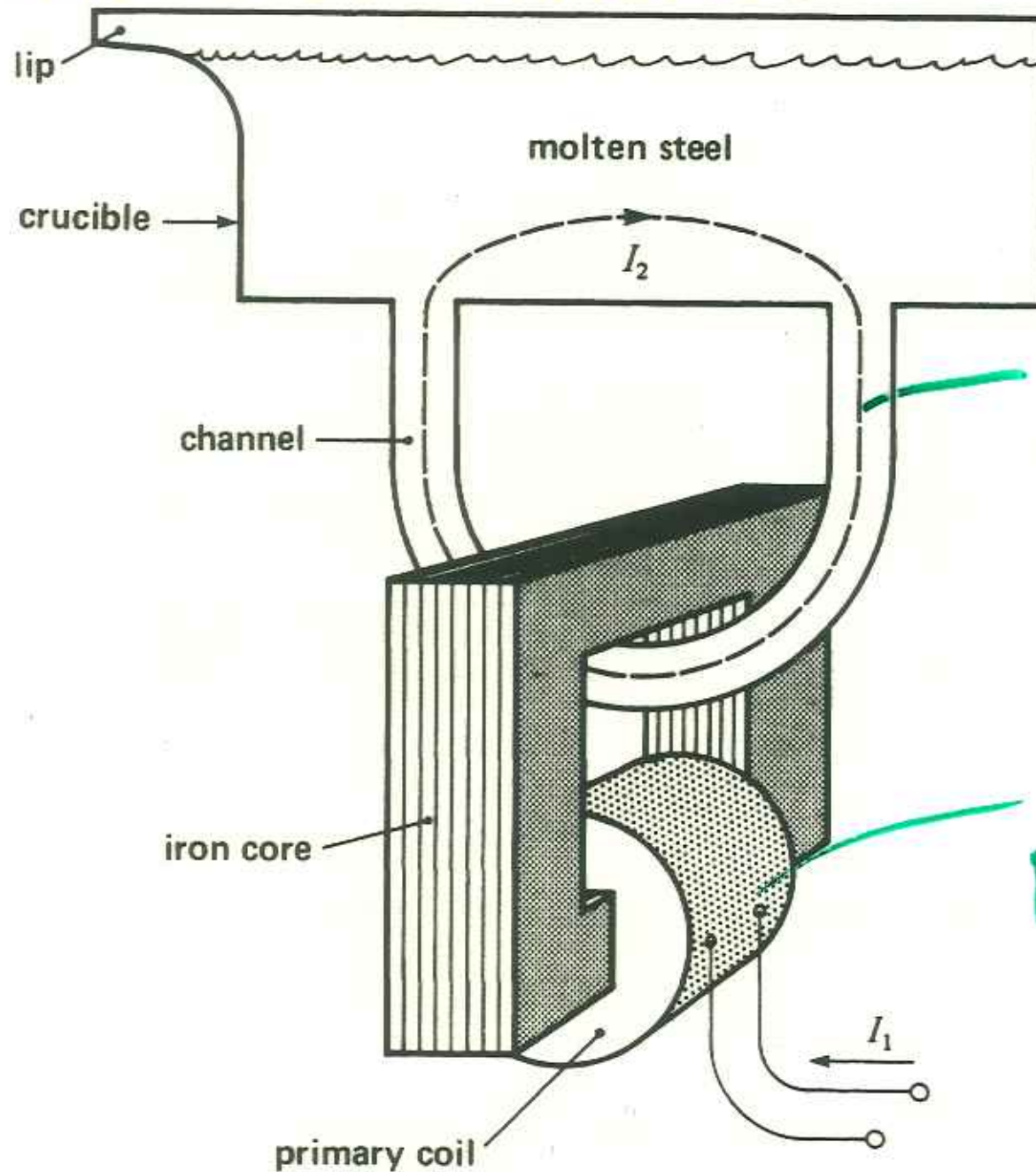
low I_{2m}
why?

Transformer
Allows : for (4) higher p.f.
 \Rightarrow little need for "C"
Compensation

Figure 12-9 Three-phase transformer for an electric arc furnace, rated 36 MVA, 13.8 kV/160 V to 320 V, 60 Hz. The secondary voltage is adjustable from 160 V to 320 V by means of 32 taps on the primary winding (not shown). The three large busbars in the foreground deliver a current of 65,000 A. Other characteristics: impedance: 3.14%; diameter of each leg of the core: 711 mm; overall height of core: 3500 mm; center line distance between adjacent core legs: 1220 mm. (Courtesy of Ferranti-Packard)



Even more efficient N:1 Trf



1 turn
 $I \uparrow \approx 10^4$
 $V \downarrow$

10^4 turns
 $L_m \sim \frac{N^2}{R}$

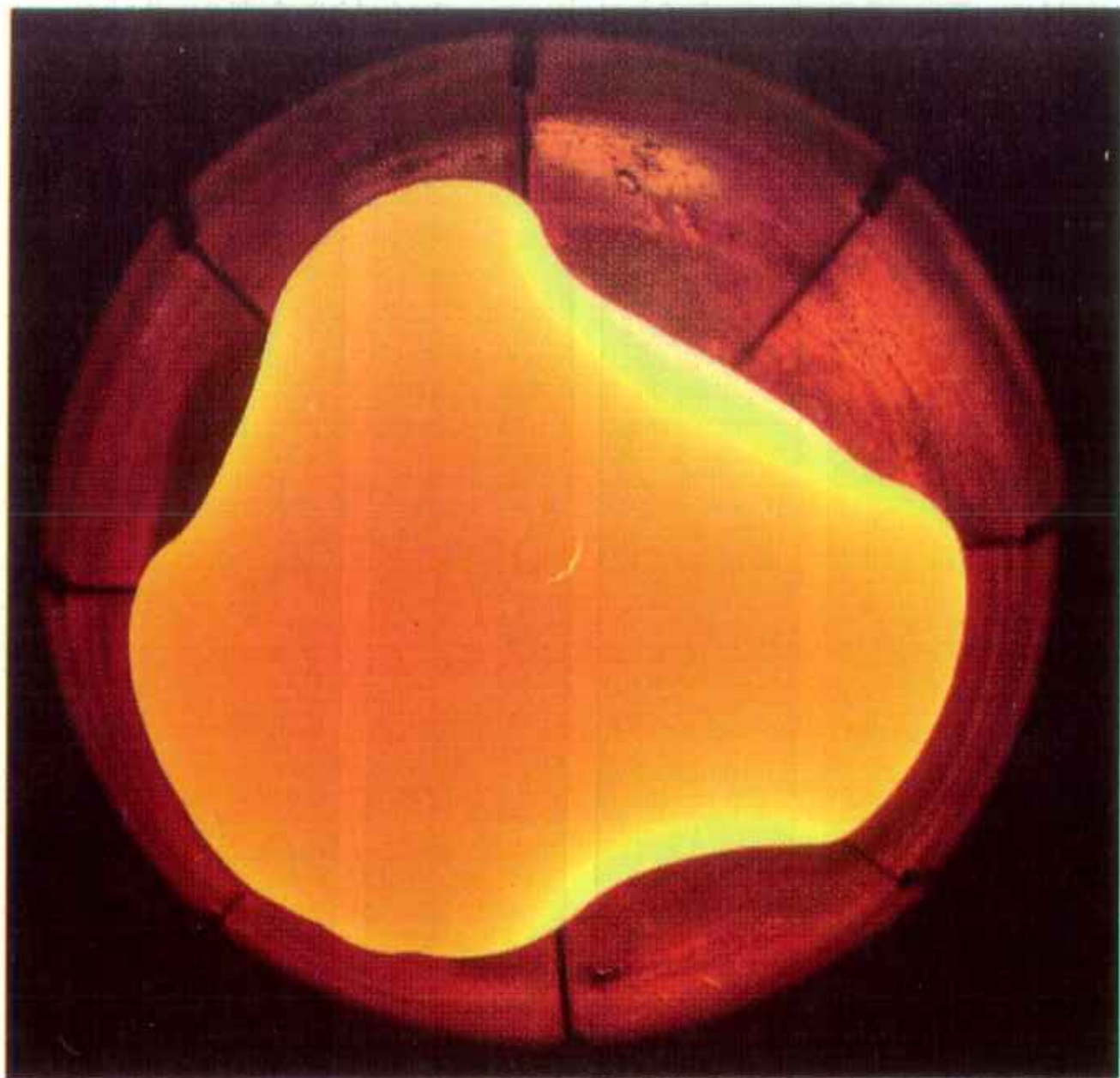


FIGURE 3: This photograph illustrates the asymmetry in the melted charge held in place with magnetic fields.